

KNOWLEDGE

1

Write the important word // important relationship and important condition

2

Can use equations, symbols , formula (explain), diagram or graphs and other suitable methods to explain your answer

Example 1

What is meant by physical quantity?

[1 Mark]

Answer

The quantity that can be measured

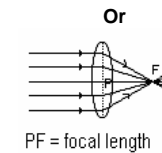
Example 2

What is meant by focal length?

[1 Mark]

Answer

The distance between optical centre and focal point



Example 3

What is meant by pressure?

[1 mark]

Answer

Force acting perpendicularly to a surface per unit area

OR

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

Example 4

State the Hooke's Law.

[1 mark]

Answer

The extension of a spring is directly proportional to the force provided the elastic limit is not exceeded

CHAPTER 1 : INTRODUCTION TO PHYSICS			
NO	TERMS	DEFINITIONS / MEANING	FORMULA
1.	Physical quantities		
2.	Base quantities		
3.	Derived quantities		
4.	Base units		
5.	Derived units		
6.	Consistency		
7.	Accuracy		
8	Sensitivity		

9.	Error		
10.	Systematic errors		
11.	Random error		
12.	Parallax error		
13.	Zero error		

CHAPTER 2 : FORCES AND MOTION			
NO	TERMS	DEFINITIONS / MEANING	FORMULA
1.	Vector quantity		
2.	Scalar quantity		
3.	Distance		
4.	Displacement		
5.	Speed		
6.	Velocity		

7.	Acceleration		
8.	Deceleration		
9.	Inertia		
10.	Mass		
11.	Momentum		
12.	Principle of conservation of momentum		
13.	Elastic collision		
14.	Non-elastic collision Force		
15.	Unbalanced / net / resultant force		
16.	Balanced forces / Forces in equilibrium		
17.	Force / Impulsive force		
18.	Impulse		

19.	Gravitational field		
20.	Gravitational field strength		
21.	Gravitational acceleration		
22.	Free fall		
23.	Weight		
24.	Newton's Second Law of Motion		
25.	Resolution of forces		
26.	1 Newton		
27.	Energy		
28.	Work done		
29.	Power		
30.	1 watt		
31.	Kinetic energy		

32.	Gravitational potential energy		
33.	Density		
34.	Principle of Conservation of energy		
35.	Efficiency		
36.	Elasticity		
37.	Hooke's Law		
38.	Elastic limit		
39.	Force constant / spring constant		
40.	Elastic potential energy		

CHAPTER 3 : FORCES AND PRESSURE			
NO	TERM	DEFINITION / MEANING	FORMULA
1.	Pressure		
2.	1 pascal or 1 N m^{-2}		
3.	Atmospheric pressure		
4.	Pascal's Principle		
5.	Buoyant force		
6.	Archimedes' Principle		
7.	Bernoulli's Principle		

CHAPTER 4 : HEAT			
NO	TERM	DEFINITION / MEANING	FORMULA
1.	Thermal equilibrium		
2.	Lower fixed point / ice point		
3.	Upper fixed point / Steam point		
4.	Heat capacity		
5.	Specific heat capacity		
6.	Specific latent heat of fusion		
7.	Specific latent heat of vaporisation		
8.	Boyle's Law		
9.	Charles' Law		
10.	Pressure Law		
11.	Absolute zero		

CHAPTER 5 : LIGHT			
NO	TERM	DEFINITION / MEANING	FORMULA
1.	Law of reflection		
2.	Principal axis of a curved mirror		
3.	Centre of curvature,C		
4.	Focal point, F of a concave mirror		
5.	Focal point, F of a convex mirror		
6.	Real image		
7.	Virtual image		
8.	Reflection of light		
9.	Refraction of light		
10.	Law of refraction		
11.	Refractive index, n		
12.	Real depth		

13.	Apparent depth		
14.	Critical angle, c		
15.	Total internal reflection		
16.	Focal point, F of a lens		
17.	Focal length, f		
18.	Power of lens		
19.	Linear magnification		

CHAPTER 6 : WAVES			
NO	TERM	DEFINITION / MEANING	FORMULA
1.	Wave		
2.	Vibration / oscillation		
3.	Transverse wave		
4.	Longitudinal wave		
5.	Wavefront		
6.	One complete oscillation		
7.	Amplitude, a (SI unit : m)		
8.	Period, T (SI unit :s)		
9.	Frequency, f (SI unit : Hz)		
10.	Wavelength, λ		
11.	Damping		
12.	Natural frequency		

13.	Resonance		
14.	Reflection of waves		
15.	Refraction of waves		
16.	Diffraction of waves		
17.	Interference of waves		
18.	Coherent waves		
19.	Principle of Superposition		
20.	Constructive interference		
21.	Destructive interference		
22.	Audio waves		
23.	Infrasound		
24.	Ultrasound		
25.	Electromagnetic spectrum		

26.	Electromagnetic waves		
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CHAPTER 7 : ELECTRICITY

NO	TERM	DEFINITION / MEANING	FORMULA
1.	Electric current		
2.	1 ampere		
3.	Electric field		
4.	Potential difference		
5.	1 volt		
6.	Resistance		
7.	Ohm's Law		
8.	Series circuit		
9.	Parallel circuit		

10.	Electromotive force (EMF)		
11.	Internal resistance, r		
12.	Electrical power		

CHAPTER 7 : ELECTROMAGNETISM

NO	TERM	DEFINITION / MEANING	FORMULA
1.	Electromagnet		
2.	Magnetic field		
3.	Catapult field		
4.	Electromagnetic induction		
5.	Lenz's Law		
6.	Faraday's Law		
7.	Direct current		
8.	Alternating current		

9.	Transformer		
10.	Step-up transformer		
11.	Step-down transformer		
12.	Ideal transformer		
13.	Eddy current		
14.	National Grid Network		

CHAPTER 9 : ELECTRONIC

NO	TERM	DEFINITION / MEANING	FORMULA
1.	Thermionic emission		
2.	Cathode ray		
3.	Semiconductor		
4.	Doping		
5.	n-type semiconductor		

6.	p-type semiconductor		
7.	p-n junction		
8.	semiconductor diode		
9.	Forward bias		
10.	Reverse bias		
11.	Rectifier		
12.	Half-wave rectification		
13.	Full-wave rectification		
14.	Transistor		
15.	Logic gates		
16.	Truth table		

CHAPTER 10 : RADIOACTIVITY			
NO	TERM	DEFINITION / MEANING	FORMULA
1.	Proton number, Z		
2.	Nucleon number, A		
3.	Isotopes		
4.	Radioactivity		
5.	Radioactive decay		
6.	Radiation		
7.	Ionising effect		
8.	Half-life		
9.	Radioisotopes		
10.	Atomic mass unit (amu or u)		
11.	Nuclear fission		

12.	Chain reaction		
13.	Nuclear fusion		
14.	Einstein's Principle		

UNDERSTANDING

- 1** Give the physics concept involved or observation
- 2** Give the explanation or reason
- 3** Can use diagram to explain the answer

Example 1

A car moves along a sharp bend of a road with a uniform speed is accelerated . Explain why?

[3 Marks]

.....

Answer

The direction of the car is changed
 The velocity changes
 The car is accelerated because acceleration is the rate of change of velocity

Example 2

Explain why a sea breeze occurs during the daytime ?

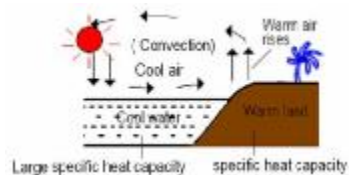
[4 Marks]

.....

Answer

The specific heat capacity of water > sand(land)
 Sand heat faster than water
 The air above the land is heated and rises
 and its place is taken by cooler air above the sea moving inland // convection currents

OR



Question 2.1

Diagram 2.1 shows a skydiver falls freely downwards before the parachute open .
 Rajah 2.1 menunjukkan penerjun jatuh secara bebas sebelum payung terjun terbuka.



Diagram 2.1
 Rajah 2.1

Explain why the skydiver must open up his arms and legs wide when fall freely as shown in diagram.
 Terangkan mengapa penerjun mesti membuka tangan dan kaki apabila jatuh secara bebas seperti dalam rajah.

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[4 marks]

Question 2.2

Explain why the safety belt used by a car driver is wide and can be slightly lengthen when the driver is jerked forward.
 Terangkan mengapa tali pinggang keselamatan yang digunakan oleh pemandu kereta adalah lebar dan boleh memanjang apabila pemandu terhumban kehadapan.

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[4 marks]

Question 2.3

A ball is thrown upwards and catches up again by a boy later.
Explain what happens to the motion of the ball as it moves upwards and downwards.
Seorang budak melambung sebiji bola ke atas dan kemudian menangkap bola itu semula. Terangkan pergerakan bola itu ke atas dan ke bawah.

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[4 marks]

Question 2.4

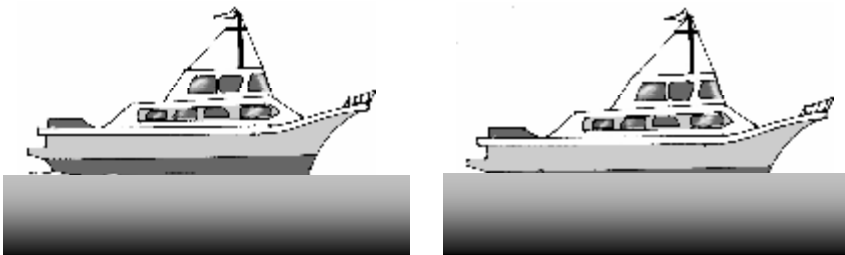
Explain how the forces between the molecules caused the elasticity .
Jelaskan bagaimana daya antara molekul mewujudkan sifat kekenyalan.

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.....
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[4 marks]

Question 2.5

Diagram 2.5 shows two boats of the same weight floating on the surface of water in the sea and in the river.
Rajah 2.5 menunjukkan dua buah kapal berjirim sama , terapung di permukaan sungai dan di permukaan laut.



Boat in the sea
Bot di dalam laut

Boat in the river
Bot di dalam sungai

Diagram 2.5
Rajah 2.5

Explain why the boat is able to float and the sinking levels of the boats are different in the river and in the sea.

Terangkan mengapa kapal itu boleh terapung dan paras kapal yang tenggelam berbeza di dalam sungai dan di dalam laut?

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.....

[4 marks]

Question 2.6

Diagram 2.6 shows a boy jumps out of the boat onto the river bank. By using the relevant physics concept, explain why the boat moves away from the jetty as he jumps
Rajah 2.6 menunjukkan seorang lelaki melompat keluar daripada bot kepada tepi sungai. Dengan menggunakan konsep fizik ,terangkan mengapa bot bergerak jauh daripada jeti selepas dia melompat.



Diagram 2.6
Rajah 2.6

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.....

[4marks]

Question 2.7

Diagram 2.7 shows a girl on a recreational trampoline. The spring-action of the trampoline naturally makes the girl bounce up and down.

Rajah 2.7 menunjukkan seorang kanak-kanak perempuan di atas sebuah trampolin rekreasi. Kesan keanjalan spring trampolin menyebabkan kanak-kanak itu melompat-lompat ke atas dan ke bawah..

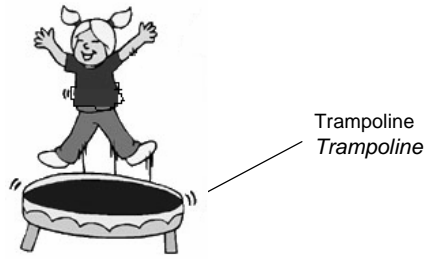


Diagram 2.7
Rajah 2.7

Explain how the spring-action of the trampoline can push the girl upward. Explain your answer in terms of the transformation of energy.

Terangkan bagaimana tindakan keanjalan spring trampolin itu membolehkan kanak-kanak itu melompat ke atas. Terangkan jawapan anda dari aspek perubahan tenaga yang terlibat.

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[4 marks]

Question 3.1

Diagram 3.1 shows a part of a structure of a long bridge. The pressure of the bridge is applied to the base of the bridge which is fixed to a seabed underwater. The bridge is supported by two pillars.

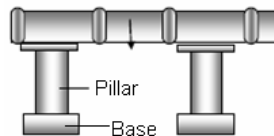


Diagram 3.1

Explain why the base of the pillar is built with a large surface area.

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[2 marks]

Question 3.2

During the World Cup, a penalty kick made by Ballack is in a curved path as shown in Diagram 3.2.1. The ball which is kicked to spin moves in a curved path. Figure 3.2.2 shows the air flow around the spinning ball.



Diagram 3.2.1

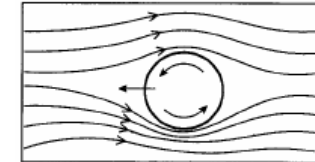


Diagram 3.2.2

Explain why the path taken by the spinning ball is curved.

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[3 marks]

Question 3.3

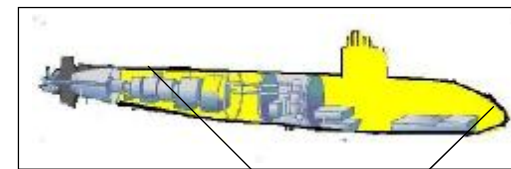


Diagram 3.3

Diagram 3.3 shows the internal structure of a submarine and the position of ballast tanks.

Explain how a submarine that floats on the sea surface can sink underwater.

Rajah 3.3 menunjukkan struktur dalaman bagi kapal selam dan kedudukan tangki ballast.

Terangkan bagaimana kapal selam yang terapung pada permukaan boleh tenggelam.

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[3 marks]

Question 3.4

Diagram 3.4 shows a vacuum cleaner.

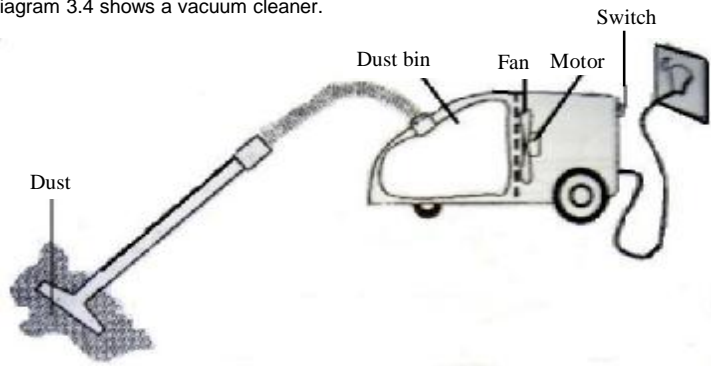


Diagram 3.4

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[3 marks]

Question 3.5

Diagram 3.5 shows two pairs of shoes used by a lady. The shoes in Diagram 3.5.1 is used when she is going for work in office and the shoes in Diagram 3.5.2 is used when she went for jogging.

Rajah 3.5 menunjukkan dua pasang kasut digunakan oleh perempuan. Kasut pada rajah 3.5.1 digunakan apabila beliau ke pejabat untuk bekerja dan kasut pada rajah 3.5.2 digunakan untuk berjogging.



Diagram 3.5.1



Diagram 3.5.2

The shoes in Diagram 3.5.2 is more suitable to be used for jogging along the beach compared to the shoes in Diagram 3.5.1. Explain why?

Kasut dalam rajah 3.5.2 adalah lebih sesuai digunakan berjogging sepanjang pantai berbanding kasut dalam rajah 3.5.1. Terangkan mengapa?

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[4 marks]

Question 3.6

Diagram 3.6 shows a cargo ship floats on sea water. The water level is at R as indicated by the Plimsoll line.

Rajah 3.6 menunjukkan sebuah kapal kargo yang terapung di dalam air laut. Aras air adalah pada R seperti yang ditunjukkan oleh garis Plimsoll.

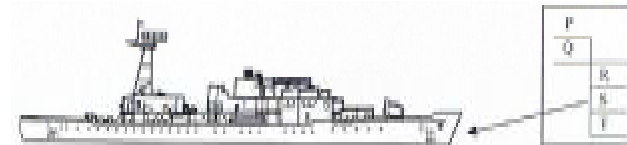


Diagram 3.6

Rajah 3.6

Why does an iron nail sink in water but a cargo ship with a huge mass floats?

Mengapakah paku besi tenggelam didalam air tetapi kapal kargo dengan muatan yang besar terapung?

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[2 marks]

Question 3.7

Diagram 3.7 shows rod A and rod B of different densities are immersed in water.
Rajah 3.7 menunjukkan rod A dan rod B yang berbeza ketumpatan ditenggelamkan dalam air.

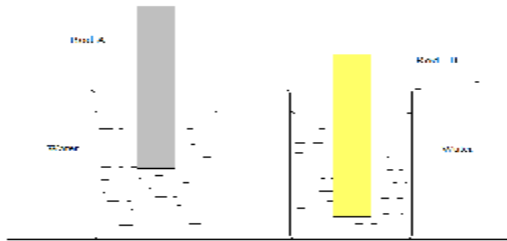


Diagram 3.7

Rajah 3.7

Explain why the rods float in water and why B sinks deeper than A.
Terangkan mengapa rod A terapung dalam air dan rod B lebih tenggelam daripada A

.....

[4 marks]

Question 3.8

Based on Diagram 3.8 Explain briefly how the load can be lifted up when the small piston X is pressed down.
Berdasarkan Rajah 3.8 Terangkan bagaimana pemberat dapat diangkat apabila ombok kecil X ditekan kebawah

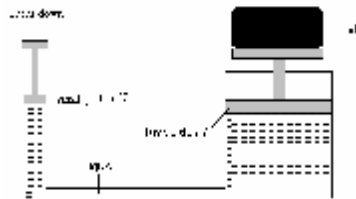


Diagram 3.8

.....

[4marks]

Question 3.9

The aircraft obtains its lift when flying due to a difference in pressure of the air between the upper and bottom sides of the wings. Explain how this difference in pressure is produced.

Sebuah pesawat udara terangkat semasa terbang disebabkan oleh perbezaan tekanan udara di antara bahagian atas dan bahagian bawah sayap. Terangkan bagaimana perbezaan tekanan ini dihasilkan.

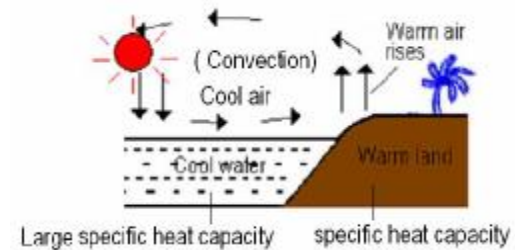
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[3 marks]

Question 4.1

Diagram 4.1 shows a seaside during the day.

Rajah 4.1 menunjukkan tepi pantai semasa siang.



Using the specific heat capacity concept, explain why sea breeze occurs during day time.
Dengan menggunakan muatan haba tentu, terangkan mengapa bayu laut dihasilkan semasa waktu siang

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[4 Marks]

QUESTION 4.2

Diagram 4.2 shows a tightly rolled paper on an iron rod and is heated.
 (Paper will be burnt when the temperature reaches 230° C)
Rajah 4.2 menunjukkan kertas yang dibalut dengan ketat pada sebatang besi dan kemudian dibakar. (Kertas akan terbakar apabila suhunya mencapai 230° C).

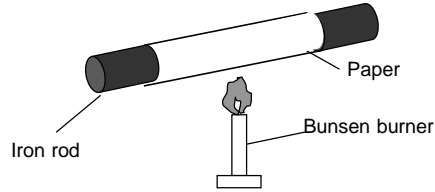


Diagram 4.2
 Rajah 4.2

Explain what happens to the paper when it is initially heated?
Terangkan apakah yang berlaku kepada kertas pada mula ia dipanaskan?

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[4 marks]

QUESTION 4.3



Explain how a new thermometer can be calibrated.
Terangkan bagaimana termometer baru boleh ditentukan.

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[4 marks]

Question 4.4

Diagram 4.4 shows two cups of coffee of equal mass being cooled by adding a few pieces of ice cubes.

Rajah 4.4 menunjukkan dua cawan kopi berjisim sama disejukkan dengan menambah beberapa ketulan ais.



Cup A
 Cawan A

Cup B
 Cawan B

Diagram 4.4
 Rajah 4.4

Initially, each cup contains 0.5 kg of coffee at 75.5 °C. It is observed that both cups of coffee reach a final temperature of 25 °C at the same time.

Pada awalnya, setiap cawan mengandungi 0.5 kg kopi pada 75.5 °C. Diperhatikan bahawa kedua-dua cawan kopi mencapai suhu akhir 25 °C pada masa sama.

Which cup of coffee requires more ice and explains your answer?

Cawan kopi yang manakah memerlukan lebih banyak ais dan jelaskan jawapan anda?

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[3 marks]

Question 4.5

Explain why water is normally used as a cooling agent in a car engine.
Terangkan mengapa air digunakan sebagai bahan penyejuk dalam enjin kereta

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[4 marks]

Question 4.6

Diagram 4.6 shows a cooling pad used to lower the temperature of a person having fever. The pad consists of a gel and is cooled in a refrigerator before it is placed on the forehead of the person to remove the heat.

Rajah 4.6 menunjukkan satu pelapik penyejuk yang digunakan untuk menurunkan suhu seorang yang demam panas. Pelapik itu mengandungi satu jel dan disejukkan dalam peti sejuk sebelum diletakkan pada dahi orang itu untuk mengeluarkan haba.

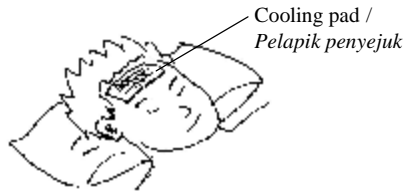


Diagram 4.6
Rajah 4.6

Explain how the heat is removed from the forehead of the person.

Terangkan bagaimana haba dikeluarkan dari dahi orang itu.

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[3 marks]

Question 5.1

Diagram 5.1 shows a stainless steel spoon. When you look at the spoon, you will see an upright and virtual image of your face on one side of the curved surfaces but an inverted image on the other side.

Rajah 5.1 menunjukkan satu sudu keluli tahan karat. Apabila anda memandang pada sudu itu, anda akan melihat imej muka yang tegak dan maya pada permukaan lengkung tetapi imej yang songsang pada bahagian sebaliknya.



Diagram 5.1
Rajah 5.1

How does one side of the curved surface of the spoon formed an upright image, while the other side formed an inverted image? Use ray diagrams to explain your answer.

Bagaimanakah bahagian yang lengkung itu membentuk imej yang tegak, sementara bahagian yang satu lagi membentuk imej songsang? Gunakan rajah sinar untuk menerangkan jawapan anda.

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[6 marks]

Question 5.2

Diagram 5.2 shows a driver that is driving under a hot sun, sees a pool of water appearing on the road ahead due to total internal reflection.

Rajah 5.2 menunjukkan seorang pemandu yang sedang memandu pada hari yang panas ternampak tompokan air di hadapan disebabkan oleh pantulan dalam penuh.

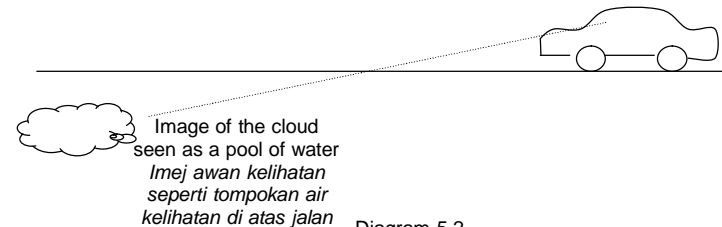


Diagram 5.2
Rajah 5.2

Explain how the pool of water appearing on the road.

Terangkan bagaimana tompokan air kelihatan di atas jalan itu?

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[5 marks]

Question 5.3

Diagram 5.3 shows a ray of light is directed perpendicularly at a side of the semi circular glass block.

Rajah 5.3 menunjukkan satu sinar cahaya ditujukan secara tegak ke sisi sebuah bongkah kaca semi bulatan.

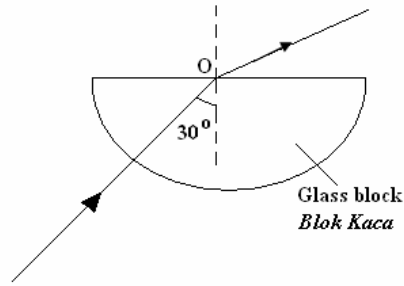


Diagram 5.3
Rajah 5.3

Explain how total internal reflection occurs in Diagram 5.3 above?
 Terangkan bagaimana pantulan dalam penuh berlaku di dalam Rajah 5.3 di atas?

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[4 marks]

Question 5.4

Describe how you estimate the focal length of a convex lens.
 Huraikan bagaimana anda boleh menganggarkan jarak fokus bagi sebuah kanta cembung.

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[4 marks]

Question 5.5

You are given two convex lenses, R and S, with focal lengths of 40 cm and 10 cm respectively. Both the lenses are used to build a compound microscope.
 Anda diberi dua buah kanta cembung, R dan S, dengan jarak fokus 40 cm dan 10 cm. Kedua-dua kanta tersebut digunakan untuk membina sebuah mikroskop majmuk.
 Explain how you would build a compound microscope.
 Terangkan bagaimana anda membina sebuah mikroskop majmuk.

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[6 marks]

Question 5.6

Diagram 5.6 shows an object placed in front of a concave mirror. A light ray travels from the object to the mirror through the centre of curvature of the mirror, C and reflects along the same path.

Rajah 5.6 menunjukkan satu objek diletakkan di hadapan sebuah cermin cekung. Satu sinar cahaya bergerak dari objek ke cermin melalui pusat lengkungan cermin, C dan dipantulkan mengikut lintasan yang sama.

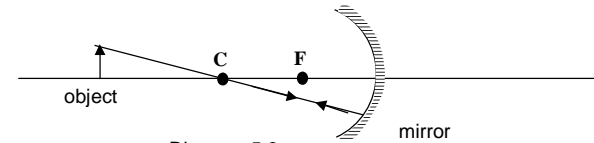


Diagram 5.6

The light ray propagates toward the centre of curvature of the mirror, C is reflected along the same path. Explain your answer.
 Cahaya yang merambat ke pusat lengkungan cermin, C akan dipantulkan mengikut lintasan yang sama. Jelaskan jawapan anda.

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[4 marks]

Question 5.7

Explain how you are going to build a simple periscope when you are given two right angles prisms.
 Terangkan bagaimana anda dapat membina sebuah periskop ringkas apabila anda diberi dua prisma bersudut tepat.

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[6 marks]

Question 5.8

Explain why a fish in a pond able to see objects around him although there are obstacles.
 Terangkan mengapa seekor ikan boleh melihat objek sekeliling walaupun terdapat Halangan

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.....

[4 marks]

Question 5.9

With the help of a diagram, explain the working principle of an optical fibre.
Dengan bantuan gambar rajah, jelaskan prinsip kerja satu serabut optik.

[4 marks]

Question 6.1

Two loudspeakers placed 1.5 m apart are connected to an audio signal generator. When a student walks at a distance in front of the loudspeakers he hears several consecutive loud and soft sounds.
Dua pembesar suara ditempatkan 1.5 m secara bersebelahan disambungkan kepada satu penjana isyarat audio. Apabila seorang pelajar berjalan di hadapan dua pembesar suara itu, dia mendengar beberapa bunyi kuat dan lemah berturutan.
Explain why.
Terangkan mengapa.

.....
.....
.....

[4 marks]

Question 6.2

Explain why the waves bend according to the shape of the shoreline when they are approaching the beach?
Terangkan mengapa gelombang membengkok mengikut bentuk tepi pantai apabila ia menghampiri pantai?

.....
.....
.....

[4 marks]

Question 6.3

Explain why the speed of sound is greater in water than that in air?
Terangkan mengapa halaju bunyi lebih tinggi dalam air berbanding dalam udara?

.....
.....

[2 marks]

Question 6.4

Diagram 6.4 shows an aeroplane fitted with a sound generator to reduce noise inside the aeroplane.
Rajah 6.4 menunjukkan sebuah kapalterbang yang dipasang satu penjana bunyi untuk mengurangkan kebisingan dalam kapalterbang.

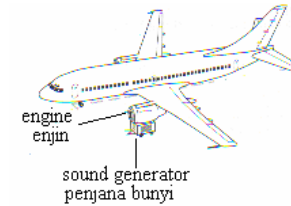


Diagram 6.4
Rajah 6.4

Explain how the device function to reduce noise inside the aeroplane?
Terangkan bagaimana alat tersebut berfungsi untuk mengurangkan kebisingan dalam pesawat?

.....
.....
.....

[4 marks]

Question 6.5

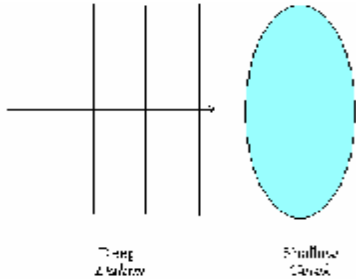
Why diamond sparkles and colourful when light enter it.
Terangkan mengapa intan berkilauan dan berwarna-warni apabila cahaya memasukinya.

.....
.....

[3 marks]

Question 6.6

Diagram 6.6 shows a plane water wave propagates from deep water to the shallow water.
Rajah 6.6 menunjukkan satu gelombang satah merambat dari kawasan dalam ke kawasan cetek yang berbentuk cembung.



Explain what happens to the plane water wave before and after passing through the shallow water. You can use a diagram to explain your answer.
*Terangkan apa yang akan berlaku kepada gelombang satah apabila melalui kawasan air cetek dan selepas melaluinya.
 Anda boleh menggunakan gambar rajah untuk menjelaskan jawapan.*

.....

 [4 marks]

Question 6.7

When a boy throws a large stone into a large still pond, the water waves is produced.
 Explain how the wave is produced?
*Apabila seorang budak lelaki melontar sebiji batu yang besar ke dalam sebuah kolam besar yang berair tenang, gelombang air dihasilkan.
 Terangkan bagaimana gelombang air terhasil?*

.....

 [2 marks]

Question 6.8

A ship can measure the depth of the sea.
 Explain how a ship can measure the depth of the sea bed.

*Sebuah kapal dapat mengukur kedalaman dasar laut.
 Terangkan bagaimana sebuah kapal dapat mengukur kedalaman dasar laut.*

.....

 [3 marks]

Question 7.1

Diagram 7.1.1 and 7.1.2 shows two identical bulbs connected to one cell and two dry cell respectively.
Rajah 7.1.1 dan 7.1.2 menunjukkan dua mentol yang serupa disambungkan kepada satu dan dua sel kering masing-masing.

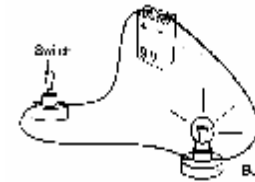


Diagram 7.1.1
Rajah 7.1.1

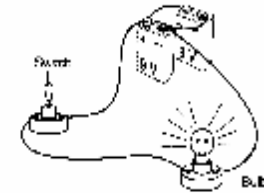


Diagram 7.1.2
Rajah 7.1.2

Explain why the bulb connected to two dry cells is brighter.
Terangkan mengapa mentol yang disambungkan kepada dua sel kering menyala lebih terang.

.....

 [3 marks]

Question 7.2

Explain why it is more dangerous to touch the live wire of a mains supply, rather than the neutral wire.
Terangkan mengapa lebih berbahaya jika meyentuh wayar hidup bekalan kuasa berbanding wayar neutralnya.

.....

 [2 marks]

Question 7.3

Diagram 7.3 shows the burning candle placed between a pair of parallel metal plates.
Rajah 7.3 menunjukkan sebatang lilin yang menyala diletakkan diantara sepasang plat logam.

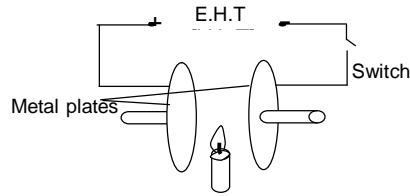


Diagram 7.3

Explain what will happen to the candle flame when the extra high voltage supply (E.H.T) is switch on?

Terangkan apakah yang akan berlaku kepada nyalaan lilin apabila suis bekalan voltan tinggi (E.H.T) dihidupkan?

.....

.....

.....

[4 marks]

Question 7.4

Explain the advantages of connecting household appliances in parallel.
Terangkan kelebihan menyambung perkakas elektrik rumah secara selari.

.....

.....

.....

[4 marks]

Question 8.1

Diagram 8.1 shows a d.c. generator.
Rajah 8.1 menunjukkan sebuah penjana a.t.

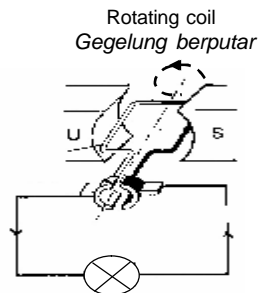


Diagram 8.1
Rajah 8.1

Explain how the generator works to produce a direct current. Sketch a current-time graph to explain your answer.

Terangkan bagaimana sebuah penjana berfungsi untuk menghasilkan arus terus. Lukiskan graf arus- masa untuk menerangkan jawapan anda.

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[4 marks]

Question 8.2

Diagram 8.2 shows two thin copper strips, WX and YZ, connected to a circuit.
Rajah 8.2 menunjukkan dua jalur kuprum, WX dan YZ yang disambungkan kepada satu litar.

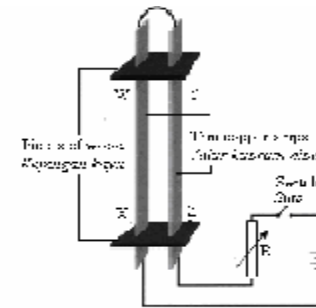


Diagram 8.2

Explain what happen to copper strip WX and YZ when the switch is on.
Terangkan apa yang berlaku kepada jalur kuprum WX dan YZ apabila suis dihidupkan.

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.....

.....

[4 marks]

Question 8.3

Diagram 8.3 shows a bar magnet is hung on a spring that attached to a retort stand. The bar magnet is displaced downwards and released so it can oscillate through a solenoid which is connected to a centre-zero galvanometer.

Rajah 8.3 menunjukkan satu magnet bar digantung pada satu spring yang diletakkan pada kaki retot. Bar magnet itu disesarkan ke bawah dan dilepaskan supaya ia boleh berayun melalui satu solenoid yang disambungkan kepada sebuah galvanometer pusat-sifar.

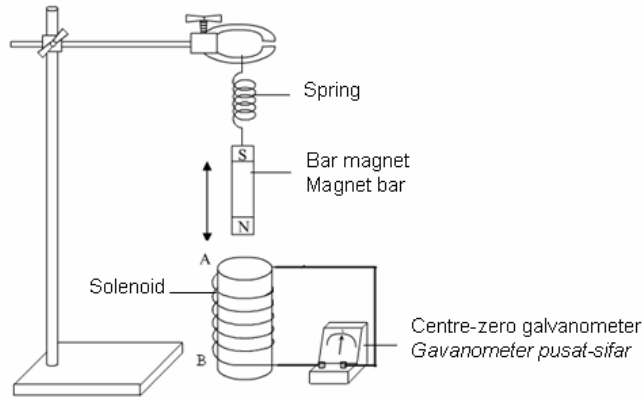


Diagram 8.3

When the bar magnet move towards the solenoid, the galvanometer pointer deflect for a while.
 Bila magnet bar bergerak mendekati solenoid, jarum galvanometer terpesong seketika.

Explain why the galvanometer pointer deflects?
 Terangkan mengapa jarum galvanometer terpesong?

.....

 [2 marks]

Question 8.4

Diagram 8.4 shows a set up used to study the effects of magnetic field of a current-carrying copper rod
 Rajah 8.4 menunjukkan susunan radas yang digunakan untuk mengkaji kesan medan magnet terhadap rod kuprum yang membawa arus elektrik.

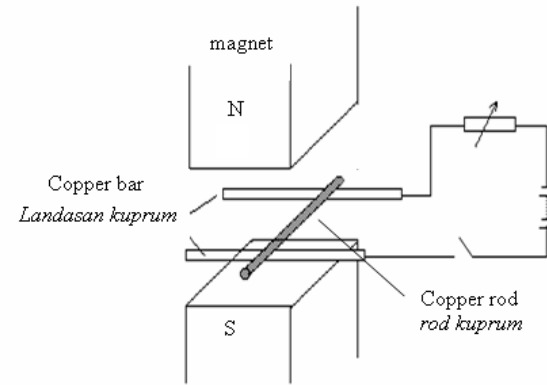


Diagram 8.4

(a) Explain what happens to the copper rod when the switch is turned on.
 Terangkan apa yang berlaku kepada rod kuprum apabila suis dihidupkan.

.....

 [2 marks]

(b) The dry cells are replaced with 12 V a.c. Explain what happens to copper rod when the switch is turned on.
 Sel bateri ditukarkan dengan 12 V a.u. Terangkan apa yang berlaku kepada rod kuprum apabila suis dihidupkan.

.....

 [2 marks]

Question 8.5

Diagram 8.5 shows a d.c. electric motor.
 Rajah 8.5 menunjukkan sebuah motor elektrik a.t

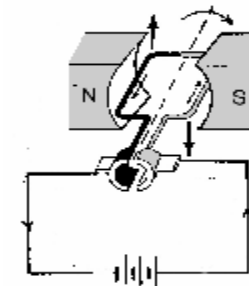


Diagram 8.5

Explain how the motor is able to rotate.
 Terangkan bagaimana motor tersebut boleh berputar.

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.....

[4 marks]

Question 8.6

Diagram 8.6 shows a simple electromagnet consists of a solenoid with soft iron core inside. And, two magnet bars are hung freely at both sides of the solenoids.

Rajah 8.6 menunjukkan satu elektromagnet ringkas yang terdiri daripada satu solenoid dililitkan pada teras besi lembut. Dan, dua bar magnet digantung dengan bebas berhampiran kedua-dua belah sisi solenoid tersebut.

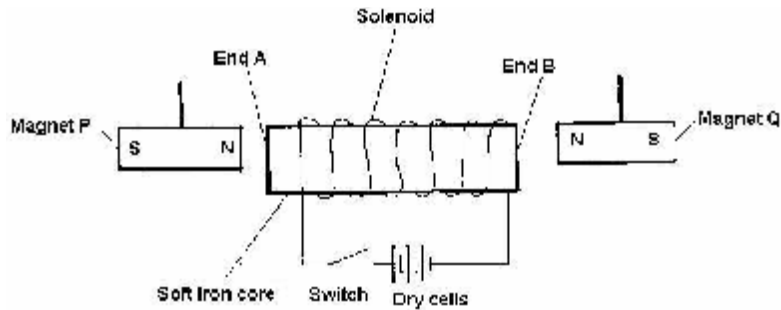


Diagram 8.6

Explain what happens to magnet P and magnet Q when the switch is on.
 Terangkan apa yang berlaku kepada kedua-dua bar magnet, P dan Q tersebut. Berikan sebabnya.

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[4 marks]

Question 8.7

Diagram 8.7 shows an electric bell connected to dry cells.
 Rajah 8.7 menunjukkan satu loceng elektrik yang disambungkan kepada sel-sel kering.

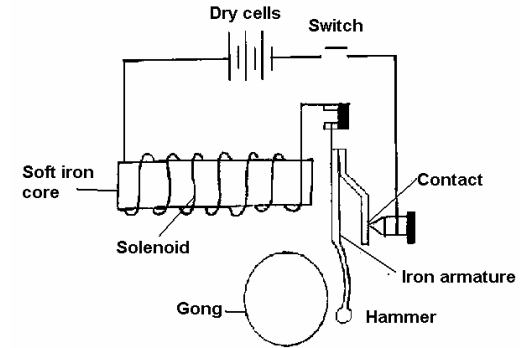


Diagram 8.7

Explain how the electric bell functions.
 Terangkan bagaimana loceng elektrik ini berfungsi.

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[4 marks]

Question 8.8

Explain the working principle of transformer.
 Terangkan prinsip kerja sebuah transformer.

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[4 marks]

Question 9.1

Explain how an n - type semiconductor is produced?
Terangkan bagaimana semikonduktor jenis-n dihasilkan.

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[4 marks]

Question 9.2

Diagram 9.2 shows a Cathode-Ray Oscilloscope.
Rajah 9.2 menunjukkan sebuah osiloskop sinar katod.



Diagram 9.2

Explain how the Cathode-Ray Oscilloscope can be used to measure the potential difference of a dry cell.
Terangkan bagaimana osiloskop sinar katod boleh digunakan untuk mengukur beza keupayaan satu sel kering.

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[4 marks]

Question 9.3

Diagram 9.3 shows a full wave rectifier circuit that forms a full wave rectification.
Rajah 9.3 menunjukkan satu litar rektifikasi gelombang penuh.

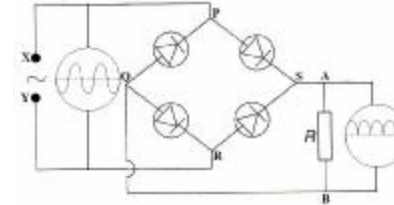


Diagram 9.3

A capacitor is then placed across the output to smooth the current. Draw the wave form produced.
Explain how a capacitor is used to smooth the current.
Satu kapasitor diletakkan merentasi output untuk meratakan arus. Lukis bentuk gelombang yang terhasil. Terangkan bagaimana kapasitor digunakan untuk meratakan arus.

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[3 marks]

Question 9.4

Diagram 9.4 shows a light dependent resistance, LDR , used in transistor circuit to control a road lamp labeled 240 V, 100 W.
Rajah 9.4 menunjukkan perintang peka cahaya digunakan dalam litar transistor untuk mengawal lampu jalan yang berlabel 240 V, 100 W

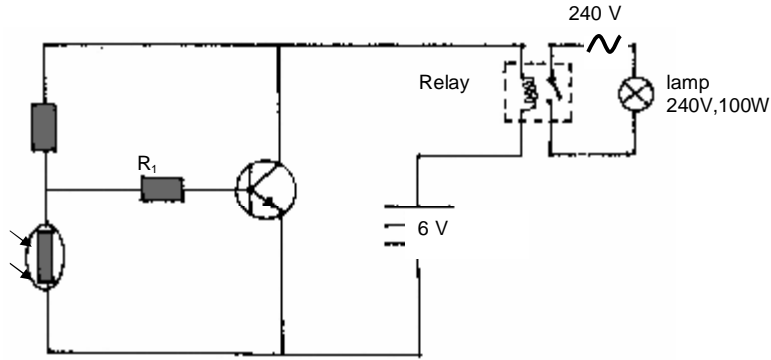


Diagram 9.4

At night the road lamp is switched on automatically. Explain how the circuit function at night.
 Pada waktu malam lampu jalan dihidupkan secara automatik. Jelaskan bagaimana litar itu berfungsi pada waktu malam.

.....

[2 marks]

Question 10.1

A factory produces aluminium plate 1 mm thick. The thickness of aluminium plate can be detected by a detector which is connected to radioactive counter equipment as shown in Diagram 10.1. Radioactive source emitting *b* ray is used.

*Sebuah kilang menghasilkan kepingan aluminium setebal 1 mm. Ketebalan kepingan aluminium boleh dikesan dengan satu pengesan yang disambungkan kepada suatu pembilang seperti dalam Rajah 10.1. Sumber radioaktif yang memancarkan sinar beta *b* digunakan.*

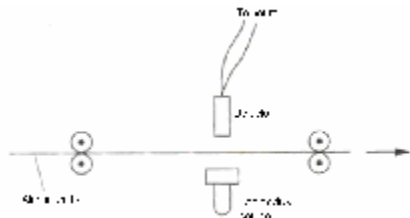


Diagram 10.1

Explain why radioactive source that emitted *a* ray and *g* ray are not suitable?

Terangkan mengapa sumber radioaktif yang memancarkan sinar *a* dan sinar *g* tidak sesuai digunakan.

.....

[2 marks]

Question 10.2

Radioisotope Strontium-90 is used to measure the thickness of paper in a paper industry. Explain how Strontium-90 is used to measure the thickness piece of paper?

Radiosotop Strontium-90 digunakan untuk mengukur ketebalan kertas di kilang kertas. Terangkan bagaimana Strontium-90 digunakan untuk mengukur ketebalan sehelai kertas?

.....

[4 marks]

Question 10.3

What is nuclear fission and nuclear fusion? Explain how nuclear fission and nuclear fusion reactions are able to release energy.

Apakah pembelahan nukleus dan pelakuran nukleus? Huraikan bagaimana tindak balas pembelahan nukleus dan pelakuran nukleus boleh membebaskan tenaga.

.....

[2 marks]

Question 10.4

Diagram 10.4 shows an application of radioactive substances in agriculture in studying the intake of fertilizer by plants.

Rajah 10.4 menunjukkan satu aplikasi bahan radioaktif dalam pertanian dalam mengkaji penggunaan baja oleh tumbuhan

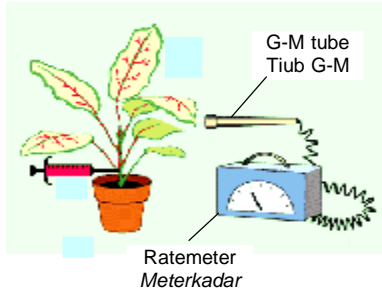


Diagram 10.4
Rajah 10.4

Explain how the study is carried out.
Jelaskan bagaimana kajian itu dijalankan.

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[4 marks]

Question 10.5

Diagram 10.5 shows an underground water pipe which has a leak.
Rajah 10.5 menunjukkan suatu paip bawah tanah yang bocor.

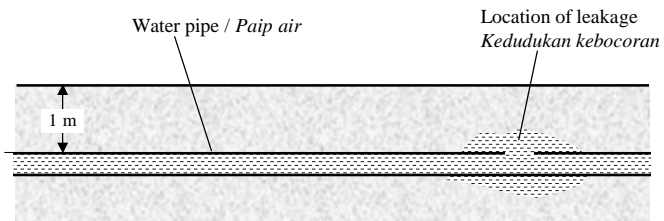


Diagram 10.5
Rajah 10.5

Explain how a radioactive substance can be used to detect the location of the leakage.

Terangkan bagaimana suatu bahan radioaktif boleh digunakan untuk mengesan kedudukan kebocoran itu.

.....

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.....

[4 marks]

APPLICATION

1

Two types of application , quantitative (calculation) or qualitative

2

Apply the related physics knowledge , physics skill or formulae

3

For calculation write the correct equation , make correct substitution and give the correct answer with the correct unit.

Example 1

A boat floating on the surface of water in the sea. The volume of the boat that sinks in sea water is 250 m^3 and the density of sea water is 1080 kgm^{-3} , calculate

- (a) upthrust which acts on the boat.
 (b) the volume of water displaced when the boat is in the river.
 [Density of river water = 1000 kgm^{-3}]

[4 Marks]

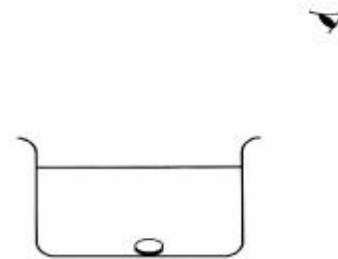
Answer

$$\begin{aligned} \text{(a) Upthrust} &= \text{mass of sea water displaced} \\ &= mg \\ &= V\rho g \\ &= 250 \times 1080 \times 10 \\ &= 2.7 \times 10^6 \text{ N} \end{aligned}$$

$$\begin{aligned} \text{(b) } 2.7 \times 10^6 &= V \times 1000 \times 10 \\ \therefore V &= 270 \text{ m}^3 \end{aligned}$$

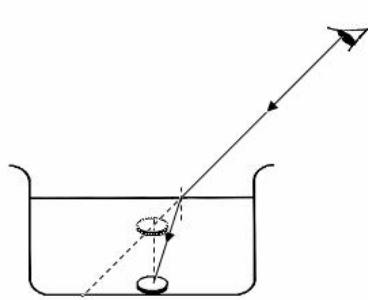
Example 2

Daw a ray diagram from a coin to the eye to show how the image of the coin is formed.



[3 Marks]

Answer



Question 1.1.

Two groups of students are asked to estimate the mass of a pendulum bob. The results of the two groups are shown in Diagram 1.1.

Dua kumpulan pelajar diminta menganggar jisim sebuah ladung bandul. Keputusan kedua-dua kumpulan itu adalah seperti yang ditunjukkan dalam Rajah 1.1

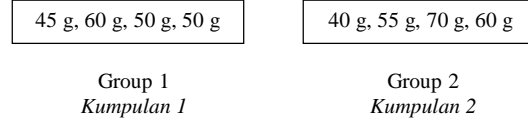


Diagram 1.1

Rajah 1.1

Calculate the average mass of a pendulum bob for both group
Kirakan Jisim purata ladung tersebut bagi kedua-dua kumpulan

Question 1.2

Diagram 1.2 shows a micrometer screw gauge is used in a measurement.

Rajah 1.2 menunjukkan tolok skru mikrometer vana digunakan dalam satu pengukuran.

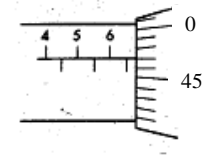


Diagram 1.2

Rajah 1.2

If the micrometer screw gauge has zero error of + 0.02 mm, the actual reading of the micrometer screw gauge is

Jika ralat sifar tolok skru mikrometer ialah +0.02 mm, bacaan sebenar tolok skru mikrometer itu ialah

Question 2.1.

Table 2.1 shows the results of an experiment to investigate the relationship between the force and extension of a piece of rubber band.

Jadual 2.1 menunjukkan keputusan suatu eksperimen untuk menyiasat hubungan antara daya dan pemanjangan seutas gelang getah.

Force / N Daya / N	0	0.3	0.6	0.9
Length / cm Panjang / cm	9.4	10.6	x	13.7
Extension / cm Pemanjangan / cm	0	1.2	2.9	4.3

Table 2.1
Jadual 2.1

What is the value of x ?
Apakah nilai x ?

Question 2.2.

Diagram 2.2 shows the journey of a bus from city A to reach city D.
Rajah 2.2 menunjukkan pergerakan bas dari bandar A ke bandar D.

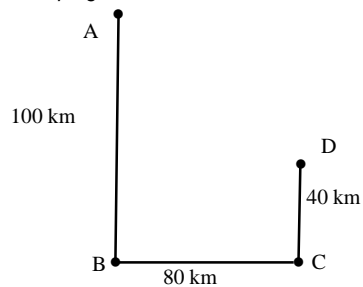


Diagram 2.2
Rajah 2.2

What is the displacement of the bus?
Berapakah sesaran bas ?

Question 2.3

Ali kicks a ball with a force of 50 N and the time of impact between his boot and the ball is 0.2s.
What is the change in momentum of the ball?

Ali menendang sebuah bola dengan daya 50 N dan masa pelanggaran di antara but dan bola ialah 0.2 s. Berapakah perubahan momentum bola itu?

Question 2.4

Diagram 2.4 shows a wooden block experiences an acceleration when it is pulled by a force F . The frictional force of 10 N acting on the wooden block.

Rajah 2.4, menunjukkan sebuah bongkah kayu mengalami pecutan bila ditarik dengan daya F . Daya geseran sebanyak 10 N bertindak ke atas blok kayu itu.

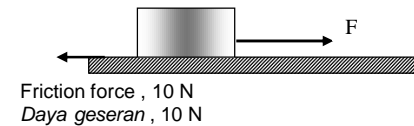


Diagram 2.4
Rajah 2.4

The pulling force, F is

Question 2.5.

A racing motorcycle of mass 202 kg accelerates from rest to its maximum velocity of 160 kmh^{-1} in 10 s.

Sebuah motorsikal perlumbaan dengan jisim 202 kg memecut dari keadaan rehat ke halaju maksima 60 ms^{-1} dalam 10 s.

(i) Calculate the acceleration of the racing motorcycle.

Hitungkan pecutan motorsikal perlumbaan tersebut.

(ii) Calculate the force acting on the racing motorcycle.

Hitungkan daya yang bertindak ke atas motorsikal perlumbaan tersebut.

Question 2.6.

Diagram 2.6 shows a motion graph of a body .
Rajah 2.6 menunjukkan graf gerakan satu jasad.

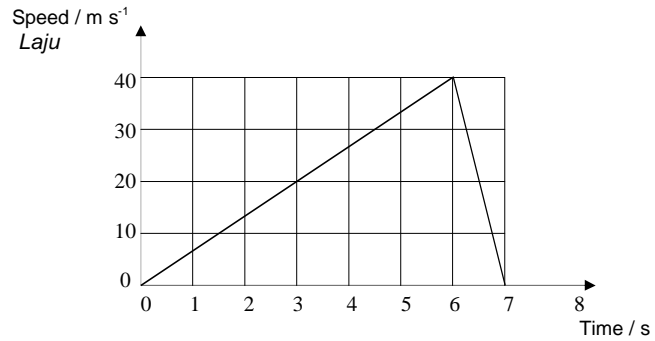


Diagram 2.6
Rajah 2.6

What is the total distance traveled of the body?
Berapakah jumlah jarak yang dilalui oleh jasad itu?

Question 3.1.

Diagram 3.1 shows a container containing water.
Rajah 3.1 menunjukkan bekas yang berisi air.

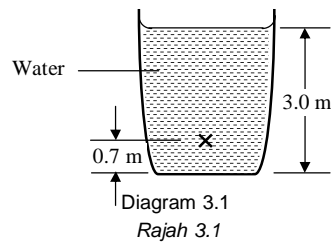


Diagram 3.1
Rajah 3.1

What is the pressure exerted by the water at X?
Berapakah tekanan yang dihasilkan oleh air pada titik X?
[Water density / ketumpatan air = $1\,000\text{ kg m}^{-3}$]

Question 3.2.

Diagram 3.2 shows a simple barometer.
Rajah 3.2 menunjukkan sebuah barometer ringkas.

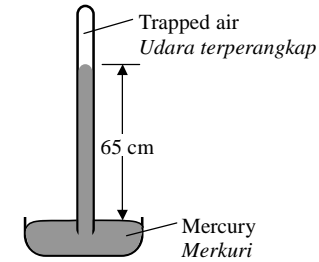


Diagram 3.2

If the atmospheric pressure is 76 cm Hg, calculate the pressure of the trapped air in the glass tube.

Jika tekanan atmosfera ialah 76 cm Hg, hitungkan tekanan udara yang terperangkap dalam tiub kaca.

Question 3.3

Diagram 3.3 shows a model of a hydraulic jack. The force F_1 applied on the small piston R is able to support two loads which placed on piston S and T.

Rajah 3.3 menunjukkan sebuah model jek hidraulik. Daya F_1 bertindak pada omboh kecil R untuk menyokong dua beban yang diletakkan pada omboh S dan T.

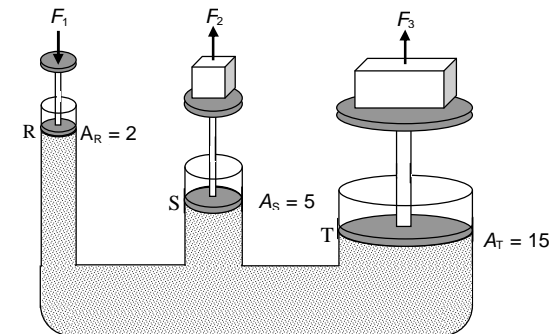


Diagram 3.3
Rajah 3.3

- (i) If $F_1 = 5.0 \text{ N}$, calculate the pressure exerted on piston R.
 Jika $F_1 = 5.0 \text{ N}$, hitungkan tekanan yang dikenakan pada omboh R.

- (ii) Determine the magnitude of the force F_2 .
 Tentukan magnitude daya F_2 .

Question 3.4.

Diagram 3.4 shows a hydraulic pump is used to raise a car of mass 1600 kg.
 Rajah 3.4 menunjukkan satu pam hidraulik diguna untuk mengangkat sebuah kereta berjisim 1600 kg.

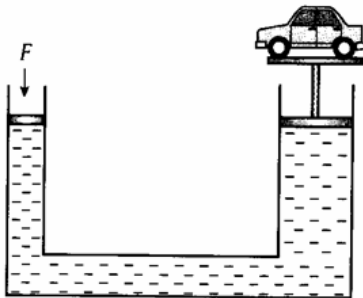


Diagram 3.4
 Rajah 3.4

The ratio of the diameter of the larger piston to the diameter of the smaller piston is 4:1.
 What is the force required to raise the car?

Question 4.1

Four different metals of equal masses, W, X, Y and Z are of equal mass and initially are at the room temperature of 25°C . The heat absorbed, Q , by each metal to achieve the final temperature, q , is shown in Table 4.1.

Empat logam berlainan W, X, Y dan Z mempunyai jisim yang sama dan pada awalnya berada pada suhu bilik, 25°C . Haba yang diserap, Q , oleh setiap logam untuk mencapai suhu akhir, q , adalah ditunjukkan dalam Jadual 4.1.

Metal Logam	Heat absorbed, Q / J Haba diserap, Q / J	$q / ^\circ\text{C}$
W	11 300	50
X	7 150	80
Y	29 025	100
Z	22 325	120

Table 4.1

Jadual 4.1

Which metal has the highest specific heat capacity?

Logam yang manakah mempunyai muatan haba tentu yang paling tinggi?

Question 4.2.

50 g of water at 10°C is mixed with 100 g of water at 30°C .

What is the temperature of the mixture ?

50 g air pada 10°C dicampurkan dengan 100 g air pada 30°C .

Berapakah suhu campuran itu?

Question 4.3

Diagram 4.3 shows the length of an air column trapped at 27°C .
Rajah 4.3, menunjukkan panjang turus udara terperangkap pada 27°C.

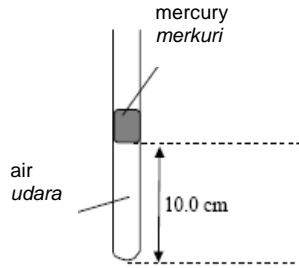


Diagram 4.3
Rajah 4.3

What is the length of the air column at 100°C ?
Berapakah panjang turus udara pada 100°C?

Question 4.4.

Substance X with mass 0.5 kg is heated by using a heater 100 W. Diagram 4.4 shows graph temperature against mass for the substance.
Suatu bahan X berjisim 0.5 kg dipanaskan dengan menggunakan pemanas 100 W.
Rajah 4.4 menunjukkan graf suhu melawan masa bagi bahan tersebut.

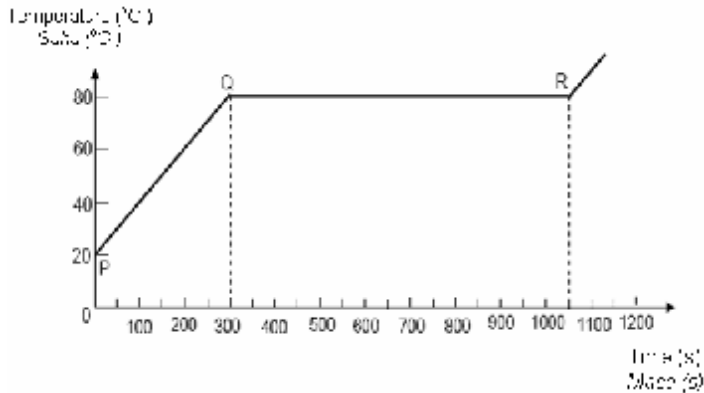


Diagram 4.4
Rajah 4.4

- (a). What is the time taken by substance X to achieve melting point ?
Berapakah masa yang diambil oleh bahan X untuk mencapai takat lebur?
- (b). Based on information on graph, find specific latent heat for the substance X.
Berdasarkan maklumat yang diberi pada graf, hitungkan haba pendam tentu bagi bahan X

Question 5.1

Diagram 5.1 is a ray diagram showing the image I of an object O that is formed by a lens.
Rajah 5.1 ialah gambarajah sinar yang menunjukkan pembentukan imej I bagi satu objek O oleh suatu kanta.

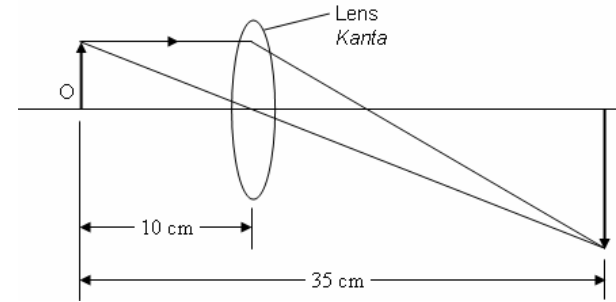


Diagram 5.1
Rajah 5.1

What is the magnification of the image?
Apakah pembesaran bagi imej itu?

$$m = v/u$$

$$= 25/10$$

$$= 2.5$$

Question 5.2.

An object of 3 cm height is placed 15 cm from a convex lens. The image is formed at 30 cm from the lens. What is the height of the image?

$$h_i = 6 \text{ cm}$$

Question 5.3

The refractive index of water is $\frac{4}{3}$. What is the apparent depth of a column of water with the height of 30 cm?

Question 5.4.

Diagram 5.4.1 shows two cars, P and Q, travelling in the opposite directions, passing through a sharp bend. A mirror is placed at X.

Rajah 5.4.1 menunjukkan dua buah kereta P dan Q, bergerak ke arah yang bertentangan, melalui satu selekoh tajam. Sebuah cermin diletakkan pada X.

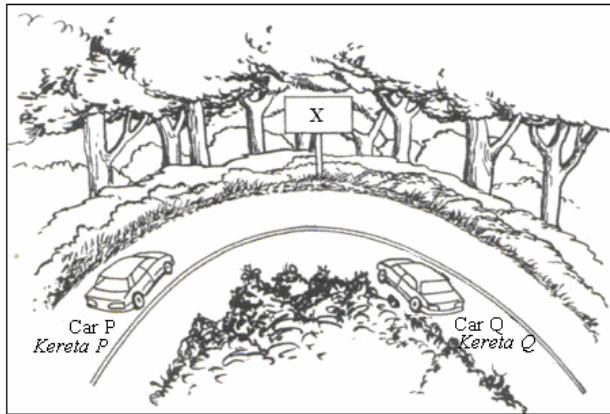


Diagram 5.4
Rajah 5.4

- (a) Diagram 5.4.1 shows an incomplete ray diagram when a plane mirror is placed at X.
Rajah 5.4.1 menunjukkan satu gambar rajah sinar yang tidak lengkap apabila sebuah cermin satah diletakkan pada kedudukan X.

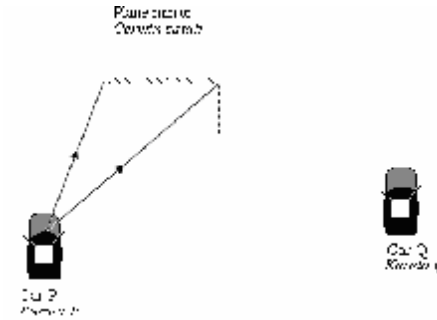


Diagram 5.4.2
Rajah 5.4.2

- (i) Complete the ray diagram in Diagram 5.4.2
Lengkapkan gambar rajah sinar pada Rajah 5.4.2 [2 marks]
- (b) Diagram 5.4.3 shows an incomplete ray diagram when a curve mirror is placed at X to replace the plane mirror in Diagram 5.4.2. The curve mirror is used to overcome the problem that occur in (a)(i).
Rajah 5.4.3 menunjukkan satu gambar rajah sinar yang tidak lengkap apabila sebuah cermin melengkung diletakkan pada kedudukan X bagi menggantikan cermin satah dalam Rajah 5.4.2. Cermin melengkung itu digunakan bagi mengatasi masalah yang terdapat dalam (a)(i).

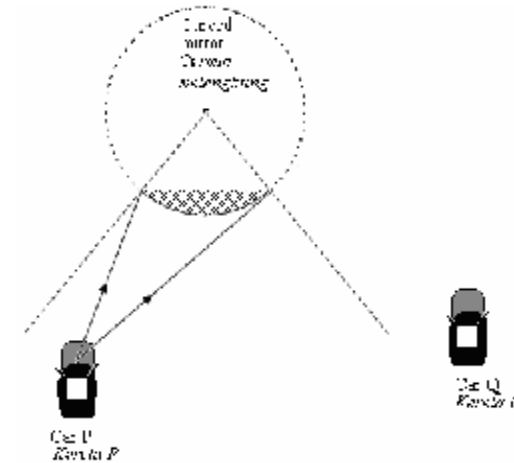


Diagram 5.4.3
Rajah 5.4.3

- (i) Complete the ray diagram in Diagram 5.4.3
 Lengkapi gambar rajah sinar dalam Rajah 5.4.3

[2 marks]

Question 6.1.

In an experiment, Yanie observes that a simple pendulum completes 30 oscillations in 15.0 seconds. What is

- (a) the frequency of oscillation?
 (b) the period of oscillation?

Question 6.2.

Diagram 6.2 shows a graph displacement – time

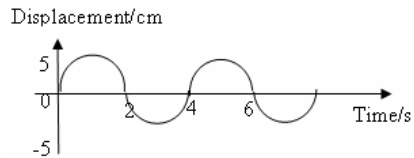


Diagram 6.2

Using diagram 6.2, calculate :

- (a) amplitude
 (b) period
 (c) frequency

Question 6.3.

Diagram 6.3 shows a graph displacement – distance.

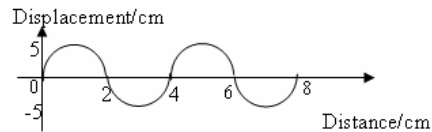


Diagram 6.3

Based on the displacement-distance graph of a wave, find

- (a) the amplitude
 (b) the wavelength of the wave

Question 6.4

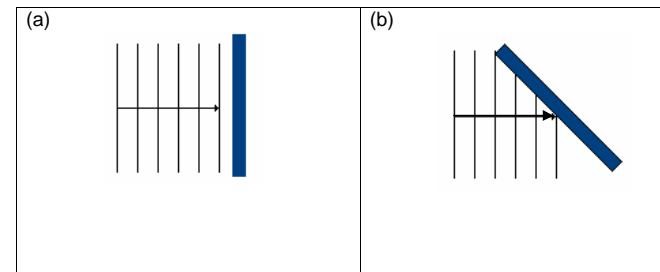
A transverse wave is found to have a distance of 4 cm from a trough to a crest, a frequency of 12 Hz, and a distance of 5 cm from a crest to the nearest trough.

Determine

- (a) the amplitude
 (b) period
 (c) wavelength
 (d) speed

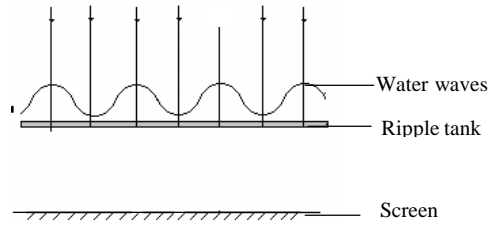
Question 6.5

Show the pattern of the reflection of the water waves



Question 6.6

Show the dark and bright pattern on the screen below.



Question 6.7

<p>(a)</p> <p>Deep Shallow Deep</p>	<p>(b)</p> <p>Deep Shallow Deep</p>
<p>(c)</p> <p>Deep Shallow Deep</p>	<p>(d)</p> <p>Deep Shallow Deep</p>
<p>(e)</p> <p>Deep Shallow Deep</p>	<p>(f)</p> <p>Deep Shallow Deep</p>

Question 6.8

Complete the diagrams below by drawing the wavefronts to show the diffraction of water waves.

<p>(a) <u>Narrow gap</u> $\leq \lambda$</p>	<p>(b) <u>Wider gap</u> $> \lambda$</p>
<p>(c) <u>Wider obstacle</u></p>	<p>(d) <u>Narrow obstacle</u></p>

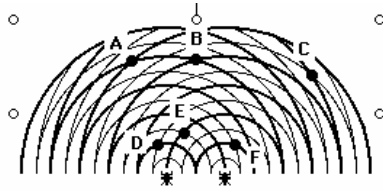
Question 6.9

Complete the table below.

Before superposition	During superposition	After superposition

Question 6.10

Categorize each labeled position as being a position where either constructive or destructive interference occurs.



- (a) Constructive interference:.....
- (b) Destructive interference:.....

Question 6.11

In a Young's double slit experiment, a light of wavelength 633 nm passes through two slit which are 0.5 mm apart. Vertical fringes are observed on a screen placed 4 m from the slits.

- (a) Calculate the distance between two adjacent bright fringes
- (b) What will happen to the distance between two adjacent bright fringes if a light of shorter wavelength is used?

Question 6.12

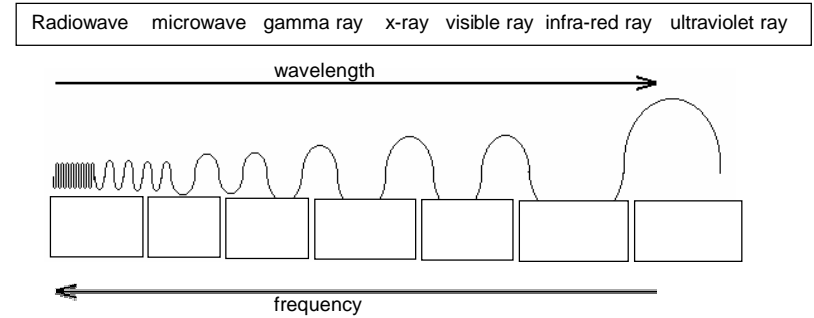
Sound waves with frequency of 5.8×10^5 Hz are used to determine the depth of the sea. The speed of sound waves in sea water is 1250 ms⁻¹. The time-base of the is adjusted at 50 ms cm⁻¹. If the time interval between the transmitting and receiving a pulse of waves is 1.2 s. Calculate

Gelombang bunyi berfrekuensi 5.8×10^5 Hz digunakan untuk menentukan Laju gelombang air ialah 1250 ms⁻¹. Dasar- masa bagi osiloskop dilaraskan pada 50 ms cm⁻¹. Jika sela masa di antara denyutan gelombang tuju dan gelombang yang diterima adalah 1.2 s. Hitung

- (a) the depth of the sea.
kedalaman laut
- (b) the wavelength of the sound wave.
panjang gelombang bagi gelombang bunyi

Question 6.13.

The diagram below shows the pattern of spectrum electromagnetic. In the boxes provided, write the names of the parts given .



Question 7.1





Draw the pattern of the electric field lines.



ELECTRIC FIELD AROUND A POSITIVE CHARGE

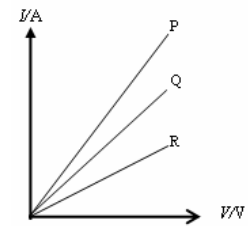
 a single electrde	
-----------------------	--

ELECTRIC FIELD AROUND A NEGATIVE CHARGE

 a single electrde	
-----------------------	--

ELECTRIC FIELD AROUND A POSITIVE AND NEGATIVE CHARGE	
 <p>two electrodes</p>	
ELECTRIC FIELD AROUND TWO NEGATIVE CHARGES	
 <p>two electrodes</p>	
ELECTRIC FIELD AROUND TWO POSITIVE CHARGES	
 <p>two electrodes</p>	
ELECTRIC FIELD AROUND A NEGATIVE CHARGE AND A POSITIVELY CHARGED PLATE	
 <p>two electrodes</p>	

ELECTRIC FIELD AROUND A POSITIVE CHARGE AND A NEGATIVELY CHARGED PLATE	
 <p>two electrodes</p>	
ELECTRIC FIELD BETWEEN TWO CHARGED PARALLEL PLATES	
 <p>two electrodes</p>	

Question 7.2

The graph shows a graph of I against V for three conductors, P, Q and R.

- Compare the resistance of conductor P, Q and R.
- Explain your answer in (a)

Question 7.3

Identical light bulbs, each of resistance $R \Omega$, are connected in three circuits as shown in Diagram 7.3.1

Mentol-mentol yang serupa, setiap satu mempunyai rintangan $R \Omega$, disambung dalam tiga litar seperti ditunjukkan dalam Rajah 7.3.1

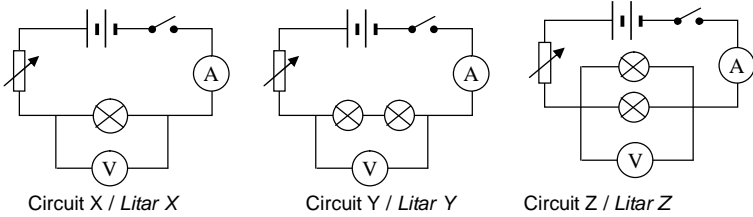


Diagram 7.3.1

Rajah 7.3.1

The rheostat in each circuit is adjusted and the potential difference, V , against current, I , graphs are plotted for each circuit. The graph for each circuit is shown in Diagram 7.3.2.

Reostat di dalam setiap litar dilaras dan graf beza keupayaan, V , melawan arus, I , diplot untuk setiap litar. Graf yang diperolehi adalah seperti yang ditunjukkan dalam Rajah 7.3.2

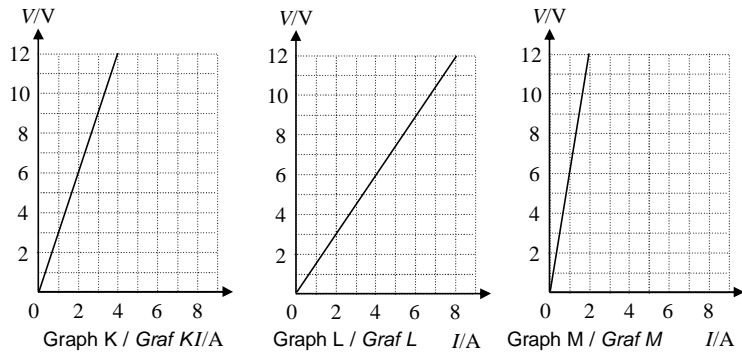


Diagram 7.3.2

Rajah 7.3.2

Match the graphs K, L and M to the circuits X, Y and Z.

Padankan graf K, L dan M kepada litar X, Y dan Z.

Circuit / Litar	Graph / Graf
X	
Y	
Z	

[3 marks]

Diagram 7.4

Diagram 7.4 shows photograph of an electric circuit. The circuit contains four identical bulbs connected to four identical new dry cells

Rajah 7.4 menunjukkan forograf bagi satu litar elektrik. Litar itu mengandungi empat mentol serupa disambung kepada empat sel kering baru yang serupa.

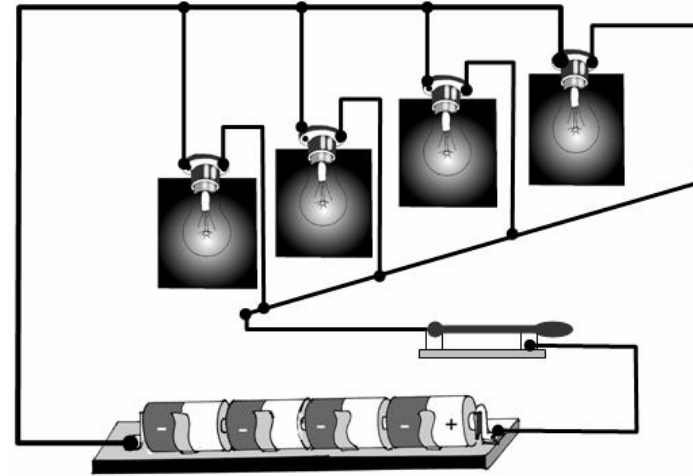


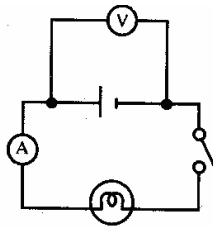
Diagram 7.4

Diagram 7.4

Draw an electric circuit diagram for the above arrangement of apparatus using appropriate symbols. Lukiskan satu rajah litar elektrik bagi susunan radas diatas dengan menggunakan simbol-simbol yang sesuai.

[2 marks]

QUESTION 7.5



A voltmeter connected directly across a battery gives a reading of 1.5 V. The voltmeter reading drops to 1.35 V when a bulb is connected to the battery and the ammeter reading is 0.3 A. Find the internal resistance of the battery.

[3 Marks]

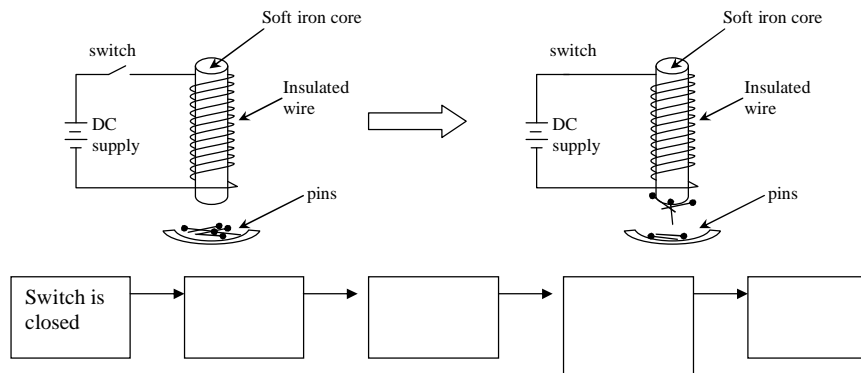
Question 7.6

A current of 5A flows through an electric heater when it is connected to the 24 V mains supply. How much heat is released after 2 minutes?

[2 Marks]

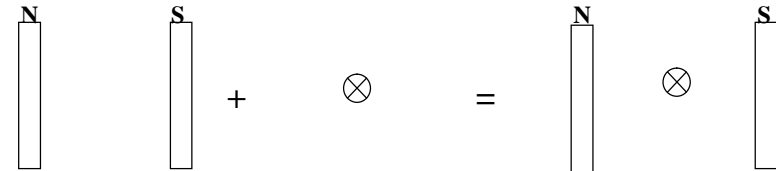
Question 8.1

Using the diagram, complete the steps to switch on the magnetism effect.



Question 8.2

Draw the combination (called *catapult field*) of two electromagnetic fields below and show the direction of movement of the conductor.



Question 8.3

Diagram 8.3.1 shows a bicycle dynamo.

Rajah 8.3.1 menunjukkan sebuah dinamo basikal.

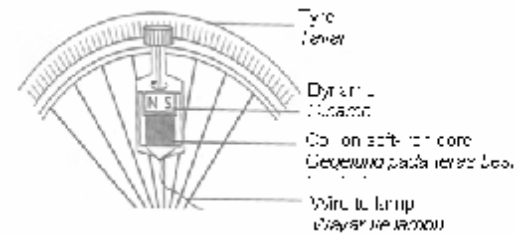


Diagram 8.3.1

The dynamo contains a rotating permanent magnet and a fixed coil. As the magnet rotates, an induced current is produced.

Dinamo terdiri daripada sebuah magnet kekal yang berputar dan satu gegelung tetap. Apabila magnet berputar, arus aruhan dihasilkan.

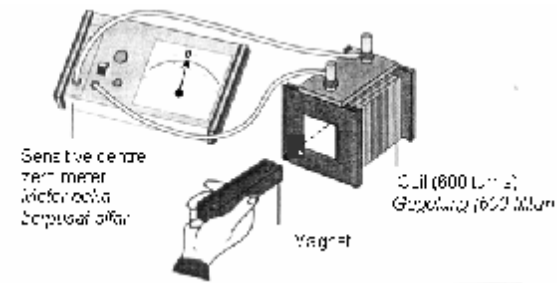
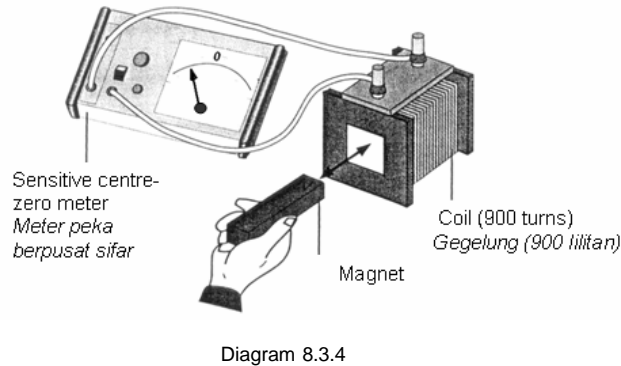
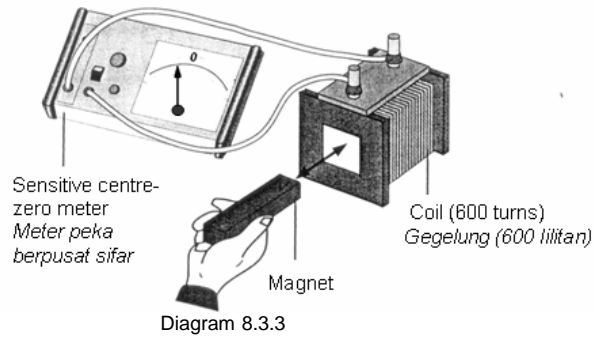


Diagram 8.3.2



- (b) (i) Based on Diagrams 8.3.2 and 8.3.3, compare the relative motions between the magnet to the coil.

Berdasarkan Rajah 8.3.2 dan 8.3.3, bandingkan gerakan relatif antara magnet dengan gegelung.
[1 mark]

- (ii) Based on Diagram 8.3.3. and 8.3.4, compare the number of turns of the coils.

Berdasarkan Rajah 8.3.3 dan 8.3.4, bandingkan bilangan lilitan gegelung.
[1 mark]

- (iii) Based on Diagram 8.3.3.and 8.3.4, relate the number of turns of the coil with the change in magnetic flux and the magnitude of induced current.

Berdasarkan Rajah 8.3.3 dan 8.3.4, hubungkaitkan bilangan lilitan gegelung dengan magnitud perubahan fluks magnet dan magnitud arus aruhan.

[2 marks]

Question 8.4

Diagram 8.4 shows a modified transformer.
Rajah 8.4 menunjukkan sebuah transformer yang telah diubahsuai.

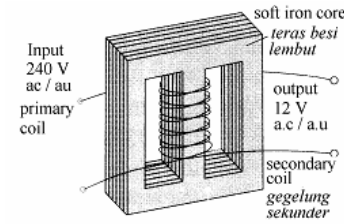


Diagram 8.4

- (a) The number of turns on the primary coil in diagram 8.4 is 1500. Calculate the number of turns on the secondary coil.

Bilangan lilitan pada gegelung primer pada Rajah 8.4 ialah 1500. Hitung bilangan lilitan pada gegelung sekunder.

- (b) The transformer in Diagram 8.4 is used to switch on an electrical appliance. The current in the primary coil is 0.1 A and the efficiency is 85%.

Transformer dalam Rajah 8.4 digunakan untuk menghidupkan sebuah alat elektrik. Arus yang mengalir dalam gegelung primer ialah 0.1 A dan kecekapannya ialah 85%.

Calculate the output power of the transformer.
Hitung kuasa output transformer itu.

Question 9.1

Diagram 9.1.1 shows the structure of a cathode ray oscilloscope (CRO).
Rajah 9.1.1 menunjukkan struktur sebuah osiloskop sinar katod (OSK).

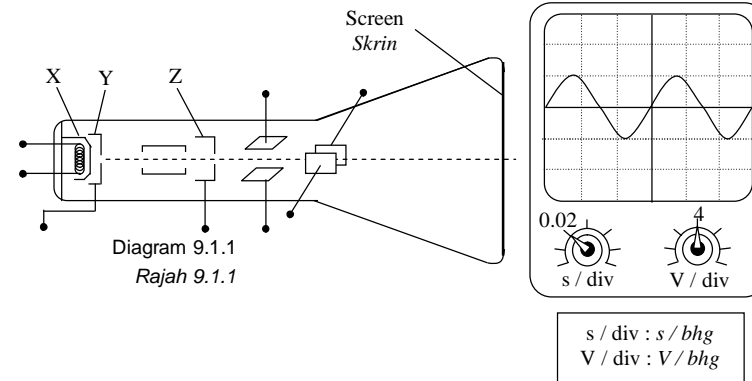


Diagram 9.1.1
Rajah 9.1.1

Diagram 9.1.2
Rajah 9.1.2

$s / div : s / bhg$
 $V / div : V / bhg$

- (a) A student uses the CRO to study the output voltage from a bicycle dynamo. Diagram 9.1.2 shows the trace on the screen and the settings of the CRO.

Seorang pelajar menggunakan OSK itu untuk mengkaji voltan output daripada sebuah dinamo basikal. Rajah 9.1.2 menunjukkan surih dan pelarasan pada skrin OSK itu.

- (i) State the type of current produced by the dynamo.
Nyatakan jenis arus yang dihasilkan oleh dinamo itu.

.....

[1 mark]

- (ii) Determine the frequency of the output voltage of the dynamo.
Tentukan frekuensi bagi voltan output dinamo itu.

[2 marks]

- (iii) Sketch the new trace in Diagram 9.1.3 if the time-base setting is now set at 0.01 s/div.

Lakarkan surih baru dalam Rajah 9.1.3 jika dasar-masa ditetapkan pada 0.01 s / bhg.

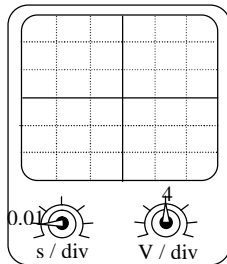


Diagram 9.1.3
Rajah 9.1.3

[1 mark]

Question 9.2

Diagram 9.2.1 shows the output of a transformer connected to a semiconductor diode and a resistor R

Diagram 9.2.2 shows the output of a transformer connected to four semiconductor diodes and a resistor R

Rajah 9.2.1 menunjukkan output sebuah transformer disambungkan kepada sebuah diod semikonduktor dan perintang R.

Rajah 9.2.2 menunjukkan sambungan output transformer kepada empat buah diod semikonduktor dan perintang R.

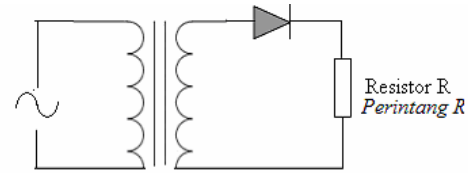


Diagram 9.2.1
Rajah 9.2.1

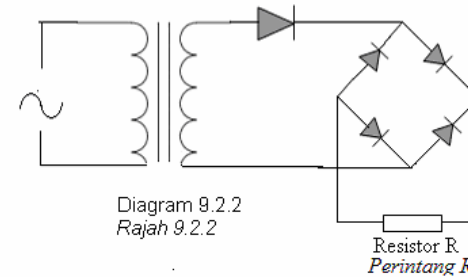


Diagram 9.2.2
Rajah 9.2.2

- (a) Based on diagram 9.2.1 and 9.2.2 compare the type of current produced by the output of the transformer and the current that flows through R .

Name the process involved.

Berdasarkan Rajah 9.2.1 dan Rajah 9.2.2 bandingkan keadaan arus yang dihasilkan oleh output transformer dan arus yang mengalir melalui R.

Namakan proses terlibat.

[5 marks]

Question 9.3

Diagram 9.3 shows an electrical circuit to detect temperature of water whilst boiling an egg. When the egg is ready to serve, the siren will go off and the base voltage, V_b is at least 1.5 V.

Rajah 9.3 menunjukkan litar elektrik untuk mengesan suhu air semasa merebus telur. Apabila telur tersebut telah masak, siren akan berbunyi dan voltan tapak, V_b mestilah sekurang-kurangnya 1.5 V.

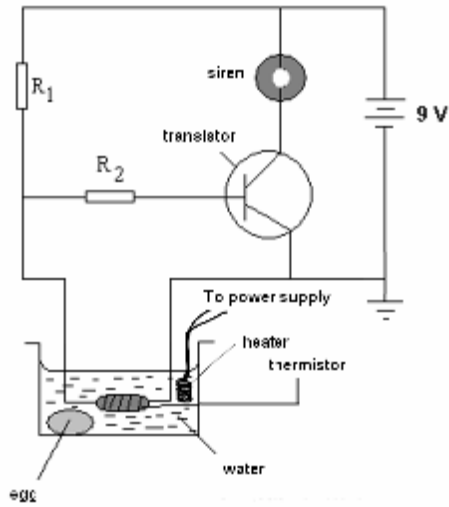


Diagram 9.3
Rajah 9.3

- (a) In Diagram 9.3, complete the symbol of the transistor and name the type of transistor used in the circuit.
 Dalam Rajah 9.3, lengkapkan simbol transistor dan namakan jenis transistor yang digunakan dalam litar itu.

..... [2 marks]

- (b) If the siren is functional, what is the maximum potential difference across R_1 ?
 Jika siren berbunyi, berapakah beza keupayaan maksima yang merentasi R_1 ?

..... [1 mark]

Question 9.4

Diagram 9.4.1 shows a logic gate NAND. A and B are the inputs and C is the output.
 Rajah 9.4.1 menunjukkan satu get logik TAKDAN. A dan B adalah input manakala C adalah output.

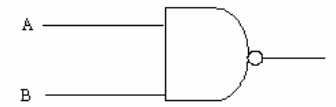


Diagram 9.4.1
Rajah 9.4.1

- (a) Complete the truth table of the logic gate NAND.
 Lengkapkan jadual kebenaran bagi get logik TAKDAN di dalam jadual

Input		Output
A	B	C
0	0	
0	1	
1	0	
1	1	

- (b) Diagram 9.4.2 shows the combination of NAND gates in an electronic circuit.
 Rajah 9.4.2 menunjukkan kombinasi beberapa get TAKDAN di dalam satu litar elektronik.

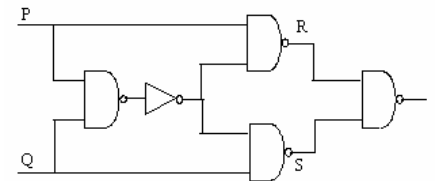


Diagram 9.4.2
Rajah 9.4.2

- (i) Based on the combination, complete the truth table as shown in the table below.

CONCEPTUALISING

1

From the situation given give the right comparison

2

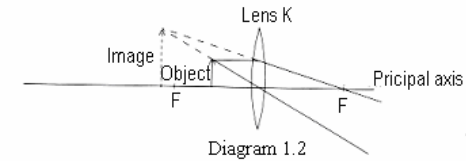
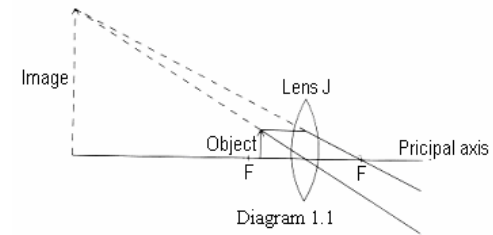
Write the relationship
(hypothesis form or proportional form)

3

Name the concept or principle involved

Example 1

Diagram 1.1 and Diagram 1.2 show the light rays from two identical objects passing through the convex lenses, J and K. Both the lenses produce virtual images. F is the focal point for each lens.



With reference to the Diagram 1.1 and Diagram 1.2, compare the thickness of the lenses, the focal length and the size image produced by the lenses J and K.

Relate the size of image with focal length make a deduction regarding the relationship between the power of the lens and the focal length.

[5 Marks]

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Answer

The thickness of lens J>K
 The focal length of K > J
 The high of image lens J>K
 The focal length is the distance between optical centre and focal point
 As the focal length increases the power decreases // inversely proportional // $P = \frac{1}{f}$

Question 2.1

Diagram 2.1.1 and Diagram 2.1.2 shows a comparison of two springs, M and N. Both the springs are elasticity made from the same wire and material. They are attached to load of equal weight.

Rajah 2.1.1 dan Rajah 2.1.2 menunjukkan perbandingan dua spring M dan N. Kedua-duanya mempunyai keelastikan dan dibuat daripada wayar dan bahan yang sama. Kedua-dua spring kemudiannya diletakkan beban yang sama berat.

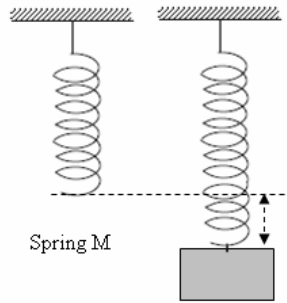


Diagram 2.1.1
Rajah 2.1.1

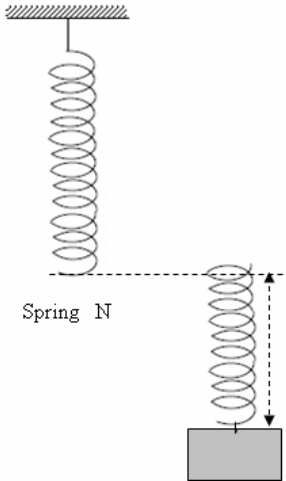


Diagram 2.1.2
Rajah 2.1.2

Based on Diagram 2.1.1 and Diagram 2.1.2
Berdasarkan Rajah 2.1.1 dan Rajah 2.1.2
Compare the forces applied on the springs and the extension of the springs and the spring constant M and N.
Hence relate the spring constant and the natural length of the spring.
Bandingkan daya yang digunakan ke atas spring dan pemanjangan spring pemalar spring M dan N
Seterusnya hubungkan pemalar dengan panjang asal spring

[5 marks]

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Question 2.2

Spiderman find that when he jumped down from a high building without bending his legs, a loud sound is produced as shown in Diagram 2.2.1
But if upon landing, he bends his legs, a soft sound is produced as shown in Diagram 2.2.2

'Spiderman' mendapati bahawa apabila beliau terjun dari bangunan yang tinggi tanpa membengkokkan kakinya, bunyi yang kuat dihasilkan seperti ditunjukkan pada Rajah 2.2.1. Sebaliknya, jika beliau membengkokkan kaki semasa mendarat, bunyi yang perlahan dihasilkan seperti ditunjukkan pada Rajah 2.2.2

Loud landing sound
Mendarat dengan bunyi yang kuat



Diagram 2.2.1
Rajah 2.2.1

Soft landing sound
Mendarat dengan bunyi yang perlahan



Diagram 2.2.2
Rajah 2.2.

Using Diagram 2.2.1 and 2.2.2, compare the time for change of momentum for Spiderman.
Menggunakan Rajah 2.2.1 dan 2.2.2, bandingkan kadar perubahan momentum 'Spiderman'.

Relate the time for change of momentum and the force acting on the Spiderman, deduce a relevant physics concept.
Hubungkan masa perubahan momentum, dan kadar perubahan momentum 'Spiderman', untuk menyimpulkan satu konsep fizik yang sesuai.

[5 marks]

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Question 3.1

Diagram 3.1.1 shows an object floating in water.
Diagram 3.1.2 shows the same object but with extra load floating in water.
Rajah 3.1.1 menunjukkan sebuah objek yang sedang terapung dalam air.
Rajah 3.1.2 menunjukkan objek yang sama tetapi dengan beban tambahan sedang terapung dalam air.

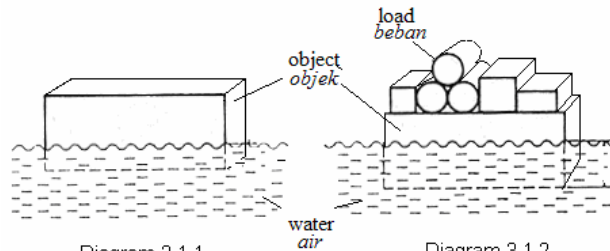


Diagram 3.1.1
Rajah 3.1.1

Diagram 3.1.2
Rajah 3.1.2

Based on Diagram 3.1.1 and Diagram 3.1.2 compare the mass of the objects ,the volumes of water displaced by the objects and the buoyant force produced. Relating the mass of the object , volume of water displaced and buoyant force , deduce a relevant physics concept.

Berdasarkan Rajah 3.1.1 dan 3.1.2 , bandingkan jisim objek , isipadu air yang disesarkan oleh objek dan daya tujuh ke atas yang dihasilkan. Hubungkan antara jisim objek , isipadu air yang disesarkan dan daya tujuh ke atas , untuk menyimpulkan satu konsep fizik yang sesuai.

[5 marks]

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Question 3.2

Diagram 3.2.1 and Diagram 3.2.2 show how water spurts out from its container when the valve is opened.

Rajah 3.2.1 dan Rajah 3.2.2 menunjukkan bagaimana air memancut keluar daripada bekasnya apabila injap dibuka.



Diagram 3.2.1
Rajah 3.2.1



Diagram 3.2.2
Rajah 3.2.2

When a liquid is held in a container, it exerts pressure on the container.

Apabila cecair diisikan ke dalam suatu bekas, ia mengenakan tekanan pada bekas itu.

With reference to Diagram 3.2.1 and Diagram 3.2.2, compare the depth of the water in both containers, the rate at which water spurts out and the distance travelled by the water that spurts out.

Merujuk kepada Rajah 3.2.1 dan Rajah 3.2.2, bandingkan kedalaman air di dalam kedua-dua bekas, kadar air memancut keluar dan jarak dilalui oleh air yang memancut keluar.

Relate the distance travelled by the water that spurts out to the depth of the water. Hence make a conclusion regarding the relationship between the pressure and the depth of the water.

Hubungkan jarak dilalui oleh air yang memancut keluar dengan kedalaman air. Seterusnya buat satu kesimpulan tentang hubungan antara tekanan dengan kedalaman air.

[5 marks]

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Question 4.1

Diagram 4.1.1 and Diagram 4.1.2 show some ice cubes left to melt in a cup at room temperature for 10 minutes.

Rajah 4.1.1 dan 4.1.2 menunjukkan ais kiub dibiarkan mencair di dalam gelas pada suhu bilik selama 10 minit

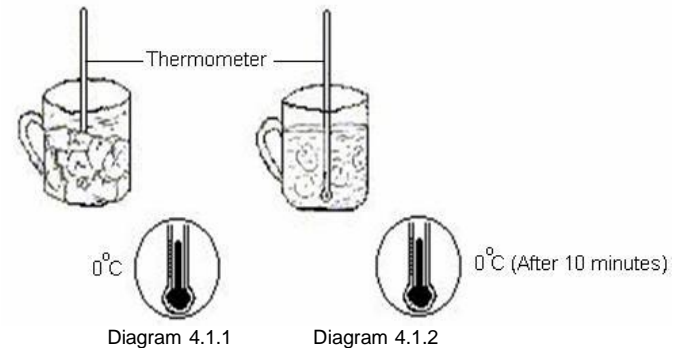


Diagram 4.1.1

Diagram 4.1.2

Observe Figure 4.1.1 and Figure 4.1.2, and compare the states of matter and the thermometer readings. Relate the change in state of matter and the thermometer readings to come up with a conclusion of the physics concept involved.

Berdasarkan pemerhatian pada rajah 4.1.1 dan 4.1.2, bandingkan keadaan jirim bahan dan bacaan jangkasuhu.. Hubungkan perubahan keadaan bahan dengan bacaan thermometer untuk membuat satu kesimpulan tentang konsep fizik yang berkaitan.

[5 marks]

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Question 4.2

The graph in Diagram 4.2.1 shows the cooling curve of 10 g of naphthalene. Graf pada Rajah 4.2.1 menunjukkan lengkung penyejukan 10 g naftalena.

The graph in Diagram 4.2.2 shows the cooling curve of 50 g of naphthalene. Graf pada Rajah 4.2.2 menunjukkan lengkung penyejukan 50 g naftalena.

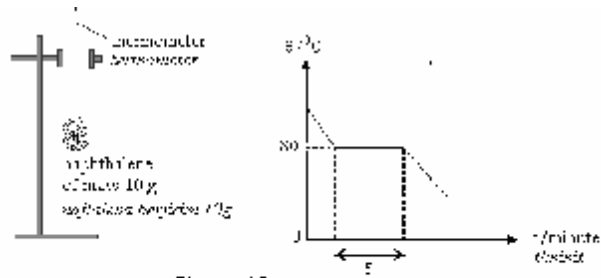


Diagram 4.2.1
Rajah 4.2.1

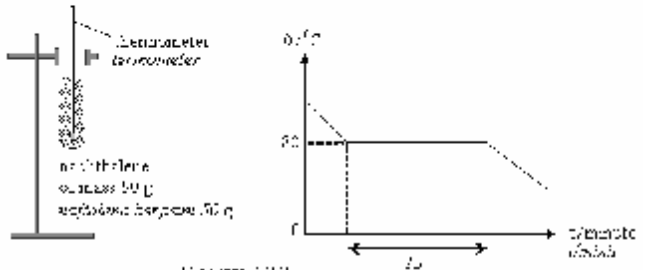


Diagram 4.2.2
Rajah 4.2.2

Using Diagram 4.2.1 and 4.2.2 compare the mass of naphthalene, the time taken for the naphthalene to solidify and the latent heat released. Relating the mass of naphthalene and the heat released to deduce a relevant physics concept.

Menggunakan Rajah-rajah 4.2.1 dan 4.2.2 bandingkan jisim naftalena, masa untuk naftalena membeku dan haba pendam yang dibebaskan. Hubungkan antara jisim naftalena dan haba pendam yang dibebaskan untuk menyimpulkan satu konsep fizik yang sesuai.

[5 marks]

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Question 5.1

Diagram 5.1.1 and Diagram 5.1.2 show the light rays from two identical objects passing through the convex lenses, J and K. Both the lenses produce virtual images. F is the focal point for each lens.

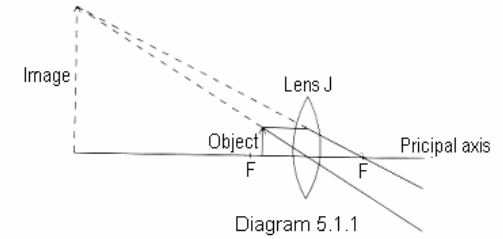


Diagram 5.1.1

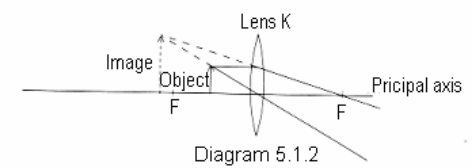


Diagram 5.1.2

With reference to the Diagram 5.1.1 and Diagram 5.1.2, compare the thickness of the lenses, the focal length and the size image produced by the lenses J and K.

Relate the size of image with focal length make a deduction regarding the relationship between the power of the lens and the focal length.

[5 Marks]

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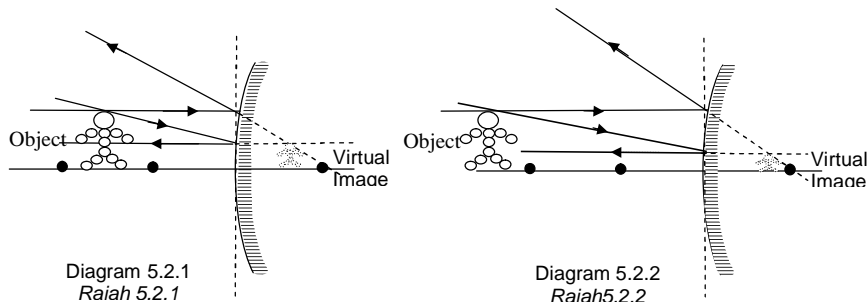
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Question 5.2

Diagram 5.2.1 and Diagram 5.2.2 show an object in front of a convex mirror at different positions. A virtual image is produced.

Rajah 5.2.1 dan Rajah 5.2.2 menunjukkan sebuah objek di hadapan sebuah cermin cembung pada kedudukan yang berlainan. Satu imej maya dihasilkan.



Based on Diagram 5.2.1 and Diagram 5.2.2,
Berdasarkan Rajah 5.2.1 dan Rajah 5.2.2

- (a) compare the size of the object.
bandingkan saiz objek [1mark]
- (b) compare the position of the object from the mirror.
bandingkan kedudukan objek dari cermin [1mark]
- (c) compare the size of the image that is formed
bandingkan saiz imej yang dihasilkan [1mark]
- (d) relate the position of the object from the mirror, the size of the image formed and the linear magnification of the image.
hubungkait kedudukan objek dari cermin , saiz imej yang dihasilkan dan pembesaran linear image. [2 marks]

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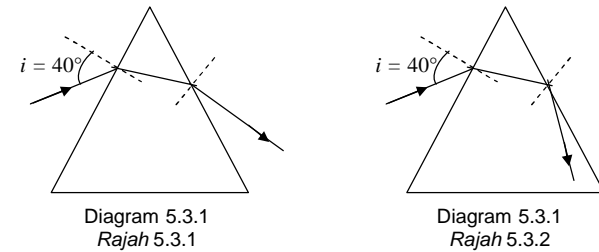
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Question 5.3

Diagram 5.3.1 and Diagram 5.3.2 show a transparent block made of a material with a different refractive index. A light ray travel in both blocks with the same incident angle, i .

Rajah 5.3.1 dan Rajah 5.3.2 menunjukkan blok lutsinar yang diperbuat daripada bahan yang mempunyai indeks biasan yang berbeza. Sinar cahaya melalui kedua-dua blok pada sudut tuju yang sama, i .



Using Diagram 5.3.1 and Diagram 5.3.2, compare the refractive index, refraction angle and critical angle between the two blocks.

Base on Diagram 5.3.1 and Diagram 5.3.2, relate the refractive index with critical angle.

Menggunakan Rajah 5.3.1 dan Rajah 5.3.2, bandingkan indeks biasan, sudut biasan dan sudut genting antara kedua-dua blok.
Merujuk kepada Rajah 5.3.1 dan Rajah 5.3.2, hubungkaitkan antara indeks biasan dan sudut genting

[5 marks]

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Question 6.1

Diagram 6.1.1 shows a fisherman boat transmits the ultrasound wave to sea bed.
 Diagram 6.1.2 shows a student shout loudly in a cave.
Rajah 6.1.1 menunjukkan sebuah bot nelayan memancarkan gelombang ultrasonik ke dasar laut.
Rajah 6.1.2 menunjukkan seorang pelajar menjerit dengan kuat dalam sebuah gua.

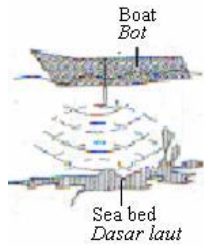


Diagram 6.1.1
Rajah 6.1.1



Diagram 6.1.2
Rajah 6.1.2

Based on Diagram 6.1.1 and Diagram 6.1.2 compare the condition of surface of the sea bed and surface of the cave, the wavelength and the direction of the wave propagation before and after hit the surface of the sea bed and the cave.
 Name the wave phenomenon involved.
Berdasarkan Rajah 6.1.1 dan Rajah 6.1.2 bandingkan keadaan permukaan dasar laut dan permukaan gua, panjang gelombang dan arah rambatan gelombang sebelum dan selepas terkena permukaan dasar laut dan permukaan gua.
Namakan fenomena gelombang yang terlibat.

[5 marks]

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Question 6.2

Diagram 6.2.1 shows the effect of a yellow monochromatic light directed to glass slide which has double slit.
 Diagram 6.2.2 shows a microphone which detect loud and weak sound in front of two loud speakers connected to an audio generator.
Rajah 6.2.1 menunjukkan kesan yang dihasilkan oleh satu cahaya monokromatik kuning ditujukan kepada satu sisip kaca yang mempunyai dwicelah.
Rajah 6.2.2 menunjukkan satu mikrofon yang mengesan bunyi kuat dan lemah di hadapan dua pembesar suara yang disambungkan kepada satu penjana audio.

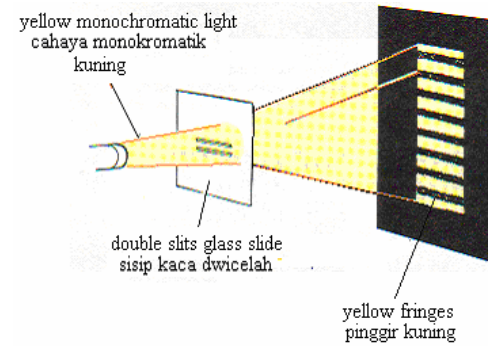


Diagram 6.2.1
Rajah 6.2.1

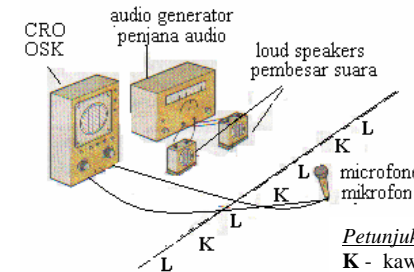


Diagram 6.2.2
Rajah 6.2.2

Petunjuk:
K - kawasan bunyi kuat
L - kawasan bunyi lemah

Using Diagram 6.2.1 and Diagram 6.2.2, state the similar characteristics of the source of light wave and sound wave and their effect on the screen and oscilloscope. Relate the characteristics to deduce a physics concept and state the physics concept.

Menggunakan Rajah 6.2.1 dan Rajah 6.2.2, nyatakan ciri-ciri yang sama bagi sumber gelombang cahaya dan gelombang bunyi serta kesannya yang dilihat pada skrin dan osiloskop. Seterusnya hubungkan ciri-ciri tersebut untuk membina satu konsep fizik dan nyatakan konsep fizik tersebut.

[5 marks]

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Question 7.1

Diagram 7.1.1 and Diagram 7.1.2 show two identical resistors which has resistance R connected to the ammeters, voltmeters, switches and batteries with different ways. Rajah 7.1.1 dan Rajah 7.1.2 menunjukkan dua perintang serupa yang mempunyai rintangan R disambungkan kepada ammeter, voltmeter, suis dan bateri dengan cara yang berbeza.

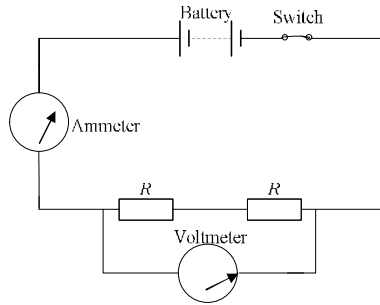


Diagram 7.1.1

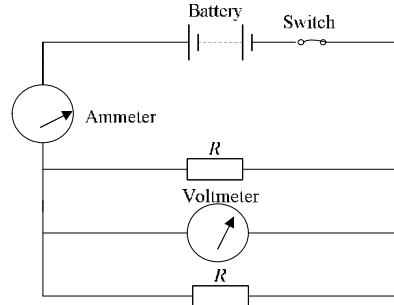


Diagram 7.1.2.2

When the switch is on, the ammeters and the voltmeters show a reading. Apabila suis dihidupkan, ammeter dan voltmeter menunjukkan bacaan.

With reference to Diagram 7.1.1 and Diagram 7.1.2, compare the type of circuit connections, the reading of ammeters, the reading of voltmeters and the effective resistance of the circuits. Relate the current flows in a circuit with the effective resistance to make a deduction regarding the relationship between type of a circuit connection and the effective resistance.

Merujuk kepada Rajah 7.1.1 dan Rajah 7.1.2, bandingkan jenis sambungan litar, bacaan ammeter, bacaan voltmeter dan rintangan berkesan bagi litar-litar. Hubungkaitkan arus yang mengalir dalam litar dengan rintangan berkesan untuk membuat satu kesimpulan tentang hubungan antara jenis sambungan litar dengan rintangan berkesan.

[6 marks]

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Question 7.2

Diagram 7.2.1 (a) and Diagram 7.2.2 (a) show two circuits used to investigate the relationship between potential difference and electric current.

Diagram 7.2.1(b) and Diagram 7.2.2(b) show the potential difference against electric current graph respectively for Diagram 7.2.1(a) and Diagram 7.2.2(b).

Rajah 7.2.1(a) dan Rajah 7.2.2(a) menunjukkan dua susunan litar untuk mengkaji hubungan antara beza keupayaan dan arus. Rajah 7.2.1(b) dan Rajah 7.2.2(b) menunjukkan graf beza keupayaan melawan arus yang sepadan bagi Rajah 7.2.1(a) dan Rajah 7.2.2 (a) masing-masing.

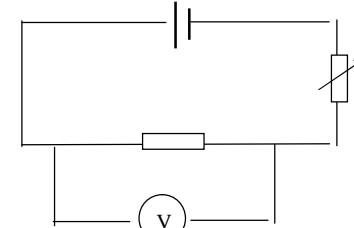


Diagram 7.2.1(a)

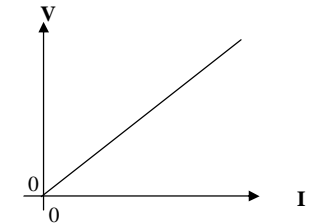


Diagram 7.2.1(b)

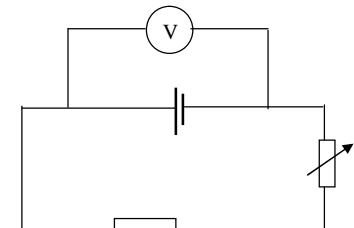


Diagram 7.2.2(a)

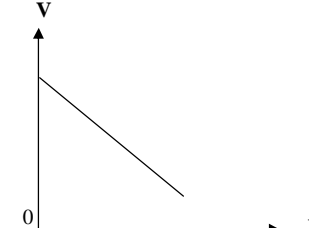


Diagram 7.2.2(b)

Compare the placement of the voltmeter in Diagram 7.2.1(a) and Diagram 7.2.2(a). Then compare the relationship between potential difference and current for both graphs. Explain the results shown in both graphs. Hence state the related physics law and concepts applicable in each situation. Bandingkan kedudukan voltmeter dalam Rajah 7.2.1(a) dan Rajah 7.2.2(a) Seterusnya bandingkan hubungan antara beza keupayaan dan arus bagi kedua-dua graf dan beri penjelasan tentang kedua-dua graf tersebut. Nyatakan hukum dan konsep fizik yang berkaitan dalam setiap situasi di atas anda.

[5 markah]

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Question 7.3

Diagram 7.3.1(a) and Diagram 7.3.1(b) show photographs of two electric circuits. Each circuit contains two identical new dry cells marked 1.5 V, a 2 ohm resistor and an ammeter.

Diagram 7.3.2(a) and Diagram 7.3.2(b) show the reading of the ammeter for each circuit respectively.

Rajah 7.3.1(a) dan Rajah 7.3.1(b) menunjukkan fotograf bagi dua litar elektrik. Setiap litar mengandungi dua sel baru yang serupa bertanda 1.5V, satu perintang 2 ohm dan satu ammeter.

Rajah 7.3.2(a) dan Rajah 7.3.2(b) menunjukkan bacaan ammeter untuk litar elektik masing-masing.

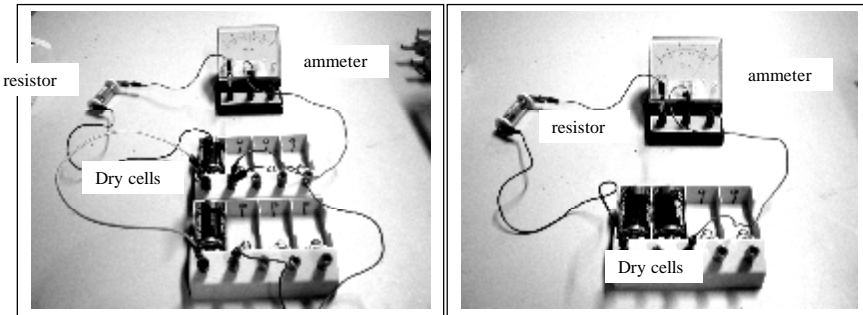
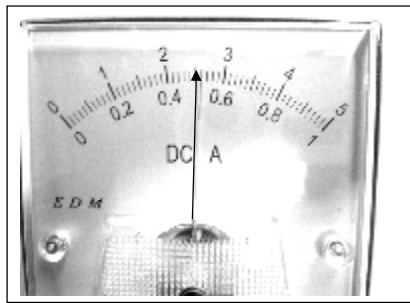
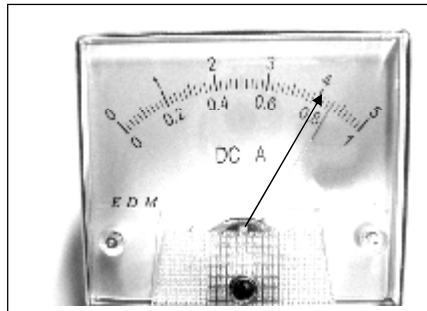


Diagram 7.3.1
Rajah 7.3.1



(a)



(b)

Diagram 7.3.2
Rajah 7.3.2

Observe Diagram 7.3.1 and Diagram 7.3.2. Compare the arrangement of dry cells in the circuit, the voltage supplied and the reading of the ammeter.

State the relationship between the energy transferred to flow the electric charges around the circuit and

- (a) the voltage supplied
- (b) the current flowing around the circuit

Perhatikan Rajah 7.3.1 dan Rajah 7.3.2. Bandingkan susunan sel-sel kering di dalam litar, voltan yang dibekalkan dan bacaan ammeter.

Nyatakan hubungan di antara tenaga yang dipindahkan untuk menggerakkan cas elektrik di dalam litar dengan

- (a) voltan yang dibekalkan
- (b) arus yang mengalir di dalam litar

[5 marks]

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Question 7.4

Diagram 7.4.1 and Diagram 7.4.2.2 show the bulbs connection at the fruit stores. The bulbs and the store are identical.

Rajah 7.4.1 dan 7.4.2 menunjukkan mentol-mentol yang disambung ke gerai buah-buahan. Mentol-mentol dan bateri pada stor adalah serupa.

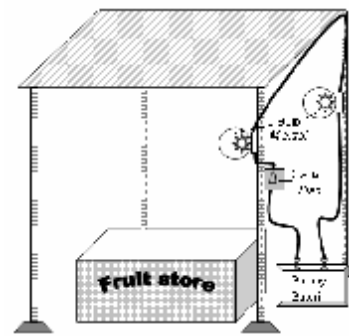


Diagram 7.4.1

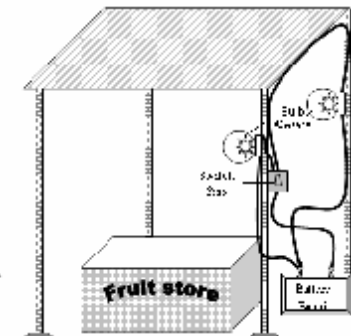


Diagram 7.4.2

Using Diagram 7.4.1 and 7.4.2, compare the brightness of the bulbs. Relate the brightness of the bulb, the potential different and the current flow for the bulbs to deduce a relevant physics concept.

Menggunakan Rajah 7.4.1 dan 7.4.2, bandingkan kecerahan mentol-mentol. Hubungkan kecerahan mentol, beza keupayaan dan arus yang mengalir melalui mentol untuk menyimpulkan satu konsep fizik yang relevan.

[5 marks]

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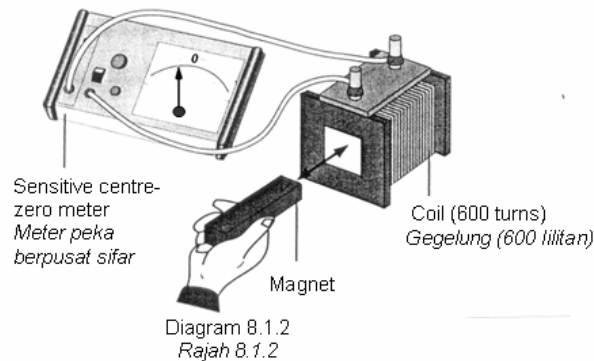
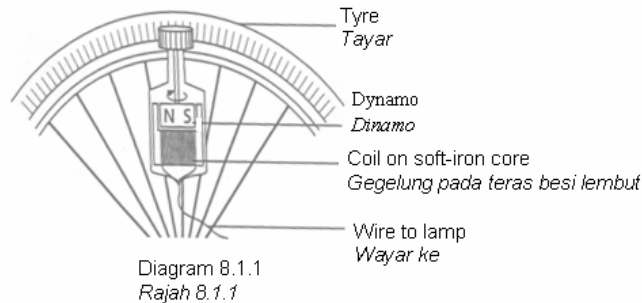
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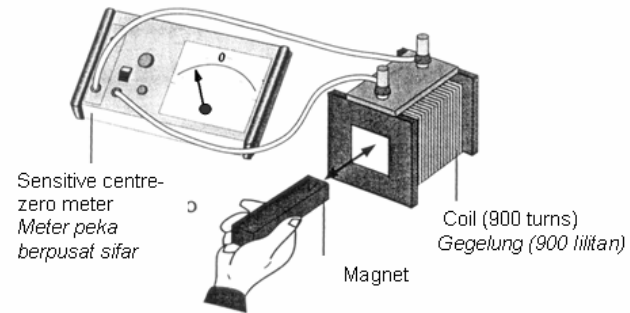
Question 8.1

Diagram 8.1.1 shows a bicycle dynamo.
Rajah 8.1.1 menunjukkan sebuah dinamo basikal.



The dynamo contains a rotating permanent magnet and a fixed coil. As the magnet rotates, an induced current is produced.

Dinamo terdiri daripada sebuah magnet kekal yang berputar dan satu gegelung tetap. Apabila magnet berputar, arus aruhan dihasilkan.



- (a) Based on Diagrams 8.1.2 and 8.1.3, compare the relative motions between the magnet to the coil.
Berdasarkan Rajah 8.1.2 dan 8.1.3, bandingkan gerakan relatif antara magnet dengan gegelung. [1 mark]
- (b) Based on Diagram 8.1.2. and 8.1.3, compare the number of turns of the coils.
Berdasarkan Rajah 8.1.2 dan 8.1.3, bandingkan bilangan lilitan gegelung. [1 mark]
- (c) Based on Diagram 8.1.2.and 8.1.3, relate the number of turns of the coil with the change in magnetic flux and the magnitude of induced current.
Berdasarkan Rajah 8.1.2 dan 8.1.3, hubungkan bilangan lilitan gegelung dengan magnitud perubahan fluks magnet dan magnitud arus aruhan. [2 marks]
- (d) State the law that explains the situation in (b) (iii).
Nyatakan hukum yang menerangkan situasi di (b) (iii). [1 mark]

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Question 8.2

Diagram 8.2.1 shows the alternator (a.c. generator) in Proton car. Diagram 8.2 .2 shows a common dynamo fixed to a bicycle. Inside the alternator, a coil of many turns will rotate in a magnetic field when the car is moving. Inside the dynamo, a permanent magnet rotates near a coil when the bicycle wheel is turning. In Diagram 8.2.1, the lamp lights up when the magnet is rotated by turning the wheel. The lamp becomes brighter when the bicycles wheel is turning faster.

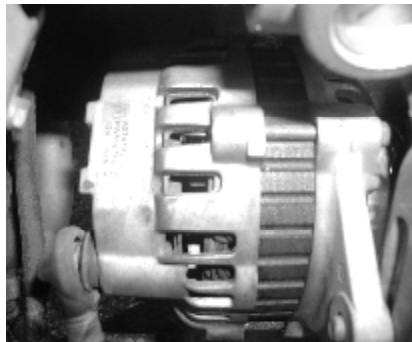


Diagram 8.2 .1

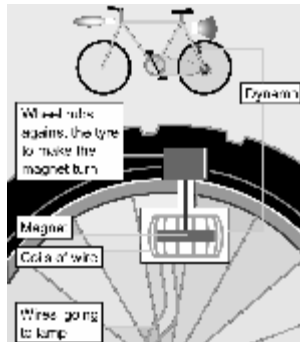


Diagram 8.2 .2

Using Diagram 8.2.1 and 8.2.2, compare the size of the induced currents produced in the car alternator and the bicycle dynamo. Relate the size of the induced current to the number of turns in the coil, the strength of the magnet used, and the speed of rotation, and deduce a relevant physics concept.

[5 marks]

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Question 8.3

Diagram 8.3.1 and 8.3.2 show insulated copper wires are wrapped around rods to form solenoids. The solenoids are connected to ammeters, rheostats, switches and dry cells.

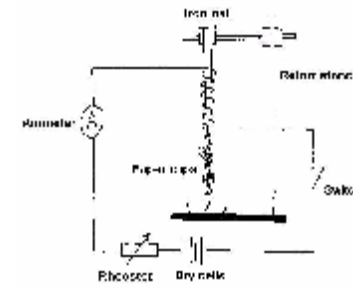


Diagram 8.3.1

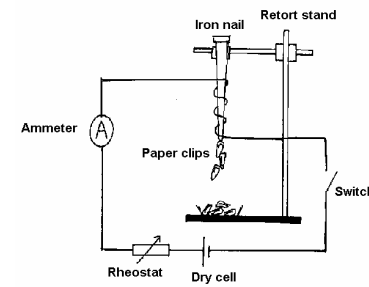


Diagram 8.3.2

(a) Using Diagram 8.3.1 and Diagram 8.3.2, compare the number of turns in solenoid, the magnitude of current flowing and the number of paper clips attracted to the solenoid.

[3 marks]

(b) State the relationship between the strength of the magnetic field and
 (i) the magnitude of current
 (ii) the number of turns in solenoid

[2 marks]

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Question 9.1

Diagram 9.1.1 shows the output of a transformer connected to a semiconductor diode and a resistor R

Diagram 9.1.2 shows the output of a transformer connected to four semiconductor diodes and a resistor R

Rajah 9.1.1 menunjukkan output sebuah transformer disambungkan kepada buah diod semikonduktor dan perintang R.

Rajah 9.1.2 menunjukkan sambungan output transformer kepada empat buah diod semikonduktor dan perintang R.

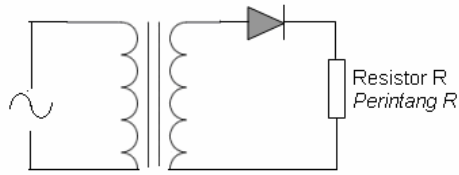


Diagram 9.1.1

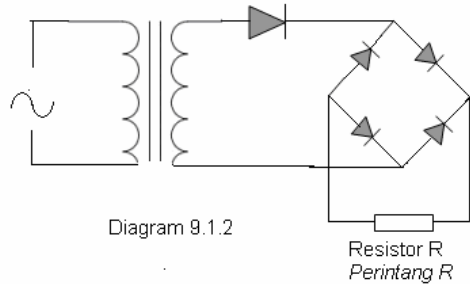


Diagram 9.1.2

Based on diagram 9.1.1 and 9.1.2 compare the type of current produced by the output of the transformer and the current that flows through R .

Name the process involved.

Berdasarkan Rajah 9.1.1 dan Rajah 9.1.2 bandingkan keadaan arus yang dihasilkan oleh output transformer dan arus yang mengalir melalui R.

Namakan proses terlibat.

[5 marks]

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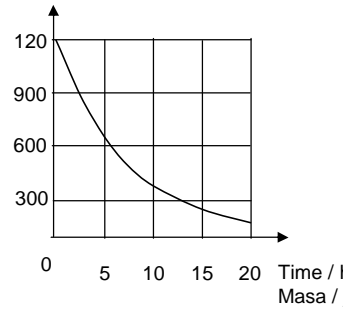
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Question 10.1

Diagram 10.1.1 and Diagram 10.1.2 show the activities of two radioactive sources P and Q.

Rajah 10.1.1 dan 10.1.2 menunjukkan aktiviti dua sumber radioaktif P dan Q.

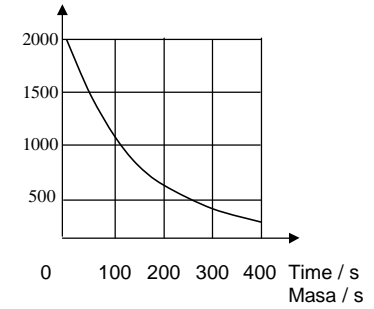
Activity / s⁻¹
Aktiviti/ s⁻¹



Radioactive source P
Sumber radioaktif P

Diagram 10.1.1
Rajah 10.1.1

Activity / s⁻¹
Aktiviti/ s⁻¹



Radioactive source Q
Sumber radioaktif Q

Diagram 10.1.2
Rajah 10.1.2

Based on Diagram 10.1.1 and Diagram 10.1.2,

Berdasarkan Rajah 10.1.1 dan Rajah 10.1.2

State common characteristic of

Nyatakan ciri sepunya

- the shape of the graph

- bagi bentuk graf

- the time taken for the activities of radioactive sources P and Q to become half of its initial value.

- sepunya bagi masa yang diambil untuk aktiviti sumber radioaktif P dan sumber radioaktif Q menjadi separuh daripada nilai asalnya.

[5 marks]

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Question 10.2

Diagram 10.2.1 and Diagram 10.2.2 show the graph of radioactivity for two different sources. Rajah 10.2.1 dan Rajah 10.2.2 menunjukkan graf radioaktif untuk dua sumber yang berlainan.

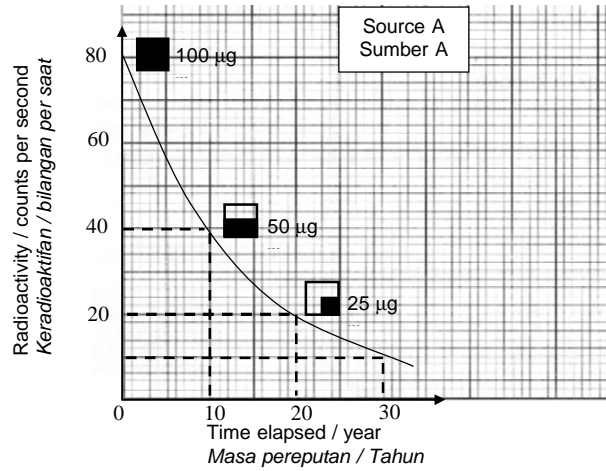


Diagram 10.2.1
Rajah 10.2.1

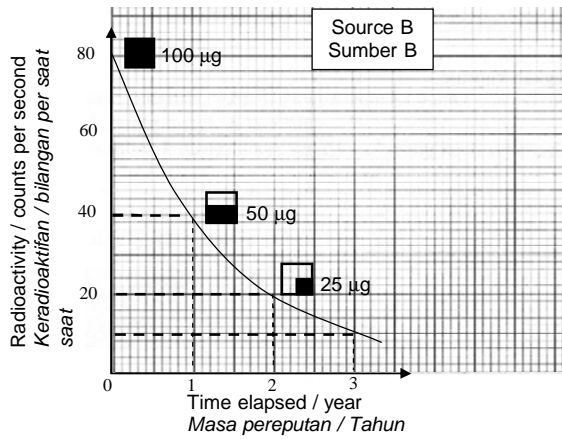


Diagram 10.2.2
Rajah 10.2.2

(a) Using Diagram 10.2.1 and Diagram 10.2.2, compare time elapsed, radioactivity and initial activity for the two sources. decay

Menggunakan Rajah 10.2.1 dan Rajah 10.2.2, bandingkan masa penyusutan, kadar reputan dan keaktifan asal bagi kedua-dua bahan radioaktif.

[3 marks]

(b) State the relationship between the fraction of radioactive source that remains and the time elapsed to deduce a relevant physics concept.

Nyatakan hubungan antara sumber bahan yang tertinggal selepas penyusutan dengan masa penyusutan untuk membuat satu kesimpulan konsep fizik

[2 marks]

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PROBLEM SOLVING

1

Identify the problem given

2

Give the suggestions or modifications

3

Give the correct reason or explanation for each suggestion or modification

4

Write the answer in table form

Example 1



Suggestions to prevent similar damage in the future, the fishermen suggest building retaining walls and relocating the jetty., to include following aspects:

- (a) the design and structure of retaining wall
- (b) the location of the new jetty

[10 Marks]

Answer

Design / way / modification	Reason
Build a slanting barrier (to reduce the deepness of the sea)	Speed / amplitude / energy / wavelength of the wave is reduced when depth of water is reduced
The surface of the barrier is made rough / uneven / porous	4. To reduce reflection of the waves / to absorb the waves
Build the new jetty at the bay	Water is calm in the bay
Build a barrier with a small opening, surrounding the bay	Diffraction of waves happens at the opening
Barrier is made of concrete / rigid material	Not easily eroded / broken down by strong waves
High retaining wall	Sea water cannot reach the house

Question 2.1

Diagram 2.1 shows cross sectional (plan site) of sailboard on a yacht. The sailboard is inefficient to be used in a yacht's tournament.
Rajah 2.1 menunjukkan keratan rentas (pandangan atas) papan layar bagi sebuah perahu layar. Papan layar itu tidak berkesan untuk digunakan dalam pertandingan perahu layar.

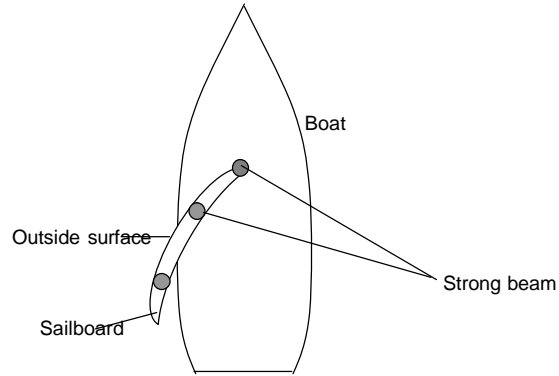


Diagram 2.1
Rajah 2.1

You are assigned to design of sailboard to be used for the yacht to moves more quickly, tends to push the boat sideway easily, more stable and withstand to the wind.
Anda ditugaskan untuk merekabentuk papan layar yang boleh digunakan supaya perahu layar bergerak lebih laju, mudah untuk berpusing, lebih stabil dan tahan angin.

[10 marks]

Design / way / modification	Reason / Explanation

Question 2.2

You are representing your school in a water rocket tournament. Explain how you design a water rocket by using a drinking bottle. The water rocket should able to move in a long horizontal distance.

Anda dipilih untuk mewakili sekolah dalam suatu pertandingan roket air. Terangkan bagaimana anda merekabentuk sebuah roket air daripada sebuah bekas berisi air. Roket air dikehendaki boleh terbang melalui jarak ufuk yang jauh.

Draw a diagram to show your design and in your explanation, emphasise the following aspects:

- (i) the matter of the drinking bottle,
- (ii) the volume of water in the drinking bottle,
- (iii) the angle of projection,
- (iv) the stability of the rocket.

Lukiskan gambar rajah yang menunjukkan reka bentuk roket air anda dan dalam penerangan anda, berikan penekanan bagi aspek-aspek berikut:

- (i) bahan bekas,
- (ii) isipadu air di dalam bekas,
- (iii) sudut pelancaran,
- (iv) kestabilan roket.

[10 marks]

Design / way / modification	Reason / Explanation

Question 2.3

Diagram 2.3 shows an athlete jumping passed over the bar in vault pole event competition.
Rajah 2.3 menunjukkan seorang olahragawan melompat melepasi palang di dalam pertandingan acara lompat bergalah.

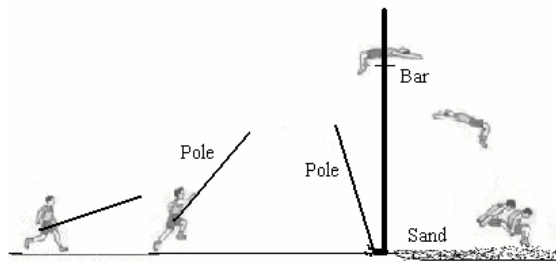


Diagram 2.3

Using a relevant physics concept, give some suggestions and explain how the athlete can jump more higher safely. Explain your suggestions based on the following aspects:
 Menggunakan konsep fizik yang sesuai, berikan cadangan dan terangkan bagaimana olahragawan itu dapat melompat lebih tinggi dengan selamat. Terangkan cadangan anda berdasarkan aspek-aspek berikut:

- (i) the athlete's attire, *pakaian olahragawan*
- (ii) athlete movement (running and jumping technique), *pergerakan olahragawan (teknik larian dan lompatan)*
- (iii) pole used *galah yang digunakan*
- (iv) safety *keselamatan*
- (v) landing technique *teknik mendarat*

[10 marks]

Design / way / modification	Reason / Explanation

Question 3.1

Diagram 3.1 shows the side view of a model of a dam made from bricks and concrete.
 Rajah 3.1 menunjukkan pandangan sisi model empangan yang dibuat daripada bata dan konkrit.

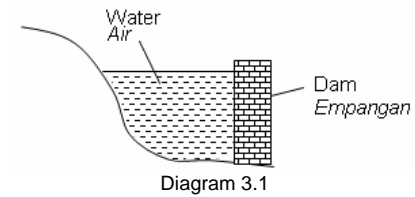


Diagram 3.1

The model of the dam is not suitable to be used.
 Model empangan ini tidak sesuai digunakan.

You are assigned to design the suitable model of a dam that can be used efficiently and safely.
 Anda ditugaskan untuk merekabentuk sebuah model empangan yang sesuai digunakan dengan berkesan dan selamat.

Explain the modifications that need to be done to the dam to enable it to:
 Terangkan pengubahsuaian yang perlu dilakukan kepada empangan supaya membolehkannya:

- (i) store more water safely. *menyimpan lebih banyak air dengan selamat.*
- (ii) for the public uses of the water in the dam *untuk kegunaan awam air di dalam empangan itu*

[10 marks]

Design / way / modification	Reason / Explanation

Question 3.2

Diagram 3.2 shows a hydraulic jack which can lift up a maximum mass of 1 metric tonne.
 Rajah 3.2 menunjukkan sebuah jek hidraulik yang boleh mengangkat jisim maksima 1 tan metrik.

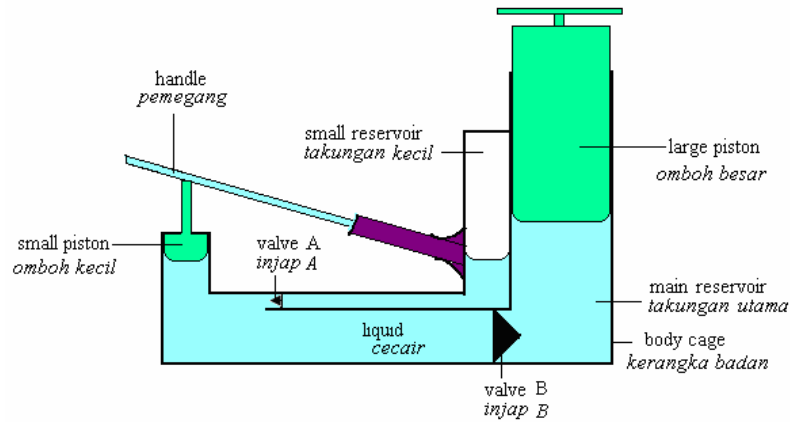


Diagram 3.2

Using suitable physics concepts, explain the modification that needs to be done to the:

Menggunakan konsep fizik yang sesuai, terangkan pengubahsuaian ke atas:

- i. size of the piston, *saiz omboh,*
- ii. material of the body, *bahan untuk membina badan,*
- iii. type of liquid used, *jenis cecair yang digunakan,*
- iv. handle *pemegang*
- v. ability to reset the piston position easily *kebolehan untuk mengembalikan omboh kepada kedudukan asal*

of the hydraulic jack to enable it to lift the greater mass.
jek hidraulik itu untuk membolehkannya mengangkat jisim yang lebih besar.

[10 marks]

Design / way / modification	Reason / Explanation

Question 4.1

A chef has to cook for a banquet and he has to be able to prepare his food quickly, with the minimum cost yet without compromising on the quality of the food served.

Seorang chef diminta memasak untuk satu jamuan dan dia perlu menyediakan makanan dalam masa yang singkat, namun tidak mengurangkan kualiti makanan yang dihidangkan.

Using the appropriate physics concepts, suggest and explain suitable designs or ways to have a pot with the following features:

- (i) long lasting and safe
- (ii) portable
- (iii) consume little fuel/cooking gas
- (iv) versatile (adaptable for various purpose: cooking, steaming and etc)

Menggunakan konsep-konsep fizik yang sesuai, cadang dan terangkan rekabentuk atau kaedah yang sesuai dilakukan untuk menghasilkan periuk yang mempunyai ciri-ciri berikut:

- (i) *tahan lama dan selamat*
- (ii) *mudahalih*
- (iii) *menggunakan hanya sedikit bahan api / gas memasak*
- (iv) *pelbagai (boleh diubah sesuai untuk pelbagai tujuan : memasak, mengukus dan lain-lain)*

[10 marks]

Modification	Explanation

Question 4.2

Diagram 4.2 shows a simple solar water-heating system. Energy from the sun falls on the solar panel. Water is pumped around the system so that a store of hot water is made available in the tank.

Rajah 4.2 menunjukkan satu sistem pemanasan air yang ringkas. Tenaga dari matahari memancar ke atas panel solar. Air dipam mengelilingi sistem itu supaya simpanan air panas tersedia di dalam tangki.

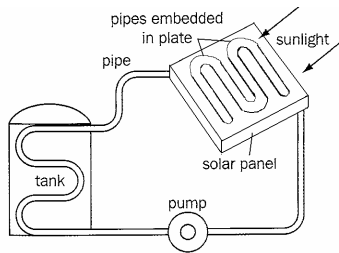


Diagram 4.2
Rajah 4.2

Using suitable physics concepts, explain the required modification needed in designing an efficient solar water-heating system. The modification should include the following aspects:

Dengan menggunakan konsep fizik yang sesuai, terangkan pengubahsuaian yang diperlukan dalam mereka bentuk sistem pemanasan air solar yang cekap. Pengubahsuaian hendaklah mengikut aspek-aspek berikut:

- (i) pipes design
rekabentuk paip
- (ii) material used
bahan yang digunakan
- (iii) heat absorption
penyerapan haba

[10 marks]

Modification	Explanation

Question 4.3

Diagram 4.3 shows a box fitted with door to be used to built a refrigerator.

Rajah 4.3 menunjukkan sebuah kotak berpintu yang akan digunakan untuk membina sebuah peti sejuk.

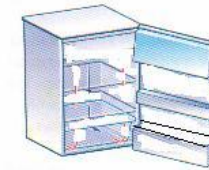


Diagram 4.3
Rajah 4.3

Using physics concepts, explain how the box can be modify to a refrigerator . In your explanation, emphasise on the;

Menggunakan konsep-konsep fizik, terangkan bagaimana kotak tersebut boleh diubahsuaui menjadi sebuah peti sejuk. Dalam penerangan anda jelaskan dari segi;

- (i) Structure and the type of material used to conduct the cooling liquid.
Binaan dan jenis bahan paip yang digunakan untuk mengalirkan cecair penyejuk.
- (ii) Cooling agent used
Cecair penyejuk yang digunakan
- (iii) Safety features
Ciri-ciri keselamatan
- (iv) The position of the freezer box.
Kedudukan kotak dingin beku

[10 marks]

Modification	Explanation

Question 5.1

Diagram 5.1 shows the structure of an optical fibre used in telecommunications.

Rajah 5.1 menunjukkan struktur gentian optik yang digunakan untuk perhubungan.

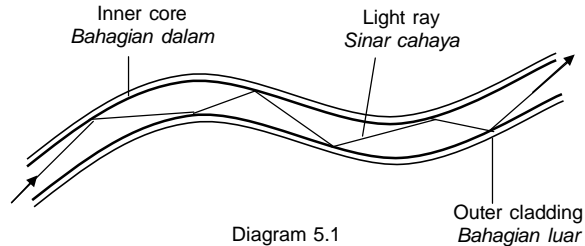


Diagram 5.1
Rajah 5.1

Optical fibres are made of fine strands of glass. Each single glass fibre (inner core) is coated with a thin layer of another type of glass (outer cladding). You are required to give some suggestions in designing an optical fibre which can carry more information.

Explain your suggestions based on the following aspects:
Gentian optik diperbuat dari kaca. Setiap lapisan gentian kaca (bahagian dalam) dilapis dengan lapisan nipis kaca (bahagian luar). Anda dikehendaki memberi beberapa cadangan untuk mereka bentuk gentian kaca yang boleh membawa banyak maklumat.

Terangkan cadangan anda berdasarkan aspek-aspek berikut:

- (i) refractive index of the inner and outer glass
indeks biasan bagi kaca dibahagian dalam dan luar.
- (ii) the properties of material used for optical fibre
sifat bahan yang digunakan untuk gentian optik
- (iii) the thickness of the glass
ketebalan kaca

Modification	Explanation

Question 5.2

Using knowledge on reflection of light, explain your choice of an anti-theft mirror that is used to have a clear view of interior of a shop, based on the following aspects:

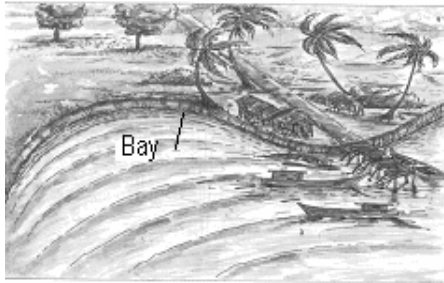
Menggunakan pengetahuan tentang pantulan cahaya, terangkan cadangan untuk memilih cermin cegah kecuriansupaya keseluruhan bahagian dalam kedai dapat dilihat, berdasarkan aspek-aspek berikut:

- (i) the type of the mirror
jenis cermin.
- (ii) the diameter of the mirror
diameter cermin
- (iii) the curvature of the mirror
lengkungan cermin
- (iv) the thickness of the mirror
ketebalan cermin
- (v) the position of the mirror.
Kedudukan cermin.

[10 marks]

Modification	Explanation

Question 6.1



Suggestions to prevent similar damage in the future, the fishermen suggest building retaining walls and relocating the jetty., to include following aspects:

- (a) the design and structure of retaining wall
- (b) the location of the new jetty

[10 Marks]

Modification	Explanation

Question 6.2

A fishing village is located at the cape of a seashore. Their house is made from wood and the roof of the house is made from coconut leaf. During the rainy season, waves are big. One year the waves are eroded the seashore caused the house to collapse.

Sebuah perkampungan nelayan di kawasan tanjung terdiri daripada rumah-rumah nelayan yang dibina daripada kayu dan atap nipah. Semasa musim tengkujuh rumah-rumah mereka mengalami kerosakan yang teruk disebabkan oleh tiupan angin dan hakisan pantai.

Using the your physics knowledge, suggest and explain of ways to help the fishermen solve the problems.

Menggunakan pengetahuan anda tentang konsep fizik, cadang dan terangkan bagaimana anda dapat membantu nelayan tersebut menyelesaikan masalah mereka.

You should use your knowledge about the wave phenomenon to explain your suggestions, to include following aspects:

Penerangan anda perlulah merangkumi aspek-aspek berikut:

- (i) the design and structure of house
reka bentuk dan struktur rumah.
- (ii) the location of the house
lokasi rumah yang hendak dibina

[10 marks]

Modification	Explanation

Question 6.3

To attract more tourist to the island in Diagram 6.3, a contractor wants to build a beach resort. As a consultant you are asked to give suggestions on the proposed project based on the following aspects:

Bagi menarik kehadiran pelancong-pelancong ke pulau dalam Rajah 6.3, pemaju ingin membina sebuah pusat percutian pantai. Sebagai perunding, anda dikehendaki memberikan cadangan kepada projek berkenaan berdasarkan aspek-aspek berikut:

- (i) The location of the resort
Lokasi pusat percutian
- (ii) Features to reduce the erosion of the shore
Kaedah untuk mengurangkan hakisan pantai
- (iii) Features to enable children to enjoy swimming in calm water.
Kaedah supaya kanak-kanak dapat berenang di kawasan air tenang

[10 marks]

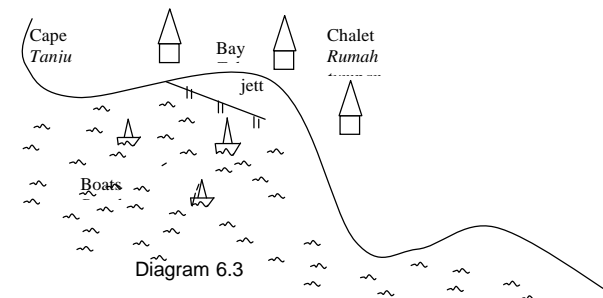


Diagram 6.3

Modification	Explanation

Question 6.4

You are assign to built a wave transmitter in a local television station which is newly start its operation. The TV station decide to use FM wave and many other devices to ensure its broadcast can be received clearly at distance places.

Anda ditugaskan untuk membina sistem penghantaran gelombang di sebuah stesen televisyen tempatan yang baru memulakan operasinya. Stesen TV tersebut bercadang menggunakan gelombang FM dan lain-lain bantuan peralatan untuk memastikan siarannya dapat terima pada jarak jauh dengan jelas.

- (i) Explain how the FM wave is produced and transmitted to the receivers.
Huraikan bagaimana gelombang FM dihasilkan dan dihantar ke penerima

[4 marks]

- (ii) Suggest a method to be used to upgrade the broadcasting quality due to the interference at the hilly area and the position of the TV station to the distance receivers.

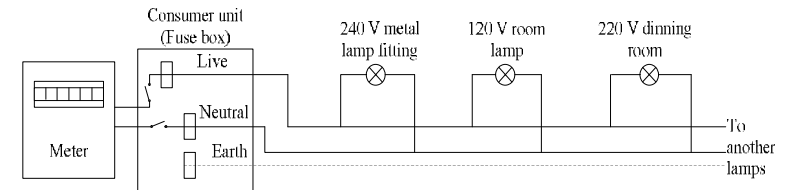
Cadangkan kaedah yang digunakan untuk meningkatkan mutu siaran akibat gangguan di kawasan berbukit dan kedudukan stesen TV dengan penerima yang jauh.

[6 marks]

Modification	Explanation

Question 7.1

Diagram 7.1 shows the lamps in a domestic lightning circuit are connected in parallel. *Rajah 7.1 menunjukkan lampu-lampu di dalam litar pencahayaan rumah yang disambung secara selari.*



Daigarm 7.1

The circuit is not complete and not efficient for electrical energy consuming and less safety. Suggest modifications that need to be done to the circuit to improve safety, produce the lamps lights up with normal brightness and to increases the efficiency of electrical energy consuming.

Litar ini tidak lengkap dan tidak cekap bagi penggunaan tenaga elektrik serta kurang selamat. Cadangkan pengubahsuaian yang perlu dilakukan kepada litar ini untuk meningkatkan keselamatan, menghasilkan lampu yang menyala dengan kecerahan normal dan meningkatkan kecekapan penggunaan tenaga elektrik.

[10 marks]

Modification	Explanation

Question 7.2

Diagram 7.2 shows an electric kettle which is a rated at 240 V, 2 000 W and connected by a flexible cable to a three-pin-plug.

Rajah 7.2 menunjukkan sebuah cerek elektrik bertabel 240 V, 2 000 W dan disambungkan oleh kabel mudah alih ke plag tiga-pin.

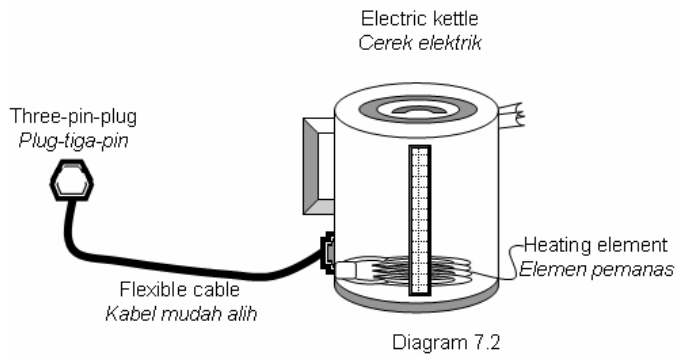


Diagram 7.2

Suggest modifications that can be made to the electric kettle in Diagram 7.2 so that it can boil water faster and has better safety.

Cadangkan pengubahsuaian yang boleh dilakukan pada cerek elektrik dalam Rajah 7.2 supaya dapat mendidihkan air dengan lebih cepat dan lebih selamat.

[10 marks]

Modification	Explanation

Diagram 8.1

Diagram 8.1 shows a moving coil ammeter
Rajah 8.1 menunjukkan sebuah ammeter gegelung bergerak.

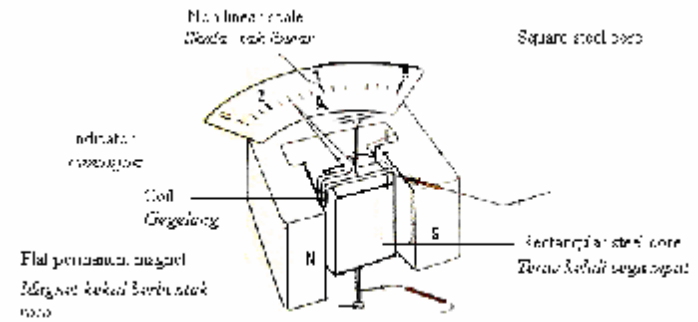


Diagram 8.1
Rajah 8.1

Explain how you would design a moving coil ammeter that can function properly. In your explanation, emphasise the following aspects:
Terangkan bagaimana anda mereka bentuk satu ammeter gegelung bergerak yang boleh berfungsi dengan lebih baik. Dalam penerangan anda, berikan penekanan bagi aspek-aspek berikut:

- the sensitivity of the ammeter,
- kepekaan ammeter itu,
- the shape of the permanent magnet,
- bentuk magnet kekal,
- the shape of the core,
- bentuk teras,
- the type material of the core,
- jenis bahan teras,
- the type of the scale of the ammeter.
- jenis skala ammeter.

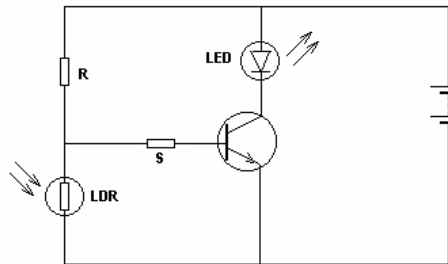
[10 marks]

Modification	Explanation

Question 9.1

Diagram 9.1 shows a light dependent resistor (LDR), resistors R and S, a light emitting diode (LED), a transistor and a battery that will be connected to form a circuit. The LED emits lights when it is in a dark surroundings.

Rajah 9.1 menunjukkan sebuah perintang cahaya (PPC), perintang R, sebuah diod pemancar cahaya(LED), sebuah transistor dan sebuah bateri yang disambungkan untuk membentuk sebuah litar. LED tersebut mengeluarkan cahaya apabila persekitarannya adalah gelap.



Rajah 9.1
Rajah 9.1

You are asked to modify the circuit as a fire detector. Modification have to be made to the circuit. In your explanation, emphasise the following aspects:

Anda dikehendakki mengubahsuai litar tersebut sebagai sebuah litar untuk mengesan kebakaran. Penjelasan anda mestilah berdasarkan aspek-aspek berikut:

- the unsuitable electronic components need to remove
- komponen elektronik yang tidak sesuai dan perlu ditanggalkan
- the electronic components that are needed to replace the unsuitable components.
- komponen elektronik yang perlu menggantikan komponen elektronik yang sesuai.
- the position of the electronic components in the circuit.
- kedudukan komponen elektronik itu di dalam litar.

[10 Marks]

Modification	Explanation

Question 10.1



Diagram 10.1
Rajah 10.1

A doctor wants to detect the presence of blockages in the blood vessels. By injecting a suitable radioisotope as tracer into the blood stream of the patient, a doctor should able to identify the part of body that not receiving enough blood. Using your knowledge on radioactivity and Diagram 10.1, explain on the following aspect:

Seorang doktor ingin mengesan salur darah yang tersumbat. Dengan menyuntik bahanradioisotop yang sesuai kepada pesakit sebagai pengesan, doktor dapat mengetahui kawasan dalam badan yang tidak dapat menerima darah secukupnya. Dengan menggunakan pengetahuan anda tentang radioaktif dan Rajah 10.1.bincangkan berdasarkan maklumat berikut:

- what radioactive material and equipment can be used to monitor the blood flow in the patient. apakah bahan radioaktif yang sesuai dan peralatan yang digunakan mengesan perjalanan darah dalam badan pesakit
- how the equipment is assembled. bagaimana peralatan ini berfungsi.
- how the system works. bagaimana sistem ini berkerja.

[10 marks]

Suggestion	Explanation

Question 10.2

Diagram 10.2 shows an underground water pipe which has a leak.
Rajah 10.2 menunjukkan suatu paip bawah tanah yang bocor.

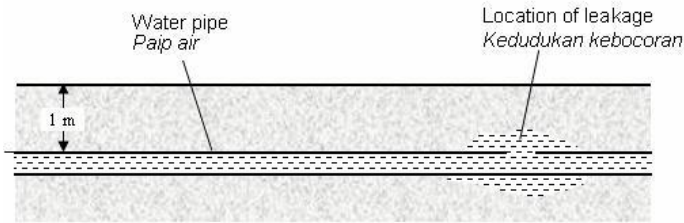


Diagram 10.2
Rajah 10.2

Radioactive substances are hazardous and must be used with care. In using a radioactive substance to detect the leakage, suggest how the substance should be chosen by considering the following aspects:

Bahan-bahan radioaktif adalah merbahaya dan mesti digunakan dengan cermat. Apabila menggunakan bahan radioaktif untuk mengesan kebocoran, cadangkan bagaimana bahan itu dipilih dengan mempertingkatkan aspek yang berikut:

- the half-life of the substance,
separuh hayat bahan,
- the types of radiation emitted by the substance,
jensi-jenis sinaran yang dipancarkan oleh bahan,
- the type of detector to be used.
jenis alat pengesanan yang digunakan.

[6 marks]

Suggestion	Explanation

Question 10.3

Your school has been selected to be one of Research and Development Centre for radioactive. Give some suggestions to modify your school lab with well equip which can be used to do the research work for radioactive source safely. Using your knowledge on radioactive and properties of materials, explain the suggestion based on the following aspects:

Sekolah anda telah terpilih sebagai salah satu pusat untuk kajian dan pembangunan bagi radioaktif. Berikan cadangan untuk mengubahsuai makmal sekolah anda dengan segala kelengkapan yang boleh digunakan untuk menjalankan kerja-kerja kajian bagi bahan radioaktif dengan selamat. Dengan menggunakan pengetahuan anda berkaitan radioaktif dan sifat-sifat bahan, terangkan cadangan tersebut berpandukan aspek-aspek berikut :

- keeping radioactive source
menyimpan bahan radioaktif
- management of radioactive solid waste
pengurusan bagi sisa radioaktif
- handling radioactive source
pengendalian sumber radioaktif
- warning during leakage
amaran bila berlaku kebocoran
- exposure detector
alat pengesanan pendedahan

[10 Marks]

Suggestion	Explanation

DECISION MAKING

1

Give the characteristics based on the subject to make decision

2

Give the correct reason or explanation for the characteristics given

3

Justify the correct choice (only one)

4

Explain the all suitability aspects// explanations

Example 1

Diagram 1 shows a traffic light is hung by two cables.



Diagram 1

As an engineer you are asked to investigate the type of cable and the arrangement of the cables to hang a heavy traffic light. Table 1 shows the characteristics of cables and the arrangement of the cables which could be used to hang the heavy traffic light.

Specification	Maximum tension support by the cable / N	Angle of θ	Mass of the traffic light /kg	Rate of the heat expansion of the cable
Company P	500	large	40	small
Q	620	large	45	high
R	600	small	60	small
S	520	small	80	high

Table 1

Based on Table 25 Explain the suitability of each characteristics in the table and hence, determine which company is most suitable to do the work. Justify your choice

[10 Marks]

Answer

Characteristic	Reason
Maximum tension is highest	To support more weight //force//load
Angle of x is large	To produce small tension in the cable
Mass of the traffic light is smallest	To produce small tension in the cable
Rate of the heat expansion of the cable is small	Difficult to break

I choose P because maximum tension is highest, angle of θ is large, mass of the traffic light is smallest and rate of the heat expansion of the cable is small

Question 2.1

Diagram 2.1 shows a tanker truck used to deliver fresh water.
Rajah 2.1 menunjukkan lori tangki digunakan untuk mengagihkan air.



Diagram2.1

The tanker truck has high mass when fully filled with water and experiences high momentum when moving.

Lori tangki itu mempunyai jisim yang besar bila diisi penuh dengan air dan mengalami momentum yang tinggi apabila bergerak.

As an engineer of manufacturing of tanker truck, you are assigned to design a tanker truck as a multi purpose transport to convey water. Table 2.1 shows characteristics of tanker truck. *Sebagai jurutera pengilang lori tangki, anda ditugaskan untuk merekabentuk lori tangki sebagai kenderaan pelbagai guna untuk mengagih air. Jadual 2.1 menunjukkan ciri-ciri lori tangki.*

Tanker truck	Characteristics			
	Number of wheel	Size of wheel	Brake system	Tanker space
J	Large number and single rear wheels	Small and wider tyres	Without air brake system	Divided to two small space
K	Small number and double rear wheels	Large and narrow tyres	Air brake system	Single big space
L	Large number and double rear wheels	Large and wider tyres	Air brake system	Divided to two small space
M	Small number and single rear wheels	Small and narrow tyres	Without air brake system	Single big space
N	Large number and single rear wheels	Large and wider tyres	Air brake system	Divided to two small space

Table 2.1

You are asked to study the tanker trucks J, K, L, M and N in Table 2.1.

Anda diminta untuk mengkaji lori-lori tangki J, K, L, M dan N dalam Jadual 2.1.

Explain the suitability of each characteristics of the tanker truck and determine the most suitable tanker truck design to be used to convey water safely.

Justify your choice.

Terangkan kesesuaian setiap ciri lori tangki itu dan tentukan rekabentuk lori tangki yang paling sesuai digunakan untuk mengagihkan air dengan selamat. Berikan sebab kepada pilihan anda.

[10 marks]

Characteristic	Reason / Explanation

The most suitable tanker truck is

Because

.....

Question 2.2

Table 2.2 shows the characteristics of 4 types of spring A, B, C and D. *Jadual 2.2 menunjukkan ciri-ciri bagi empat jenis spring A, B, C dan D.*

Spring	Spring Constant / Nm ⁻¹ <i>Pemalar spring / Nm⁻¹</i>	Density / kg m ⁻³ <i>Ketumpatan / kg m³</i>	Elastic Limit / N <i>Had kenyal / N</i>	Strength <i>Kekuatan</i>
A	170	2700	35	Low <i>Rendah</i>
B	540	7860	40	Low <i>Rendah</i>
C	270	8920	45	High <i>Tinggi</i>
D	900	19300	50	High <i>Tinggi</i>

Table 2.2

You are assign to design a swing for baby of mass 4 kg.

Anda ditugaskan untuk merekabentuk sebuah buaian untuk bayi berjisim 4 kg.

(i) Explain the suitable characteristics of the spring to be used to make a swing. *Terangkan kesesuaian ciri-ciri spring untuk digunakan sebagai spring buaian tersebut.*

(ii) Decide which spring is most suitable to be used to make the cradle and give reasons.

Tentukan spring yang paling sesuai digunakan sebagai spring buaian tersebut dan berikan sebab.

[10 marks]

Characteristic	Reason / Explanation

The most suitable spring is

Because

Question 2.3

Diagram 2.3 shows four boats, P, Q, R and S, with different specifications.
Rajah 2.3 menunjukkan empat bot, P, Q, R dan S, dengan spesifikasi yang berbeza

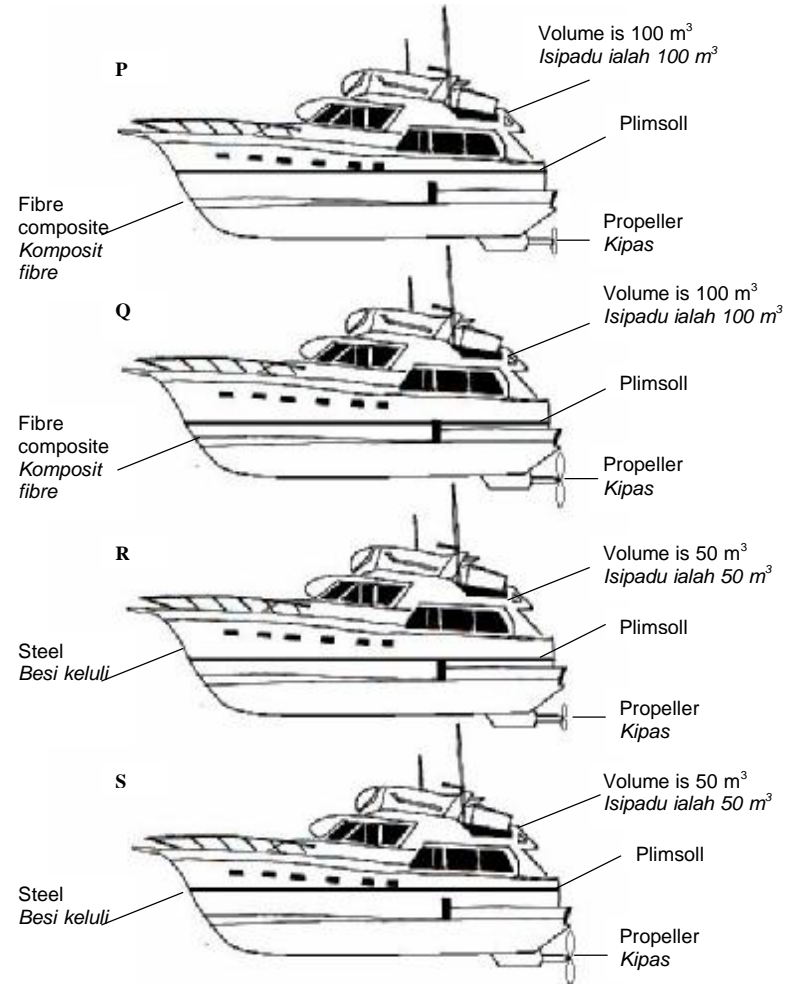


Diagram 2.3

You are required to determine the most suitable boat that can carry many passengers, move with high speed and safe.

Study the specifications of all the four boat from the following aspects:

Anda dikehendaki menentukan bot yang paling sesuai digunakan untuk membawa penumpang yang ramai, bergerak dengan laju yang tinggi dan selamat.

Kaji spesifikasi keempat-empat bot itu dari aspek berikut:

- The material used to build the body of the boat
Bahan yang digunakan untuk membina badan bot
- The volume of the boat
Isipadu bot
- The distance of the plimsoll line from the surface of sea
Jarak garis plimsol dari permukaan laut
- The size of the propeller
Saiz kipas

Explain the suitability of the above aspects and hence, determine the most suitable bot to carry heavy load and move with high speed.

Justify your choice.
*Terangkan kesesuaian aspek-aspek di atas dan seterusnya tentukan bot yang dapat membawa muatan yang berat dan bergerak dengan laju yang tinggi.
Berikan sebab bagi pilihan anda.*

[10 marks]

Characteristic	Reason / Explanation

The most suitable boat is

Because

Question 3.1

Diagram 3.1 below shows a simple hydraulic brake system in a car.
Rajah 3.1 dibawah menunjukkan satu sistem brek hidraulik ringkas bagi sebuah kereta.

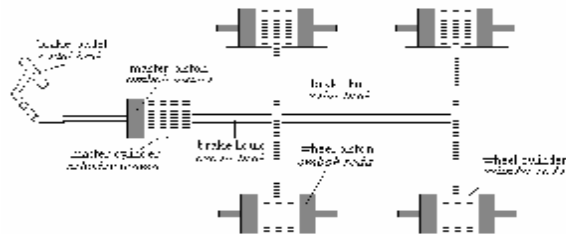


Diagram 3.1

Table 3.1 shows the characteristics of the brake system consists of type of liquid brake line, size of pistons and type of brake either disc brake or drum brake.

Jadual 11.1 menunjukkan ciri-ciri bagi system brek yang terdiri daripada jenis cecair brek, salur brek, saiz omboh dan jenis brek samada brek piring atau gelendung brek.

Brake system <i>Sistem brek</i>	Type of liquid <i>Jenis cecair brek</i>	Thickness of brake transmission line <i>Ketebalan salu penghantaran brek</i>	The ratio of cross sectional area for wheel and master piston. <i>Nisbah luas keratan rentas omboh roda dan omboh utama.</i>	The chosen of the type of brake for front and rear wheel. <i>Pemilihan jenis brek untuk roda hadapan dan roda belakang.</i>	
				Front wheel <i>Roda hadapan</i>	Rear wheel <i>Roda belakang</i>
P	Oil <i>Minyak</i>	Thin <i>Nipis</i>	High <i>Tinggi</i>	Disc <i>Piring</i>	Drum <i>Gelendung</i>
Q	Oil <i>Minyak</i>	Thick <i>Tebal</i>	Low <i>Rendah</i>	Disc <i>Piring</i>	Drum <i>Gelendung</i>
R	Paraffin <i>Parafin</i>	Thin <i>Nipis</i>	High <i>Tinggi</i>	Drum <i>Gelendung</i>	Disc <i>Piring</i>
S	Oil <i>Minyak</i>	Thick <i>Tebal</i>	High <i>Tinggi</i>	Disc <i>Piring</i>	Drum <i>Gelendung</i>
T	Water <i>air</i>	Thick <i>Tebal</i>	Low <i>Rendah</i>	Drum <i>Gelendung</i>	Disc <i>Piring</i>

Table 3.1
Jadual 3.1

You are asked to investigate the characteristics of the materials in Table 3.1 which could be used to make an efficient hydraulic brake system.

Justify your choice.

Anda ditugaskan untuk mengkaji ciri-ciri yang ditunjukkan dalam Jadual 3.1 yang boleh digunakan untuk membuat satu system brek hidraulik yang cekap.

Berikan penjelasan terhadap pilihan anda.

[10 marks]

Characteristic	Reason / Explanation

The most suitable hydraulic brake system is

Because

Question 3.2

Table 3.2 shows four fluid, K, L, M, and N, with different specifications.
Jadual 3.2 menunjukkan empat bendalir, K, L, M, dan N, dengan spesifikasi yang berbeza.

FLUID <i>Bendalir</i>	Type of liquid <i>Jenis cecair</i>	Compressibility <i>Ketermampatan</i>	Density / <i>kg m⁻³</i> <i>Ketumpatan</i> <i>/ kg m⁻³</i>	Rate of vaporization <i>Kadar</i> <i>peruapan</i>
K	Water <i>Air</i>	Incompressible <i>Tak boleh mampat</i>	1360	Low <i>Rendah</i>
L	Oil <i>Minyak</i>	Incompressible <i>Tak boleh mampat</i>	800	Low <i>Rendah</i>
M	Oil <i>Minyak</i>	Compressible <i>Boleh mampat</i>	1000	High <i>Tinggi</i>
N	Petrol <i>Petrol</i>	Compressible <i>Boleh mampat</i>	790	High <i>Tinggi</i>

Table 3.2

You are required to determine the most suitable liquid that can be used as a hydraulic fluid in the hydraulic jack
Anda dikehendaki menentukan cecair yang paling sesuai digunakan sebagai bendalir hidraulik dalam jet hidraulik.

Study the specifications of all the four types of fluid from the following aspects:
Kaji spesifikasi keempat-empat jenis bendalir itu dari aspek berikut:

- i) Type of liquid
Jenis cecair
- ii) Compressibility
Ketermampatan
- iii) Density of liquid
Ketumpatan cecair
- iv) Rate of vaporation of liquid
Kadar pengewapan cecair

[10 marks]

Characteristic	Reason / Explanation

The most suitable fluid is

Because

Question 4.1

Diagram shows a cooling system of a motorcycle engine.
 You as a mechanical engineer is given a task to study characteristics of metal shown in the Table 4.1 to be used as effective fins in the cooling system of the motorcycle engine.

Rajah 4.1 menunjukkan sistem penyejukan enjin motosikal. Anda sebagai jurutera mekanikal diberi tugas untuk mengkaji ciri-ciri logam yang ditunjukkan dalam Jadual 4.1 untuk digunakan sebagai sirip enjin motosikal yang efektif.

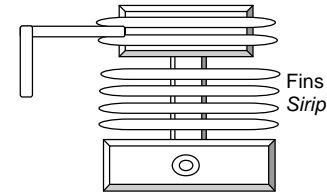


Diagram 4.1
Rajah 4.1

Types of metal <i>Jenis logam</i>	Specific heat capacity <i>Jkg⁻¹°C⁻¹</i> <i>Muatan haba tentu</i> <i>Jkg⁻¹°C⁻¹</i>	Melting point <i>°C</i> <i>Takat lebur</i> <i>°C</i>	Heat Conductor <i>Konduktor Haba</i>	Rate of expansion <i>Kadar pengembangan</i>
P	300	1020	Good <i>Baik</i>	Moderate <i>Sederhana</i>
Q	360	700	Moderate <i>Sederhana</i>	High <i>Tinggi</i>
R	450	1600	Good <i>Baik</i>	Moderate <i>Sederhana</i>
S	900	720	Moderate <i>Sederhana</i>	High <i>Tinggi</i>

Table 4.1

State suitable characteristics of metal that is used as fins in the motorcycle engine.
Nyatakan kesesuaian ciri-ciri logam yang sesuai digunakan sebagai sirip penyejuk dalam enjin motosikal.

Determine the most suitable metal that can be used as fins. Give reasons for your choice.
Tentukan logam yang paling sesuai digunakan untuk sirip penyejuk. Berikan sebab kepada pilihan anda.

[10 Marks]

Characteristic	Reason

I choose
 Because

Question 4.2

Table 4.2 shows the specifications of components that can be used in brake systems, P,Q,R,S and T.
Jadual di bawah menunjukkan spesifikasi bagi komponen yang digunakan dalam sistem brek P, Q, R, S dan T.

Brake system Sistem brek	Specifications of components in a car brake system <i>Spesifikasi komponen sistem brek kereta</i>			
	Specific heat capacity of brake disc $J\ kg^{-1}\ ^{\circ}C^{-1}$ <i>Muatan haba tentu cakera brek $J\ kg^{-1}\ ^{\circ}C^{-1}$</i>	Melting point of brake disc $^{\circ}C$ <i>Takat lebur cakera brek $^{\circ}C$</i>	Compression of brake fluid <i>Kemampatan bendalir brek</i>	Hardness of brake pads <i>Kekuatan pad brek</i>
P	360	930	Difficult <i>Sukar</i>	High <i>Tinggi</i>
Q	2400	1220	Difficult <i>Sukar</i>	Low <i>Rendah</i>
R	890	580	Easy <i>Mudah</i>	High <i>Tinggi</i>
S	2210	1940	Difficult <i>Sukar</i>	High <i>Tinggi</i>
T	1460	2070	Easy <i>Mudah</i>	Low <i>Rendah</i>

Table 4.2

Based on Table 4.2
 Berdasarkan Jadual 4.2 :

You are required to determine the most suitable brake system and explain the suitability of the aspects in Table 4.2

Anda diminta mengenalpasti sistem brek yang paling sesuai dan terangkan kesesuaian aspek - aspek yang tertera di Jadual 4.2

[10 marks]

Characteristic	Reason

I choose
 Because

Question 4.3

You are a member of Solar Club in your school to carry out a research project on the uses solar energy. You are asked to design a solar furnace to heat water in a container. You are assigned to justify the most suitable solar furnace P, Q, R and S as shown in Diagram 4.3.

Anda sebagai seorang ahli Kelab Solar sekolah anda Sekitar membuat kajian tentang penggunaan tenaga solar. Anda ditugaskan merekacipta sebuah relau suria untuk memanaskan air dalam sebuah bekas. Anda dikehendakki memilih salah satu daripada empat sistem relau suria P,Q,R dan S seperti pada Rajah 4.3.

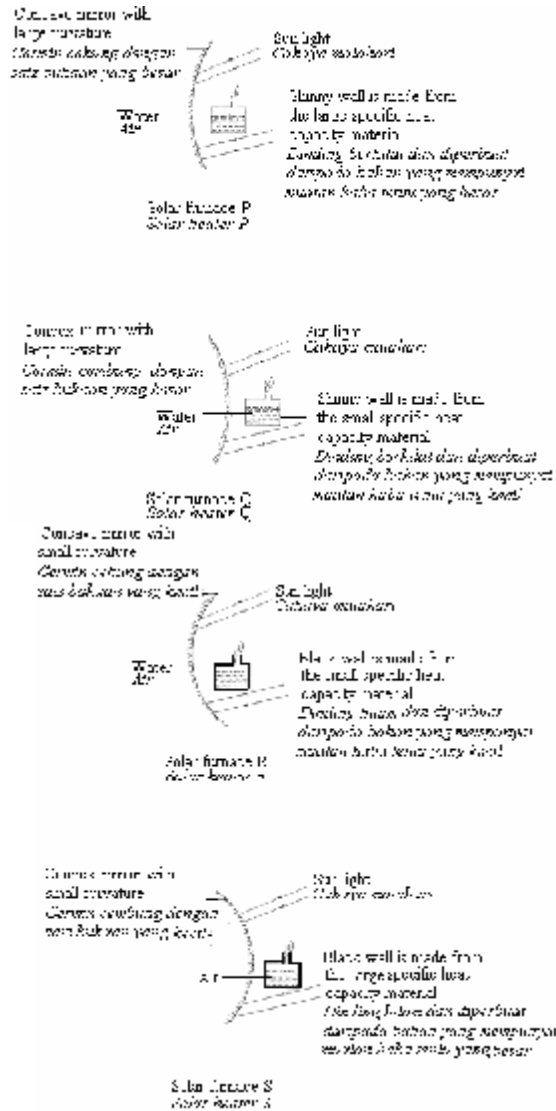


Diagram 4.3
Rajah 4.3

Based on Diagram 4.3
Berdasarkan Rajah 4.3

Explain the suitability of the characteristics of the solar furnaces to heat the water faster.
Terangkan kesesuaian ciri-ciri relau suria yang boleh digunakan untuk pemanasan air dengan lebih cepat.

Determine the most suitable solar furnace to be used and give reasons for your choice.
Tentukan relau suria yang manakah paling sesuai digunakan untuk pemanasan air dengan lebih cepat dan berikan sebab.

[10 marks]

Characteristic	Reason

I choose
 Because

Question 5.1

Traffic safety mirrors as in Diagram 5.1 are often installed outdoors, at corners and junctions of roads to prevent accidents. Table 5.1 shows the characteristics of five types of mirrors.

Cermin keselamatan jalanraya seperti pada Rajah 5.1 selalunya dipasang di selekoh dan simpang jalanraya untuk mengelak kemalangan. Jadual 5.1 menunjukkan ciri-ciri bagi lima jenis cermin.



Diagram 5.1
Rajah 5.1

Characteristics [Ciri-ciri] Mirror [Cermin]	Shape [bentuk]	Weather resistance [ketahanan terhadap cuaca]	Impact resistance of material [ketahanan terhadap hentaman]	Reflectivity of material [Kebolehpantulan bahan]
P	Concave [cekung]	Excellent [sangat baik]	Excellent [sangat baik]	Greater than 90% [melebihi 90%]
Q	Convex [cembung]	Excellent [sangat baik]	Poor [Lemah]	80%-90%
R	Convex [cembung]	Excellent [sangat baik]	Good [Baik]	Greater than 90% [melebihi 90%]
S	Concave [cekung]	Good [Baik]	Excellent [sangat baik]	80%-90%
T	Plane [satah]	Excellent [sangat baik]	Good [Baik]	Greater than 90% [melebihi 90%]

Table 5.1
Jadual 5.1

Explain the suitability of each characteristic of the mirrors to be used as an outdoor safety mirror and determine which mirror is the most appropriate. Give reasons for your choice.

Terangkan kesesuaian bagi setiap ciri di atas untuk digunakan sebagai cermin keselamatan dan tentukan cermin manakah yang paling sesuai digunakan. Beri alasan bagi pilihan anda

[10 marks]

Characteristic	Reason

I choose
 Because ...

Question 5.2

Table 5.2 shows materials which can be used to make an optical fibre.

Jadual 5.2 menunjukkan 5 jenis bahan yang boleh digunakan untuk membina serabut optik.

Material	Refractive index	% of light energy absorbed	Rigidity	Strength
P	1.75	2 %	Strong Kuat	Weak Lemah
Q	1.80	10 %	Weak Lemah	Strong Kuat
R	1.70	2 %	Weak Lemah	Strong Kuat
S	1.52	3 %	Strong Kuat	Strong Kuat
T	1.48	10 %	Weak Lemah	Weak

Table 5.2
Jadual 5.2

You are asked to investigate the characteristics of the materials in Table 11.1 which could be used to make the optical fibre.

Explain the suitability of **each** characteristic and hence, determine the most suitable material to be used to make the optical fibre.

Give a reason for your choice.

Anda ditugaskan untuk mengkaji ciri-ciri bahan dalam Jadual 11.1 untuk digunakan bagi membuat satu serabut optik.

Terangkan kesesuaian **setiap** ciri dan seterusnya tentukan bahan yang paling sesuai untuk membuat serabut optik itu.

Berikan satu sebab untuk pilihan anda.

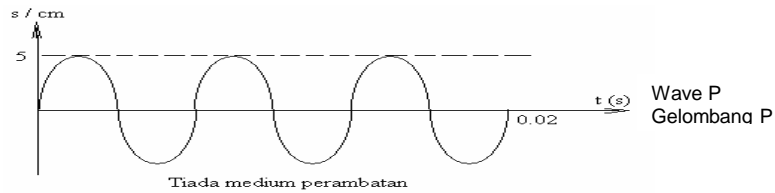
[10 marks]

Characteristic	Reason

I choose
 Because ...

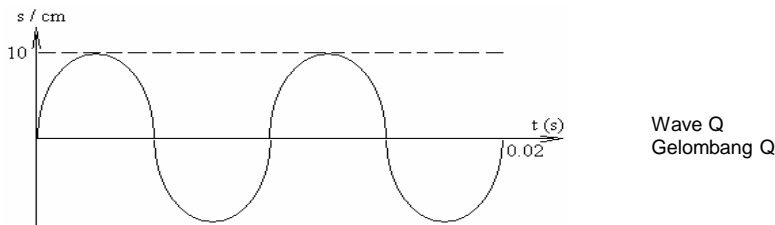
Question 6.1

Diagram shows a displacement-time graph for sound wave P, Q, R and S.
 Rajah 6.1 menunjukkan graf sesaran melawan masa bagi gelombang bunyi P, Q, R dan S.



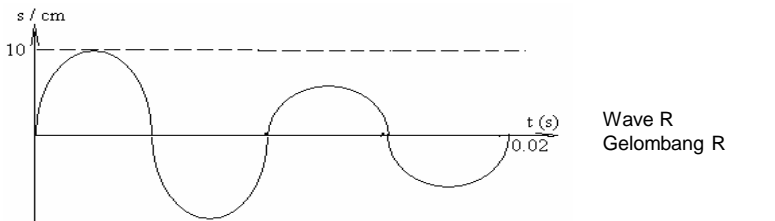
Tiada medium perambatan

No medium of propagation



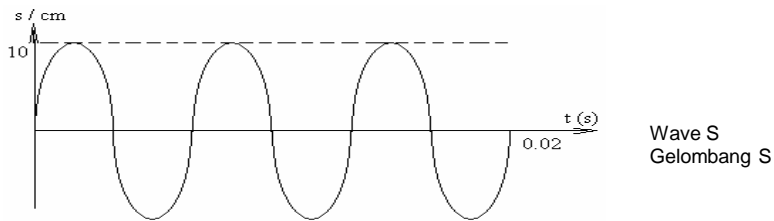
Ada medium perambatan

There is medium of propagation



Ada medium perambatan

There is medium of propagation



Ada medium perambatan

Diagram 6.1

You are assigned to investigate the suitable wave to be used in an ambulance siren.

Study waves P, Q, R and S in Diagram 6.1 and consider the following aspects.

Anda ditugaskan untuk mengkaji gelombang yang sesuai digunakan sebagai siren ambulans. Kaji gelombang P, Q, R dan S dalam Rajah 6.1 dan pertimbangkan aspek berikut;

- wave amplitude
amplitud gelombang
- wave length
panjang gelombang
- damping effect
kesan pelembapan
- medium of propagation
medium perambatan.

Explain the aspect's suitability and identify the most suitable wave to be used in an ambulance siren.

Justify your answer.

Terangkan kesesuaian aspek-aspek itu dan seterusnya tentukan gelombang yang paling sesuai digunakan sebagai siren ambulans itu.

Berikan sebab bagi pilihan anda.

[10 markah]

Characteristics	Explanation

I choose

Because

Question 6.2

Company A and Company B produced two types of cellular phones having a frequency of 1500 MHz and 800 MHz respectively. Determine which cellular phone is more efficient to be used. Give reasons for your answers.

Syarikat A dan Syarikat B mengeluarkan dua jenis telefon selular yang mempunyai frekuensi 1500 MHz dan 800 MHz. Tentukan telefon selular yang manakah lebih cekap penggunaannya. Berikan sebab bagi jawapan anda.

	Type of wave	Velocity	Wave Length	Coverage
--	--------------	----------	-------------	----------

	Jenis gelombang	Halaju	Panjang gelombang	Liputan
P	Electromagnetic <i>Elektromagnet</i>	High <i>Tinggi</i>	High <i>Panjang</i>	Low <i>rendah</i>
Q	Electromagnetic <i>Elektromagnet</i>	High <i>Tinggi</i>	High <i>Panjang</i>	Wide <i>Luas</i>
R	Mechanical <i>Mekanikal</i>	High <i>Tinggi</i>	High <i>Panjang</i>	Wide <i>Luas</i>
S	Mechanical <i>Mekanikal</i>	Low <i>Rendah</i>	High <i>Panjang</i>	Average <i>Sederhana</i>

Table 6.2

Based on Table 6.2 determine the suitability of the different waves used in cellular phone communication.

Berdasarkan Jadual 6.2, tentukan kesesuaian perbezaan gelombang yang digunakan dalam komunikasi telefon selular

[10 marks]

Characteristics	Explanation

I choose
 Because

Question 6.3

Table 6.3 shows four region and specifications of retaining wall P, Q, R and S which can be used as a guideline to build a resort field near a beach.

Jadual 6.3 menunjukkan kawasan dan spesifikasi dinding penghalang P, Q, R dan S yang boleh digunakan sebagai garis panduan untuk membina sebuah medan peranginan di tepi pantai.

Region Kawasan	P	Q	R	S

Shape of beach <i>Bentuk pantai</i>	Bay <i>teluk</i>	Bay <i>teluk</i>	Cape <i>tanjung</i>	Cape <i>tanjung</i>
Retaining wall <i>Benteng penahan</i>	High <i>tinggi</i>	Low <i>rendah</i>	High <i>tinggi</i>	High <i>tinggi</i>
Shape of retaining wall <i>Bentuk benteng penahan</i>	Slope with holes <i>Cerun berlubang</i>	Slope without holes <i>Cerun tanpa lubang</i>	Straight Vertical wall <i>Dinding tegak lurus</i>	Straight vertical wall with holes <i>Dinding tegak lurus berlubang</i>
Rock structure <i>Struktur batu</i>	Big rocks in water nearby the beach <i>Batu-batu besar dalam air berdekatan pantai</i>	One big rock in water nearby the beach <i>Satu bongkah batu dalam air berdekatan pantai</i>	Big rocks at the beach <i>Batu besar di pantai</i>	Totally no big rock <i>Tiada batu besar</i>

Table 6.3

You are required to determine the most suitable region to build a resort field. Study the specifications of all four regions based on the following aspects:

Anda diminta untuk menentukan kawasan yang paling sesuai untuk membina sebuah medan peranginan. Kaji spesifikasi keempat-empat kawasan itu berdasarkan aspek-aspek berikut:

- Shape of beach
Bentuk pantai
- Retaining wall
Dinding penahan
- Shape of retaining wall
Bentuk dinding penahan
- Rock structure
Struktur batu.

Explain the suitability of the aspects.
 Justify your choice

Terangkan kesesuaian aspek-aspek tersebut.
 Beri sebab bagi pilihan anda.

[10 marks]

Characteristics	Explanation

I choose
 Because

Question 6.4

Table 6.4 shows characteristics of four sound wave that can be transmitted from a seabed mapping ship.

Jadual 6.4 menunjukkan ciri-ciri empat jenis gelombang bunyi yang boleh dipancarkan dari sebuah kapal pemeta dasar laut.

Wave Gelombang	Frequency / Hz Frekuensi / Hz	Amplitude Amplitud	Percentage of reflected energy by sea bed. Peratus tenaga yang dipantul oleh dasar laut	Rate of sound energy absorb by water. Kadar penyerapan tenaga bunyi oleh air
R	20 000	Large Besar	40	High Tinggi
S	300	Medium Sederhana	50	High Tinggi
T	2 000	Medium Sederhana	30	Medium Sederhana
U	25 000	Large Besar	60	Low Rendah

Table 6.4

Explain the suitability of each aspect in the table and identify the most suitable wave to be use to measure sea depth.
 Justify your answer.

Terangkan kesesuaian setiap ciri-ciri dalam jadual di atas dan seterusnya tentukan gelombang yang paling sesuai untuk digunakan bagi menentukan kedalaman laut. Berikan sebab bagi pilihan anda.

[10 marks]

Characteristics	Explanation
-----------------	-------------

I choose
 Because

Question 7.1

Table 7.1 shows the specifications for four wires of the same diameter that can be used as a heating element of an electric kettle.

Jadual 7.1 menunjukkan ciri-ciri empat dawai yang sama diameter untuk digunakan sebagai elemen pemanas dalam cerek elektrik.

Type Jenis	Density Ketumpatan / (kg m ⁻³)	Melting point Takat lebur / (°C)	Oxidation rate Kadar pengaratan	Resistance Rintangan / (Ω / m)
P	6500	7500	High tinggi	8.0 x 10 ⁻⁷
Q	7000	8050	High tinggi	7.0 x 10 ⁻⁷
R	5000	8500	Low Rendah	5.0 x 10 ⁻⁷
S	2500	9000	Low rendah	8.0 x 10 ⁻⁷

Table 7.1

You are required to determine the most suitable wire and explain the suitability of the aspects in Table 7.1

Anda dikehendaki menentukan dawai yang paling sesuai dan jelaskan kesesuaian aspek-aspek dalam Jadual 7.1.

[10 marks]

Characteristics	Explanation
-----------------	-------------

I choose
 Because

Question 7.2

Table 7.2 shows the specifications of five fuses that can be used to protect a semiconductor device. *Jadual 7.2 menunjukkan spesifikasi lima fius yang boleh digunakan untuk melindungi suatu peranti semikonduktor.*

Fuse <i>Fius</i>	Thickness of fuse wire <i>Ketebalan dawai fius</i>	Catridge Type <i>Jenis katrij</i>	Rating <i>Kadar</i>	Melting Point <i>Takat Lebur</i>
P	Medium <i>Sederhana</i>	Rubber <i>Getah</i>	10 A	Medium <i>Sederhana</i>
Q	Thin <i>Halus</i>	Glass <i>Kaca</i>	10 A	Low <i>Rendah</i>
R	Thin <i>Halus</i>	Ceramic <i>Seramik</i>	13 A	Low <i>Rendah</i>
S	Thin <i>Halus</i>	Plastic <i>Plastik</i>	10 A	High <i>Tinggi</i>
T	Thick <i>Tebal</i>	Ceramic <i>Seramik</i>	13 A	Low <i>Rendah</i>

Table 7.2

Determine the most suitable fuse to protect a 240 V, 2400 W semiconductor device. Study the specifications of all five fuses based on the following aspects. *Tentukan fius yang paling sesuai digunakan untuk melindungi suatu peranti semikonduktor 240 V, 2400 W.*

Kaji spesifikasi bagi kesemua lima fius tersebut berdasarkan aspek-aspek yang berikut.

- The thickness of wire. The catridge type.
Ketebalan wayar. Jenis katrij.

- The rating of the fuse. The melting point.
Perkadaran fius Takat lebur
 Explain the suitability of the aspects and justify your choice.
Jelaskan kesesuaian aspek-aspek itu dan beri sebab bagi pilihan anda.

[10 marks]

Characteristics	Explanation

I choose
 Because

Question 7.3

The cables available of the immersion heater are two-core flex and became broken and frayed. Most part of the immersion heater was metal fitting. You are assigned to fit the cables or replace it to ensure the immersion heater safe to be used.

Kabel yang ada untuk pemanas rendam ialah jenis dua-teras mudah lentur telah rosak dan pecah. Sebahagian besar bahagian pemanas rendam dibuat daripada logam. Anda ditugaskan untuk membaiki kabel atau menggantikannya supaya pemanas rendam tersebut selamat digunakan.

Table 7.3 shows the characteristics of wiring a mains plug. *Jadual 7.3 menunjukkan ciri-ciri pendawaian palam utama.*

Wiring <i>Pendawaian</i>	Characteristics of wiring <i>Ciri-ciri pendawaian</i>			
	Flex cable	Cable rating	Fitting fuse	Main plug

	<i>Kabel mudah lentur</i>	<i>Perkadaran kabel</i>	<i>Pemasangan fius</i>	<i>Palam utama</i>
P	Twin-core dua-teras	13 A	13 A to live wire ke dawai hidup	Two pin Dua pin
Q	Three-core tiga-teras	3A	3 A to neutral wire ke dawai neutral	Three pin Tiga pin
R	Three-core tiga-teras	1 A	1 A to earth wire ke dawai bumi	Three pin Tiga pin
S	Three-core tiga-teras	13 A	13 A to live wire ke dawai hidup	Three pin Tiga pin
T	Twin-core dua-teras	3 A	3 A to live wire ke dawai hidup	Two pin Dua pin

Table 7.3

Explain the suitability of the characteristics of the wiring to be used to fit or replaced the cables of the immersion heater.

Terangkan kesesuaian setiap ciri pendawaian yang digunakan untuk membaiki atau menggantikan kabel pemanas rendam.

Determine the most suitable wiring to be used and give reasons for your choice.

Tentukan pendawaian yang paling sesuai untuk digunakan dan beri penjelasan bagi pilihan anda.

[10 marks]

Characteristics	Explanation

I choose
 Because

Question 7.4

Diagram 7.4 shows a fuse which cuts off the circuit when there is too much current flows through an electrical appliance or a 3-pin plug. Inside the fuse, there is a thin wire. When a current exceeded certain value overflows into an electrical appliance or a 3-pin plug, the wire in the fuse will melt and cut off the current. This prevents the electrical appliances from being spoiled by the excess current.

Rajah 7.4 menunjukkan fius yang digunakan untuk memutuskan litar apabila arus yang terlalu besar mengalir ke dalam alat elektrik atau palam 3-pin. Dalam fius, terdapat seutas dawai halus. Apabila arus yang melebihi nilai tertentu melaluinya, dawai halus tersebut akan lebur dan memutuskan bekalan. Ini melindungi alat elektrik daripada menjadi rosak.



A piece of thin wire in a fuse
Seutas dawai halus dalam fius

Diagram 7.4
Rajah 7.4

Table 7.4 shows the features of a few types of wire K, L, M, and N that can be used to make the thin wire in a fuse.

Jadual 7.4 menunjukkan spesifikasi empat jenis dawai K, L, M, dan N, yang boleh digunakan untuk menjadikan dawai halus dalam fius.

Type of metal <i>Jenis logam</i>	Resistance <i>Rintangan</i>	Melting Point <i>Takat Lebur</i>	Rate of oxidation <i>Kadar Pengoksidaan</i>	Maximum value of the current to flow through <i>Nilai arus maksima yang dapat melaluinya</i>
K	High <i>Tinggi</i>	High <i>Tinggi</i>	High <i>Tinggi</i>	3 A
L	Low <i>Rendah</i>	Low <i>Rendah</i>	High <i>Tinggi</i>	3 A
M	High <i>Tinggi</i>	High <i>Tinggi</i>	Low <i>Rendah</i>	5 A
N	Low <i>Rendah</i>	Low <i>Rendah</i>	Low <i>Rendah</i>	5 A

Table 7.4

You are required to determine the most suitable type of wire to be used as the wire in a built-in fuse labeled 6 V, 27 W. Study the specifications of all the four types of wire based on the following aspects:

Anda diminta untuk mengenal pasti jenis dawai yang paling sesuai digunakan untuk dijadikan dawai halus dalam fius berlabel 6 V,27 W. Kaji spesifikasi keempat-empat jenis logam itu berdasarkan aspek yang berikut:

- resistance of the wire
Rintangan dawai
- melting point of the wire
Takat lebur dawai
- rate of oxidation of the wire
kadar pengoksidaan dawai
- maximum value of current to flow through the wire before the heat produced causes the wire to melt.
Nilai maksima bagi arus yang boleh mengalir melalui dawai sebelum haba yang dihasilkan menyebabkan dawai melebur

[10 marks]

Characteristics	Explanation

I choose
 Because

Question 7.5

Diagram 7.5 shows a fuse used in electrical devices to prevent damage when excess current flows through it.
Rajah 7.5 menunjukkan satu fius yang digunakan dalam alat-alat elektrik untuk mengelakkan kerosakan bila terdapat arus yang berlebihan mengalir ke dalam alat tersebut .

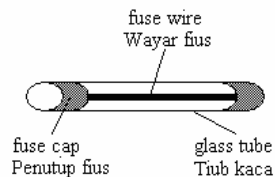


Diagram 7.5

Table 7.5 shows characteristics of metal used as fuse wire.
Jadual 7.5 menunjukkan ciri-ciri logam yang digunakan sebagai dawai fius.

Metal Logam	Resistant Rintangan / Ω	Melting point Takat lebur / $^{\circ}\text{C}$	Specific heat capacity Muatan haba tentu / $\text{Jkg}^{-1} \text{ }^{\circ}\text{C}^{-1}$	Diameter Diameter
P	0.03	700	900	Big Besar
Q	0.97	1200	500	Small Kecil
R	0.22	327	128	Small Kecil
S	0.18	1083	387	Big Besar

Table 7.5

You are assign to study the metal's characteristics in Table 7.5 to be used as fuse wire as in Diagram 7.5.
Anda ditugaskan untuk mengkaji ciri-ciri logam dalam Jadual 7.6 untuk digunakan sebagai dawai fius seperti Rajah 7.5.

Explain the suitability of each metal's characteristic in Diagram 7.5 and determine the most suitable metal to be used as fuse wire.
 Give reason for your choice.
Terangkan kesesuaian setiap ciri-ciri logam dalam Jadual 7.5 dan seterusnya tentukan logam yang paling sesuai digunakan sebagai dawai fius. Berikan sebab untuk pilihan anda.

[10 marks]

Characteristics	Explanation

I choose
 Because

Question 7.6

Table 7.6 shows the characteristics of four types of cables that have the same length.
Jadual dibawah menunjukkan ciri-ciri bagi empat jenis kabel yang mempunyai panjang yang sama.

Cable	Diameter/ cm	Density/ kgm ⁻³	Rate of expansion	Melting point
P	2	4.50 x 10 ³	Medium	High
Q	4	3.00 x 10 ³	Low	High
R	3	5.45 x 10 ³	High	Low
S	1	2.50 x 10 ³	Low	Medium

Table 7.6

You are to choose one of the cables to be used in the National Grid Network. Explain the suitability of each of the characteristics of the cables. Choose the most suitable cable and justify your choice. *Anda diminta memilih satu dari kabel untuk digunakan dalam Rangkaian Grid Nasional. Terangkan kesesuaian setiap ciri-ciri kabel tersebut. Pilih kabel yang paling sesuai dan jelaskan pilihan anda.* [10 marks]

Characteristics	Explanation

I choose
 Because

Question 8.1

Diagram 8.1 shows an electric bell.
 Rajah 8.1 menunjukkan sebuah loceng elektrik.

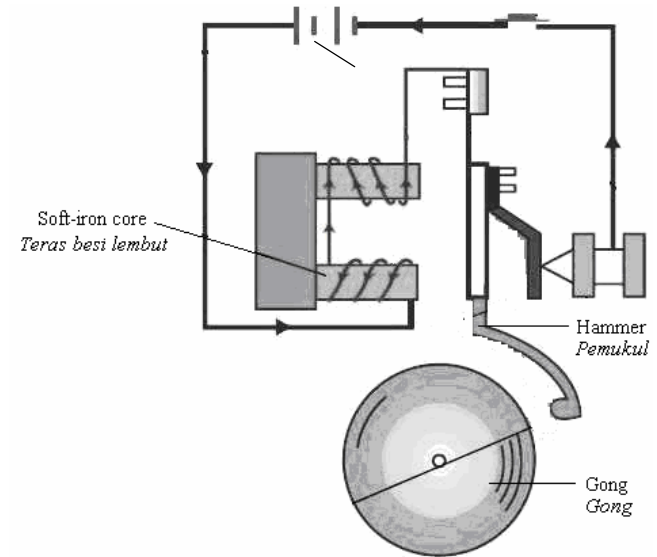


Diagram 8.1
 Rajah 8.1

The electric bell in Diagram 8.1 is able to produce a louder sound .
 Table 8.1 shows the characteristics of electric bells P,Q,R,S and T which could be used.
 Rajah 8.1 menunjukkan sebuah loceng elektrik yang mengeluarkan bunyi.
 Jadual 8.1 menunjukkan ciri-ciri loceng elektrik P,Q,R,S dan T yang boleh digunakan.

Electric Bell Loceng elektrik	Size of the hammer Saiz pemukul	Distance between the hammer and the gong/cm Jarak antara pemukul dan gong/cm	The number of turns of the coil around soft iron core Bilangan lilitan gegelung di sekeliling teras besi lembut	Curvature of the gong Kelengkungan gong
P	Big Besar	2.0	50	High Tinggi
Q	Big Besar	5.0	100	High Tinggi
R	Big Besar	5.0	100	Low Rendah
S	Small Kecil	5.0	50	Low Rendah
T	Small Kecil	2.0	100	Low Rendah

Table 8.1
 Jadual 8.1

You are asked to study the electric bells P,Q,R,S and T.
 Anda dikehendakki mengkaji loceng elektrik P,Q,R,S dan T.

Explain the suitability of each characteristic of the electric bell in Table 8.1 and hence, determine which electric bell is able to produce the loudest sound.
 Terangkan kesesuaian setiap ciri loceng elektrik dalam Jadual 8.1 dan seterusnya tentukan loceng elektrik yang manakah mengeluarkan bunyi yang paling kuat.

[10 Marks]

Characteristic Ciri	Reason Sebab

I choose
 Because

Question 8.2

The transmission of electricity over the National Grid Network uses high voltage cables. You are assigned to study the characteristics of cables which could be used as transmission cable. Table 8.2 shows the characteristics of four transmission cables.

Penghantaran tenaga elektrik melalui Rangkaian Grid Nasional menggunakan kabel yang mempunyai voltan yang tinggi. Anda diminta untuk mengkaji ciri-ciri kabel yang sesuai digunakan sebagai kabel penghantaran.. Jadual 8.2 menunjukkan ciri-ciri bagi 4 jenis kabel penghantaran.

Cable	Resistivity /Ωm ⁻¹	Density / kg m ⁻³	Cost	Rate of thermal expansion
P	3.0 x 10 ⁻⁷	5 x 10 ⁵	Low	High
Q	1.8 x 10 ⁻⁸	2 x 10 ³	Medium	Low
R	7.5 x 10 ⁻⁷	8 x 10 ²	High	Medium
S	7.0 x 10 ⁻⁸	4 x 10 ³	Medium	High

Jadual 8.2

Based on the table 8.2;

Berdasarkan Jadual 8.2;

- (i) Explain the suitability of the characteristics of the cables to be used as transmission cable.
 Jelaskan ciri-ciri kabel yang sesuai dijadikan kabel penghantaran.
- (ii) Determine the most suitable transmission cable to be used and give reasons for your choice.
 Tentukan kabel yang paling sesuai digunakan sebagai kabel penghantaran dan beri sebab atas pilihan anda.

[10 marks]

Characteristic	Reason

I choose
 Because

Question 8.3

Diagram 8.3 shows the features in the design of four direct current motors, P, Q, R and S. You are required to determine the most suitable motor to lift a heavy object smoothly. Study the features of all the four motors:

Rajah 8.3 menunjukkan ciri-ciri dalam rekabentuk empat buah motor arus terus, P, Q, R dan S. Anda dikehendaki menentukan motor yang paling sesuai digunakan untuk mengangkat suatu objek berat dengan lancar.

Kaji ciri-ciri keempat-empat motor itu:

- The density of the wires of the coil
 Ketumpatan bagi wayar dalam gegelung
- The number of turns of the coil
 Bilangan lilitan gegelung
- The strength of the magnet
 Kekuatan magnet
- The number of segments in the commutator
 Bilangan segmen dalam komutator

Explain the suitability of the features.
 Justify your choice.

Terangkan kesesuaian ciri-ciri itu.
 Beri sebab bagi pilihan anda.

[10 marks]

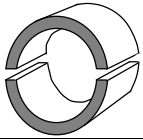
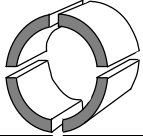
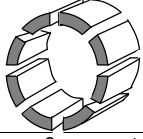
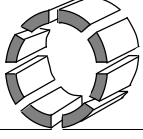
Model Model	Density of the coil / kg m ⁻³ Ketumpatan gegelung / kg m ⁻³	Number of turns of the coil Bilangan lilitan gegelung	Strength of magnet Kekuatan magnet	Number of segments in the commutator Bilangan segmen dalam komutator
P	9200	4000	Low Rendah	2 segments 2 segmen 
Q	11600	9000	High Tinggi	4 segments 4 segmen 
R	8960	8000	High Tinggi	8 segments 8 segmen 
S	10500	5000	Medium Sederhana	8 segments 8 segmen 

Diagram 8.3.
Rajah 8.3

Characteristic	Reason

I choose
Because

Question 9.1

Diagram 9.1 shows circuits J, K, L, M and N each containing an ideal transformer. Diodes in the circuits are used for the purpose of rectification.
Rajah 9.1 menunjukkan litar J,K,L,M dan N dengan setiap litar itu mengandungi sebuah transformer unggul.

Diod-diod dalam litar-litar itu digunakan untuk kegunaan rektifikasi.

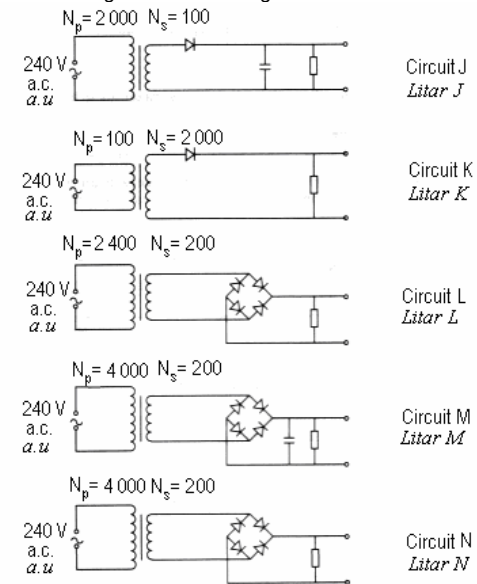


Diagram 9.1
Rajah 9.1

Key :
Kunci:

- N_p = Number of turns in primary coil
= *Bilangan lilitan gegelung primer*
- N_s = Number of turns in secondary coil
= *Bilangan lilitan gegelung sekunder*

You are asked to make a 12 V battery charger . Study the circuits, J, K ,L, M and N in Diagram 9.1 and consider the following aspects:
Anda dikehendakki membina sebuah alat pengecas elektrik 12V. Kaji litar-litar J, K, dan N dalam Rajah 9.1 berdasarkan aspek-aspek berikut:

- type of transformer
- *jenis transformer*
- ratio of the number of turns in primary coil to secondary coil
- *nisbah lilitan gegelung primer kepada gegelung sekunder*
- number of diodes use
- *bilangan diod yang digunakan*
- characteristic of output current
- *ciri-ciri arus output*

Explain the suitability aspects and justify your choice.
Terangkan kesesuaian aspek dan buat justifikasi terhadap pilihan anda.

[10 Marks]

Characteristic	Reason

I choose
Because

Question 10.1

The water supply to your school is from a large storage tank situated in the school compound. There is a sudden drop in the water pressure at the taps in your school. You suspect that this could be due to a big leak in the underground water pipes. Table 10.1 gives the list of materials and equipment that could be used to locate the leak.

Sumber air ke sekolah anda adalah dibekalkan daripada sebuah tangki air besar yang terletak dalam kawasan sekolah. Terdapat kekurangan tekanan air yang keluar daripada pili di sekolah anda. Anda mengagak terdapat kebocoran yang agak besar di pili bawah tanah. Jadual 10.1. memberikan senarai bahan dan kelengkapan yang boleh digunakan untuk mengesan kebocoran tersebut.

Radioactive source <i>Sumber Radioaktif</i>	Radiation emitted <i>Sinaran Yang Dipancarkan</i>	Half-life <i>Separuh hayat</i>
P	α	16 hours <i>16 jam</i>
Q	β	20 days <i>20 hari</i>
R	β	15 hours <i>15 jam</i>
S	γ	40 minutes <i>40 minit</i>

Detector <i>Pengesan</i>	Counter <i>Pembilang</i>
Spark counter <i>Pembilang bunga api</i>	Scaler <i>Meter skalar</i>
Cloud chamber <i>Kebuk awan</i>	Ratemeter <i>Meter kadar</i>
Geiger-Muller tube <i>Tiub Geiger-Muller</i>	
Radiation badge <i>Lencana sinaran</i>	

Table 10.1
Jadual 10.1

Explain the suitability of the radioactive source, the detector and the counter to be used to locate the leak and to detect the radiation emitted and justify your choice.
Terangkan kesesuaian cirri-ciri sumber radioaktif, pengesan dan pembilang yang boleh digunakan untuk mengesan kebocoran and sinaran yang dipancarkan dan beri sebab bagi pilihan anda.

[10 Marks]

Characteristic	Reason

I choose
Because

Question 10.2

Table 10.2 shows the characteristics of the five radioisotopes, P, Q, R, and T, that can be used to detect the brain tumour.

Jadual 10.2 menunjukkan ciri-ciri lima radioisotop, P, Q, R, S dan T, yang boleh digunakan untuk mengesan ketumbuhan didalam otak.

Radioisotope <i>Radioisotop</i>	Half-life <i>Separuh-hayat</i>	Ionising power <i>Kuasa pengionan</i>	Radioactive radiation <i>Sinaran radioaktif</i>
P	5.0 minutes <i>5.0 minit</i>	Low <i>Rendah</i>	Gamma
Q	8 days <i>8 hari</i>	High <i>Tinggi</i>	Alpha
R	6 hours <i>6 jam</i>	Low <i>Rendah</i>	Gamma
S	5.27 years <i>5.27 tahun</i>	Moderate <i>Sederhana</i>	Beta
T	7 hours <i>7 jam</i>	High <i>Tinggi</i>	Alpha

Table 10.2
Jadual 10.2

As a medical officer, you are required to determine the most suitable radioisotope that could be used to inject into the blood of a patient to detect the location of a brain tumour. Study the characteristics of all five radioisotopes based on the following aspects:

Sebagai seorang pegawai perubatan, anda diminta untuk mengenal pasti radioisotop yang paling sesuai untuk disuntik ke dalam darah pesakit bagi mengesan kedudukan ketumbuhan di otak. Kaji ciri kelima-lima radioisotop itu berdasarkan aspek yang berikut:

- The Half-life
Separuh hayat
- The ionising power
Separuh hayat
- The radioactive radiation
Sinaran radioaktif

Explain the suitability of the aspects.
Justify your choice.

Terangkan kesesuaian aspek-aspek itu
Beri sebab bagi pilihan anda.

[10 Marks]

Characteristic	Reason

I choose
Because
.....

Question 10.3

The population of pests can be controlled using radiation from radioactive source. You are assigned to study the characteristics of some radioisotopes that are suitable for use in controlling the population of pests.

Table 10.3 shows the characteristics of four radioisotopes.

Populasi serangga dapat dikawal dengan menggunakan sinaran radioaktif dari satu sumber radioaktif.

Anda ditugaskan untuk mengkaji ciri-ciri bagi beberapa radioisotope yang sesuai untuk digunakan dalam mengawal populasi serangga.

Jadual 10.3 menunjukkan ciri-ciri bagi empat radioisotop.

Radioisotope <i>Radioisotope</i>	Characteristics of radioisotope <i>Ciri-ciri radioisotop</i>		
	State of matter <i>Keadaan jirim</i>	Types of ray <i>Jenis sinar</i>	Half-life <i>Separuh hayat</i>
Iodine-131 <i>Iodin-131</i>	Liquid <i>Cecair</i>	Gamma <i>Gama</i>	8 days <i>8 hari</i>
Xenon-133 <i>Xenon-133</i>	Solid <i>pepejal</i>	Beta <i>Beta</i>	5 days <i>5 hari</i>
Cobalt-60 <i>Kobalt-60</i>	Solid <i>Pepejal</i>	Gamma <i>Gama</i>	5 years <i>5 tahun</i>
Strontium-90 <i>Strontium-90</i>	liquid <i>cecair</i>	Beta <i>Beta</i>	8 years <i>8 tahun</i>

Table 10.3
Jadual 10.3

Explain the suitability of the characteristics of the radioisotope to be used in the controlling the population of pests based on the following aspects:

Terangkan kesesuaian ciri-ciri radioisotope untuk digunakan dalam mengawal populasi serangga berdasarkan aspek-aspek berikut:

- State of matter
Keadaan jirim
- Types of ray
Jenis sinar
- Half-life
Separuh hayat

Determine the most suitable radioisotope to be used and give the reason for your choice.
Tentukan radioisotope yang paling sesuai digunakan dan beri sebab bagi pilihan anda.

[8 Marks]

Characteristic	Reason

I choose
Because
.....

SCIENTIFIC INVESTIGATION

1	Hypothesis	6	Arrangement of apparatus
2	Inference	7	Procedure
3	Aim	8	Table
4	Variables	8	Graph
5	List of apparatus		

Example 1

Situation 1

Diagram 1 shows a man is in a leaking sampan. He noticed that the spurt coming from the hole at the bottom of the sampan is higher compared to the one from the side.

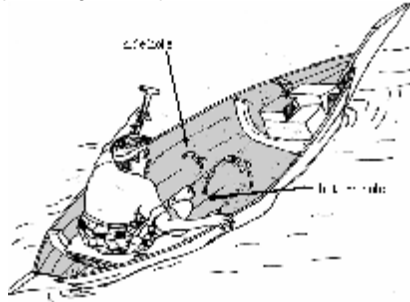


Diagram 1

Situation 2

Diagram 2.1 and Diagram 2.2 shows two positions of a diver in the sea.



Diagram 2.1



Diagram 2.2

Observe the positions of the diver and the pain in his ear.

Answer

Inference :

The pressure in the water depends on the depth of the water

Hypothesis:

As the depth of water increases , the pressure in the water inceases.

Aim of the experiment :

To investigate the relationship between the pressure in the water and the depth of water

Variables in the experiment:

Manipulated variable: depth of water

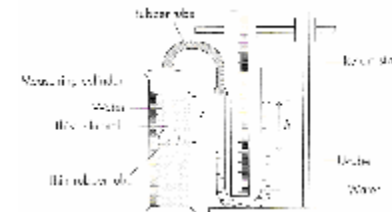
Responding variable: the pressure in the water.

Fixed variable: density of the water

List of apparatus and materials:

Measuring cylinder, thistle funnel, rubber tube, manometer, and retort stand.

Arrangement of the apparatus:



The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable.

The measuring cylinder is completely filled with water.

The thistle funnel is connected to the manometer with a rubber tube.

The thistle funnel is lowered with the water to a depth $h = 10.0\text{m}$

The manometer reading, p is measured.

The experiment is repeated 5 times with values of depth $y = 20.0\text{m}, 30.0\text{ cm}, 40.0 ,50.0\text{ cm}$ and 560.0 cm .

Tabulate the data:

h						
p						

Analysis the data:

Plot the graph p against h



Question 1.1

A student carries out an experiment to investigate the relationship between the resistance, R , of a wire and the length, L , of the wire.

Diagram 1.1.1 shows the circuit used in the experiment.

Seorang pelajar menjalankan satu eksperimen untuk mengkaji hubungan rintangan, R , bagi seutas dawai dengan panjang, L , bagi dawai itu.

Rajah 1.1.1 menunjukkan litar yang digunakan dalam eksperimen itu.

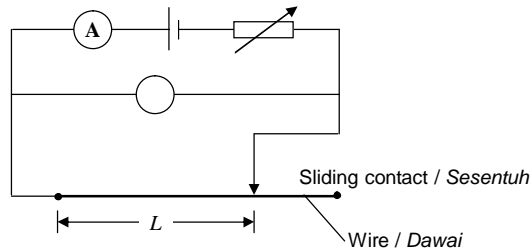


Diagram 1.1.1
Rajah 1.1.1

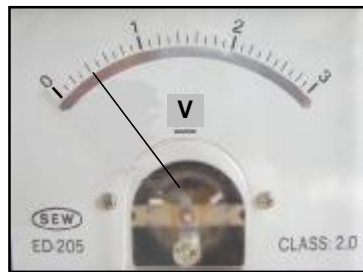
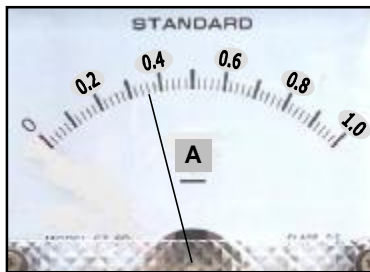
The position of the sliding contact is adjusted until the length of the wire in the circuit is, $L = 20.0$ cm. The rheostat is adjusted to obtain a suitable current. The current, I and the potential difference, V across the wire are measured by an ammeter and voltmeter respectively.

Diagram 1.1.2 shows the readings of the ammeter and voltmeter.

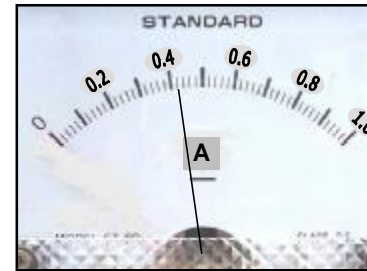
The procedure is repeated for lengths of the wire, $L = 30.0$ cm, 40.0 cm, 50.0 cm and 60.0 cm. The corresponding readings of the ammeter and voltmeter are shown in Diagrams 1.1.3, 1.1.4, 1.1.5 and 1.1.6.

Kedudukan bagi sesentuh gelongsor dilaraskan sehingga panjang dawai dalam litar ialah $L = 20.0$ cm. Reostat dilaraskan untuk memperoleh satu nilai arus yang sesuai. Arus, I dan beza keupayaan, V merentasi dawai itu masing-masing diukur oleh ammeter dan voltmeter. Rajah 1.1.2 menunjukkan bacaan ammeter dan voltmeter.

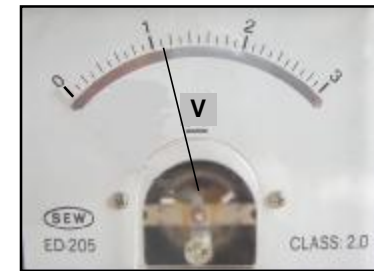
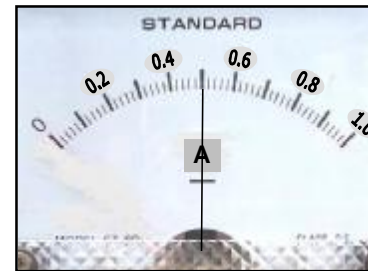
Prosedur itu diulang bagi panjang dawai, $L = 30.0$ cm, 40.0 cm, 50.0 cm dan 60.0 cm. Bacaan-bacaan sepadan bagi ammeter dan voltmeter ditunjukkan dalam Rajah 1.1.3, 1.1.4, 1.1.5 dan 1.1.6.



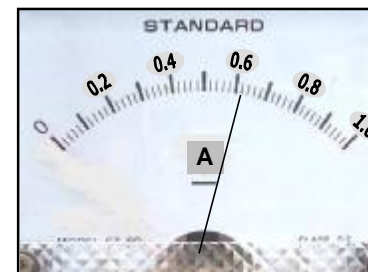
$L = 20.0$ cm
Diagram 1.1.2



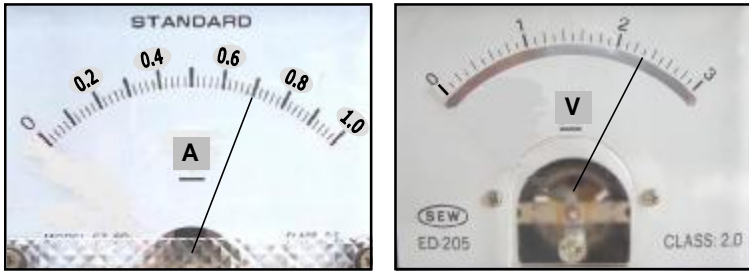
$L = 30.0$ cm
Diagram 1.1.3



$L = 40.0$ cm
Diagram 1.1.4



$L = 50.0$ cm
Diagram 1.1.5



$L = 60.0 \text{ cm}$
Diagram 1.1.6

(a) For the experiment described above, identify:
Bagi eksperimen yang diterangkan di atas kenal pasti:

(i) the manipulated variable,
pembolehubah dimanipulasikan,

.....

[1 mark]

(ii) the responding variable,
pembolehubah bergerak balas,

.....

[1 mark]

(iii) a fixed variable.
satu pembolehubah dimalarkan.

.....

[1 mark]

(b) What is the use of the strip of mirror next to the scale of the voltmeter?
Apakah kegunaan jalur cermin di sebelah skala voltmeter itu?

.....

[1 mark]

(c) Based on Diagrams 1.1.2, 1.1.3, 1.1.4, 1.1.5 and 1.1.6, determine the current, I and potential difference, V for the corresponding lengths of wire, L . For each value of L , calculate the resistance, R of the wire.

The resistance, R , is calculated using the formula, $R = \frac{V}{I}$

Tabulate your results for L , I , V and R in the space below.

Berdasarkan Rajah 1.1.2, 1.1.3, 1.1.4, 1.1.5 dan 1.1.6, tentukan arus, I , beza keupayaan, V , yang sepadan dengan panjang dawai, L .

Rintangan, R , dihitung dengan menggunakan rumus, $R = \frac{V}{I}$
Jadualkan keputusan anda bagi L , I , V dan R pada ruang di bawah.

(d) On the graph paper, plot a graph of R against L .
Pada kertas graf, lukiskan graf R melawan L .

[5 marks]

[5 marks]

(e) Based on your graph, state the relationship between R and L .
Berdasarkan graf anda, nyatakan hubungan antara R dan L .

.....

[1 mark]

(f) State one precaution that should be taken to obtain accurate readings of V .
Nyatakan satu langkah berjaga-jaga yang perlu diambil untuk mendapatkan bacaan V yang lebih jitu.

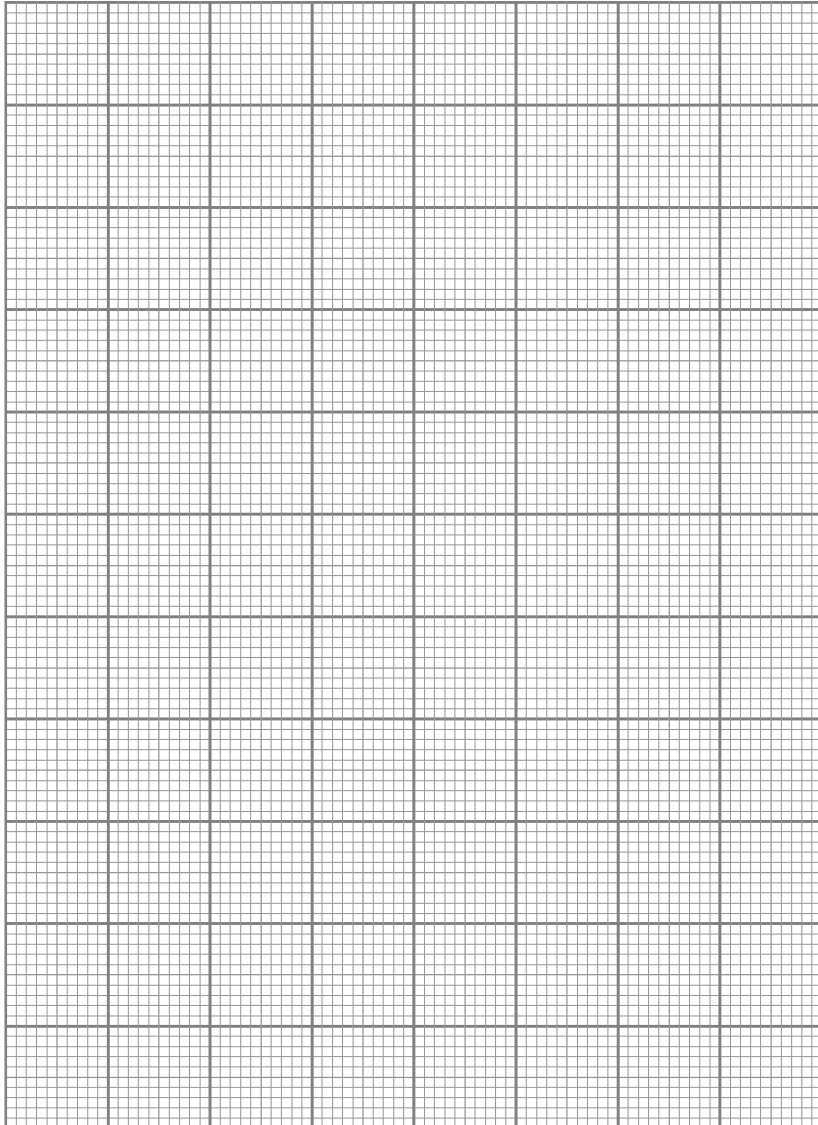
.....

.....

[1 mark]

Graph of R against L

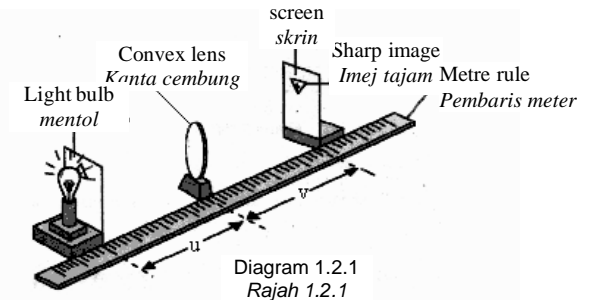
Graf R melawan L



Question 1.2

A student carries out an experiment to investigate the relationship between the object distance, u and the image distance, v , of a convex lens with focal length, f . The apparatus is set up as shown in Diagram 1.2.1

Seorang pelajar menjalankan satu eksperimen untuk mengkaji hubungan antara jarak objek, u dan jarak imej, v bagi kanta cembung yang mempunyai panjang fokus, f . Radas disediakan seperti Rajah 1.2.1.



The object distance is fixed at $u = 34$ cm, 30 cm, 26 cm, 20 cm and 16 cm. The convex lens is placed at the "zero" mark on the scale of the metre rule when the image distance, v , is measured.

Jarak objek ditetapkan pada $u = 34$ cm, 30 cm, 26 cm, 20 cm dan 16 cm. Kanta cembung diletakkan pada kedudukan "sifar" di pembaris meter apabila jarak imej, v , diukur.

(a) For the experiment described above, identify:

Daripada penerangan eksperimen di atas, kenalpasti:

(i) The manipulated variable
Pembolehubah manipulasi

.....

[1 mark]

(ii) The responding variable
Pembolehubah bergerakbalas

.....

[1 mark]

(iii) The constant variable
Pembolehubah dimalarkan

.....

[1 mark]

Diagram 1.2.2, 1.2.3, 1.2.4, 1.2.5 and 1.2.6 showed the end part of metre rule when the image distance, v , is measured.

Rajah 1.2.2, 1.2.3, 1.2.4, 1.2.5 dan 1.2.6 menunjukkan bahagian akhir pembaris meter semasa jarak imej, v , diukur.

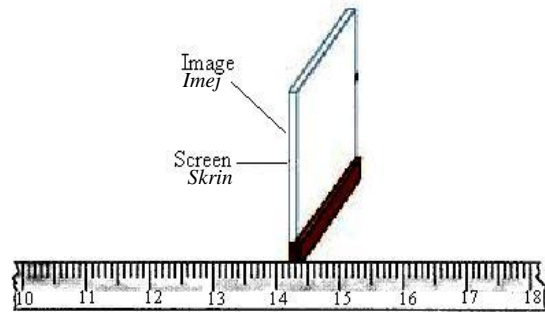


Diagram 1.2.2: Object distance, $u = 34$ cm
Rajah 1.2.2: Jarak objek, $u = 34$ cm

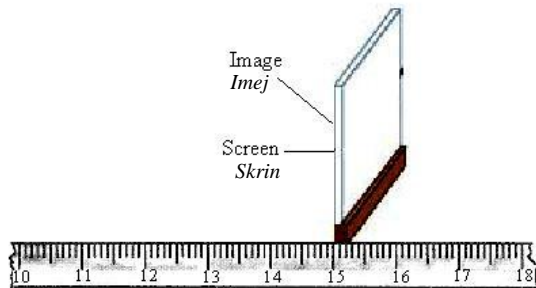


Diagram 1.2.3: Object distance, $u = 30$ cm
Rajah 1.2.3: Jarak objek, $u = 30$ cm

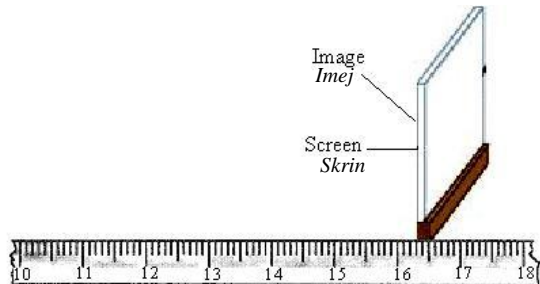


Diagram 1.2.4: Object distance, $u = 26$ cm
Rajah 1.2.4: Jarak objek, $u = 26$ cm

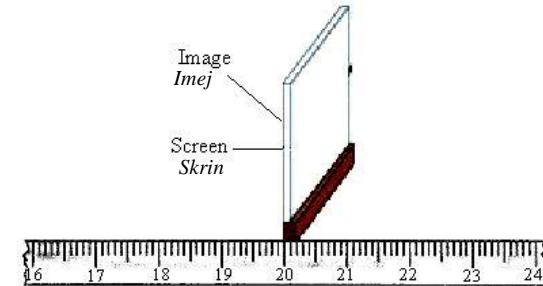


Diagram 1.2.5: Object distance, $u = 20$ cm
Rajah 1.2.5: Jarak objek, $u = 20$ cm

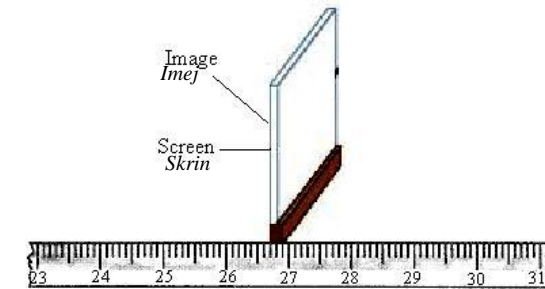


Diagram 1.2.6: Object distance, $u = 16$ cm
Rajah 1.2.6: Jarak objek, $u = 16$ cm

- (b) Based on diagram 1.2.2, 1.2.3, 1.2.4, 1.2.5 and 1.2.6, determine the magnitude of $\frac{1}{u}$ and $\frac{1}{v}$, when u is equal to 34 cm, 30 cm, 26 cm, 20 cm and 16 cm.

Berdasarkan Rajah 1.2.2, 1.2.3, 1.2.4, 1.2.5 dan 1.2.6 tentukan nilai $\frac{1}{u}$ dan $\frac{1}{v}$, apabila u ialah 34 cm, 30 cm, 26 cm, 20 cm dan 16 cm.

Tabulate the values of u , v , $\frac{1}{u}$ and $\frac{1}{v}$ in the space below.

Jadualkan nilai-nilai bagi u , v , $\frac{1}{u}$ dan $\frac{1}{v}$ pada ruangan di bawah.

[6 marks]

(c) On the graph paper, plot a graph of $\frac{1}{v}$ against $\frac{1}{u}$.

Di atas kertas graf plotkan graf $\frac{1}{v}$ melawan $\frac{1}{u}$.

[5 marks]

(d) Based on your graph, state the relationship between $\frac{1}{v}$ and $\frac{1}{u}$.

Berdasarkan graf anda, nyatakan perhubungan di antara $\frac{1}{v}$ dan $\frac{1}{u}$.

[1 mark]

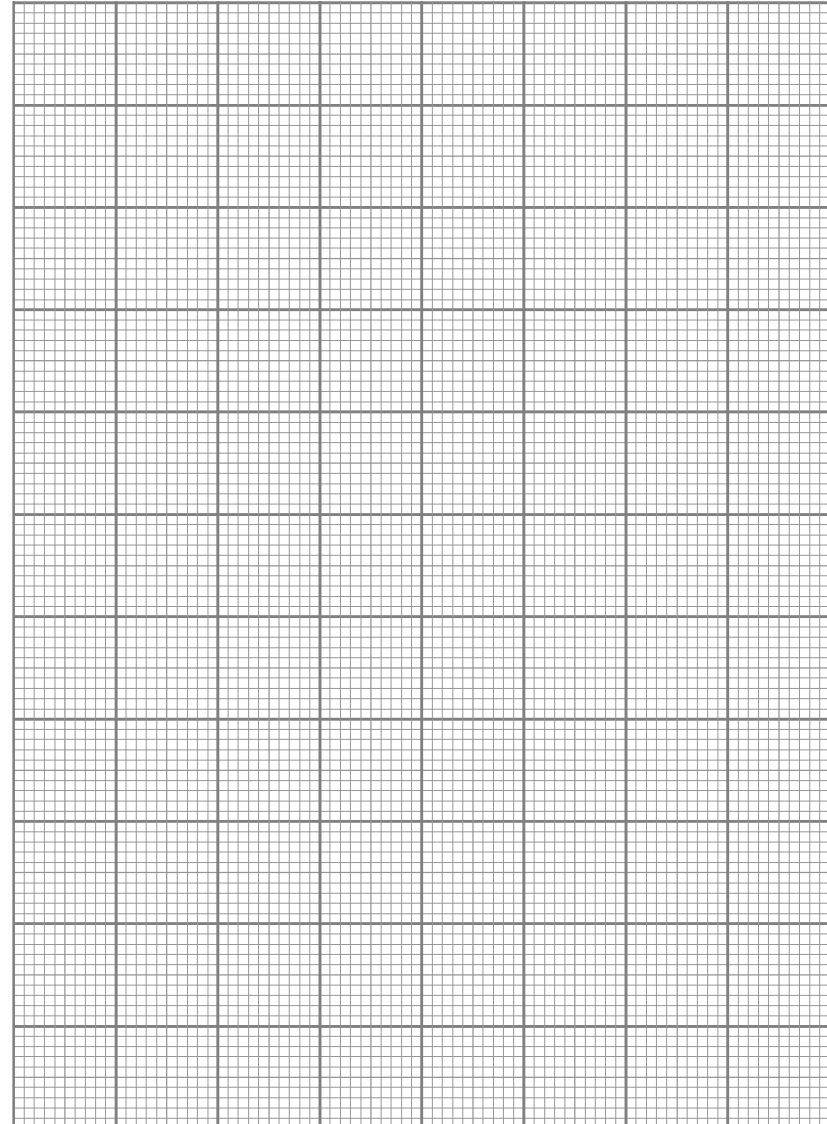
(e) State **one** precaution that should be taken to obtain the accurate result.

Nyatakan **satu** langkah berjaga-jaga yang perlu diambil untuk mendapat keputusan yang lebih jitu.

[1 mark]

Graph of $\frac{1}{v}$ against $\frac{1}{u}$

Graf $\frac{1}{v}$ lawan $\frac{1}{u}$



Question 2.1

Graph on Diagram 2.1 shows an experiment results to identify the relationship between force, F and acceleration, a , for an object which moves on a rough surface runaway.

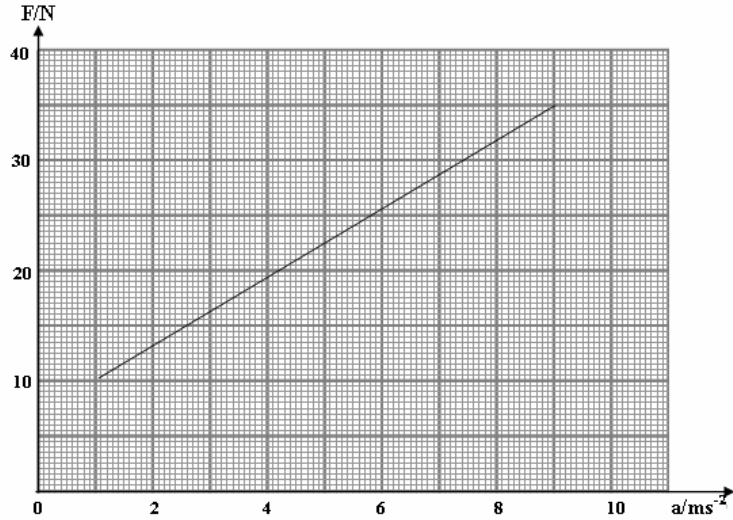


Diagram 2.1

- (a) On the graph, Show and determine the value of F when $a = 0.0 \text{ ms}^{-2}$.
 [2 marks]
- (b) What will happen to, a , when F increases?
 [1 mark]
- (c) Using the graph in Diagram 2.1:
- (i) Calculate the gradient of the graph, F against a . Show on the graph how you determined the gradient
 [3 marks]
- (ii) Determine the value of a when $F = 14.0 \text{ N}$. Show on the graph how you determine the value.
 $a =$ [2 marks]

(iii) Write the relationship between F and a

..... [1 mark]

(d) Name the physical quantity that represents the value of the gradient in (c) (i).

..... [1 mark]

(e) State **one** precaution that should be taken for this experiment.

..... [1 mark]

Question 2.2

A student carries out an experiment to investigate the relationship between pressure, P and depth, h of a liquid X at sea level.

Diagram 2.2 shows the graph P against h .

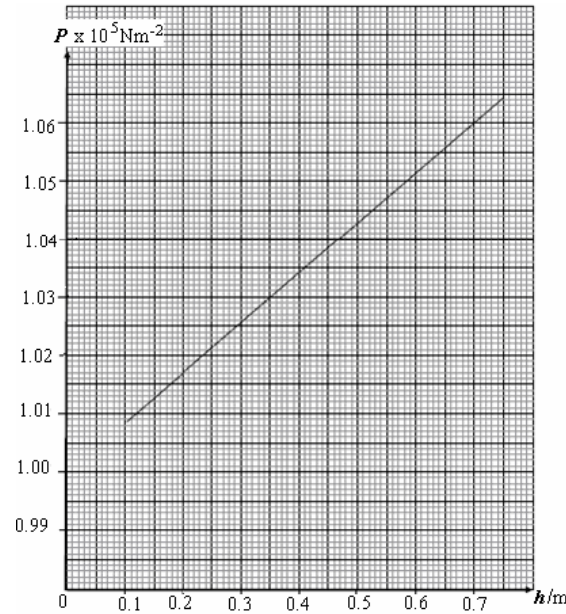
The pressure P is determined using the formula :

$$P = P_{\text{liquid}} + P_{\text{atm}}$$

where

P_{liquid} = pressure by column of liquid X

P_{atm} = atmospheric pressure



- (a) Based on the graph on page 11, determine the atmospheric pressure, P_{atm} when $h = 0$ m. Show on the graph, how you determine the value of the atmospheric pressure.

$P_{atm} = \dots\dots\dots$ [2 marks]

- (b) The density of the liquid can be determined from the formula

$\rho = 0.12 k$ where k is the gradient of the graph P against h

- (i) Calculate the gradient, k , of the graph P against h . Show on the graph how you determine k .

$k = \dots\dots\dots$ [4 marks]

- (ii) Determine the density of liquid, ρ

$\rho = \dots\dots\dots \text{ kg m}^{-3}$ [1 mark]

- (c) Based on the graph on Diagram 2.2, determine the pressure P exerted on the liquid when the depth of liquid, $h = 0.5$ m

$P = \dots\dots\dots$ [2 marks]

- (d) (i) If the liquid X is replaced with a denser liquid Y, what will happen to the value of k ?
 [1 mark]

(ii) Explain your answer.
 [1 mark]

- (e) State one precaution that should be taken to improve the results of this experiment.
 [1 mark]

Question 2.3

A student carried out an experiment to investigate the relationship between the temperature of a liquid when heated and its mass, m . The student used the same immersion heater to heat up different masses of the liquid in a constant time. The initial temperature, θ_0 of the liquid which is constant and the final temperature, θ , of the liquid after being heated are recorded.

The results of the experiment is shown in a graph of θ against $\frac{1}{m}$ shown in Diagram 2.3

Graph of θ against $\frac{1}{m}$

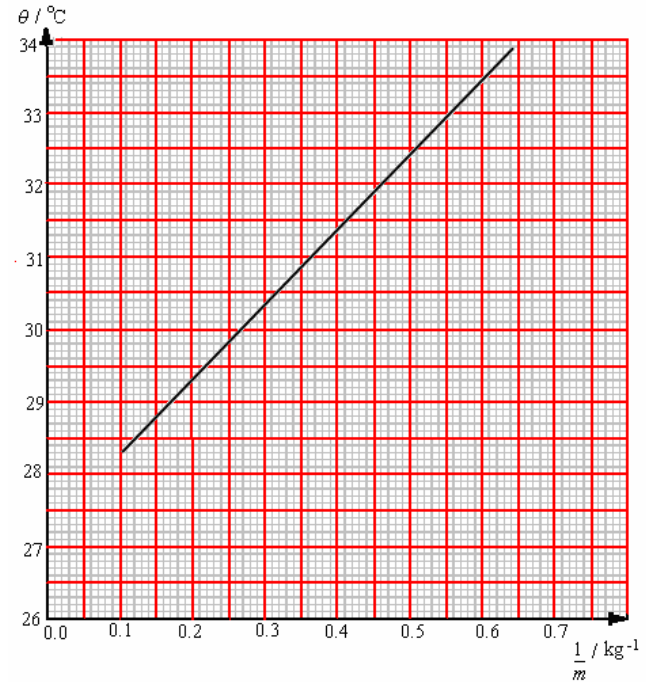


Diagram 2.3

- (a) State the relationship between θ and m .
 [1 mark]
- (b) The initial temperature, θ_0 , of the liquid can be determined from the intercept of the θ -axis. Show on the graph how you determine θ_0 and write the value below.
 $\theta_0 = \dots\dots\dots$ [2 mark]
- (c) Determine the value of m when $\theta = 33.5^\circ\text{C}$
 Show on the graph how you determine the value of m .

m = [2 marks]

(d) The amount of heat, Q is used to heat up the liquid is given by the formula

$$Q = ck$$

Where k is the gradient of the graph and $c = 5.2 \times 10^3 \text{ J kg}^{-1} \text{ }^\circ\text{C}^{-1}$
Calculate

(i) The gradient, k of the graph.
Show on the graph how you determine the gradient.

k = [3 marks]

(ii) The amount of heat, Q

Q = [3 marks]

(e) State **one** precaution that should be taken to improve the results of this experiment.

..... [1 mark]

Question 2.4

A student carried out an experiment to investigate the relationship between the image

magnification, M and the image distance, v, of a given lens.
The results of the experiment are shown in the graph of v against M in Diagram 2.4

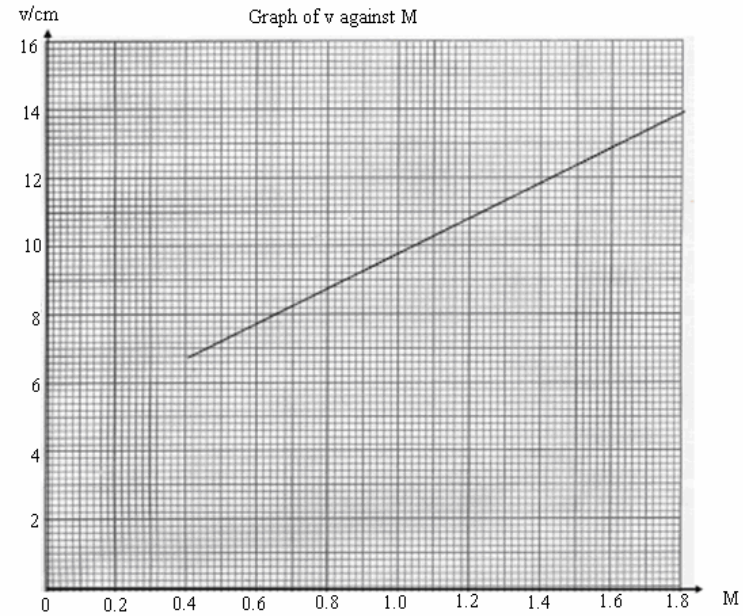


Diagram 2.4

(a) The image distance, v, can be determined from the intercept of the v-axis Show on the graph of v against M on Diagram 2.4 how you determine v and state its value in the space below.

v = [2 marks]

(b) State the relationship between v and M.

..... [1 mark]

(c) The focal length, f, of the lens is given by the formula $\frac{f}{k} = 0.976$ where k is the gradient of the graph.

(i) Calculate the gradient of the graph of v against M Show on the graph how you determine the gradient.

$k = \dots\dots\dots$ [3 marks]

(ii) Calculate the value of the focal length, f , of the lens.

$f = \dots\dots\dots$ [3 marks]

(d) Determine the image distance, v , when the magnification $M = 0.8$

(e) State **one** precaution that should be taken during this experiment. [2 marks]

$\dots\dots\dots$
 $\dots\dots\dots$
 [1 mark]

Question 2.5

A student carries out an experiment to investigate the relationship between elasticity of a

spring, k and the period of oscillation, T of a steel spring. The student uses springs of different elasticity and record the corresponding period, T , and fixes the mass, m of the weight used.

The student then plots a graph of T^2 against $\frac{1}{k}$ as in Diagram 2.5.

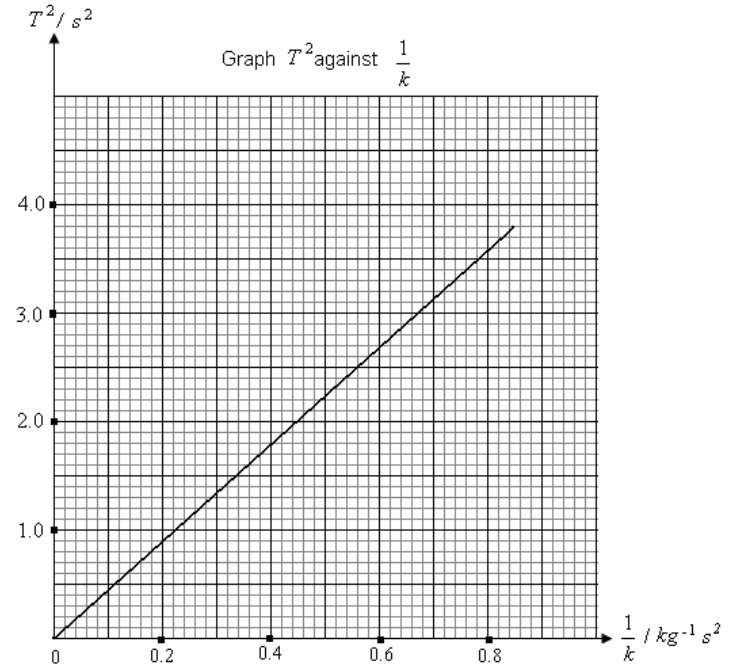


Diagram 2.5

(a) Based on the graph in Diagram 2.5,
 (i) what happen to T when k increased?

$\dots\dots\dots$ [1 mark]

(ii) find the period, T , if $\frac{1}{k}$ is 0.9. Show on the graph how you find T .

[3 marks]

(iii) calculate the graph gradient. Show on the graph how you find the gradient.

[3 marks]

- (b) Using the value obtained in (a)(iii) and equation $T^2 = 4\pi^2 \frac{m}{k}$, calculate the weight mass, m , used.

[4 marks]

- (c) What happen to T if the experiment is conducted in the region has a small acceleration due to gravity?

.....

[1 mark]

Question 2.6

A student carries out an experiment to investigate the interference of sound waves. Two loudspeakers are connected to an audio signal generator. The student measured the distance between two adjacent loud sounds, x , for different values of frequency, f . The student then

plots a graph of f against $\frac{1}{x}$ as shown in Diagram 2.6.

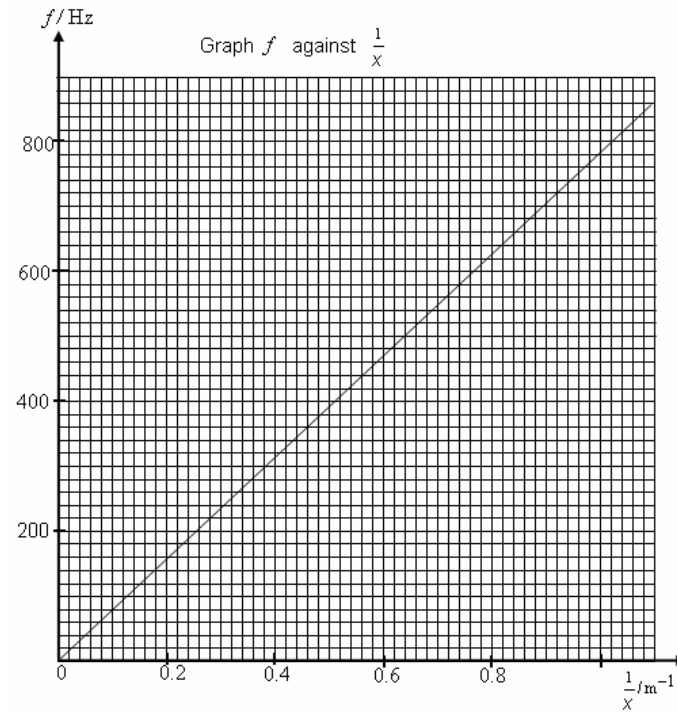


Diagram 2.6

- (a) Based on the graph on Diagram 2.1,
 (i) State the relationship between x and f .

..... [1 mark]

- (ii) Determine the frequency, f , when the distance between two adjacent loud sounds, x , is 2.0 m. Show on the graph how you determined f .

- (iii) Calculate the gradient of the graph, m .
 Show on the graph how you determined the gradient. [3 marks]

[3 marks]

(b) Given that $I = \frac{ax}{D}$ and $v = fl$, write an expression of v in terms of D, f, a, v and x .

[1 mark]

(c) Given that $x = f = m$.
By using the value of the gradient, m , obtained in (a)(iii) and the expression in (b), calculate the velocity of sound in air when $D = 2.8$ m and $a = 1.2$ m.

[2 marks]

(d) State **two** precautions that should be taken during this experiment.

.....
.....

[2 marks]

Question 2.7

A student carried out an experiment to investigate the relationship between the velocity of sound wave, v and air temperature, T . The results of the experiment are shown in the graph of v^2 against T in Diagram 2.7.

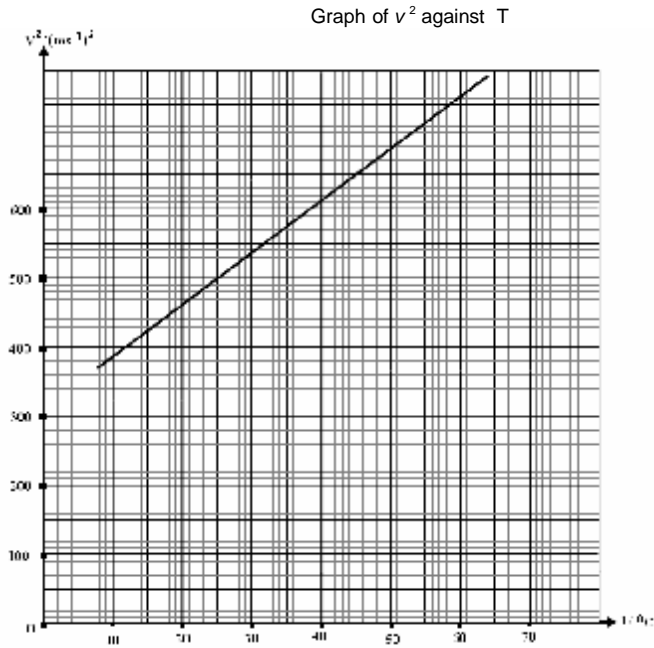


Diagram 2.7

(a) Based on the graph in Diagram 2.7.

(i) state the relationship between v and T ?

.....
[1 mark]

(ii) determine the value of v when $T = 0^{\circ}\text{C}$
Show on the graph, how you determine the value of v

$v =$
[2 marks]

(b) The specific heat capacity of air c , is given by the formula $c = \frac{l}{k}$
where k is the gradient of the graph.

(i) Calculate the gradient of the graph, k , of v^2 against T
Show on the graph how you determine the gradient.

$k =$
[3 marks]

(ii) Determine the value, c , of the air

$c =$
[2 marks]

(c) Determine the sound wave velocity in the air, v , if the temperature of air = 30°C
Show on the graph, how you determine the value of v .

[3 marks]

(d) State **one** precaution that can be taken to improve the accuracy of the readings in this experiment.

.....
.....

[1 mark]

Question 2.8

A student carried out an experiment to investigate the relationship between the resistance, R , and diameter, d , of a nichrome wire and to determine the resistivity, ρ , of the nichrome wire. The student used six nichrome wires with different diameters and the length, l , of each wire is 100 cm.

The result of the experiment is shown in the graph R against $\frac{1}{d^2}$ in Diagram 2.8 below

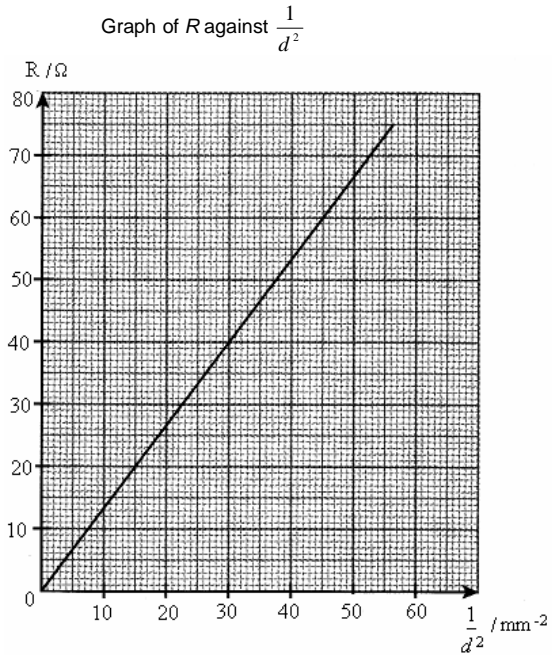


Diagram 2.8

(a) Based on the graph in Diagram 2.8,

(i) State the relationship between R and d^2 .

.....

[1 mark]

(ii) Determine resistance of 100 cm nichrome wire, X , with diameter of 0.20 mm.

[2 marks]

(b) The resistivity, ρ , of nichrome is given by the formula $\rho = \frac{\pi R d^2}{4l}$

(i) Calculate the gradient, m , of the graph. Show on the graph how you determine m .

$m = \dots\dots\dots$

[3 marks]

(ii) Express gradient, m , in terms of R and d^2 .

[1 mark]

(iii) Using the formula $\rho = \frac{\pi R d^2}{4l}$ and the value of m in (b)(i), calculate the resistivity, ρ , of nichrome. Use $l = 100$ cm.

[2 marks]

(c) Another nichrome wire, Y , has a diameter of 0.25 mm and a length of 200 cm.

Using the formula $\rho = \frac{\pi R d^2}{4l}$ and the value of ρ in (b)(iii), calculate the resistance of nichrome wire, Y .

[2 marks]

(d) State **one** precaution that should be taken during this experiment.

.....

.....

[1 mark]

Question 2.9

A student carries out an experiment to investigate the relationship between resistance, R , and length of a constantan wire, l .

The results of this experiment is shown in the graph of R against l in Diagram 2.9.

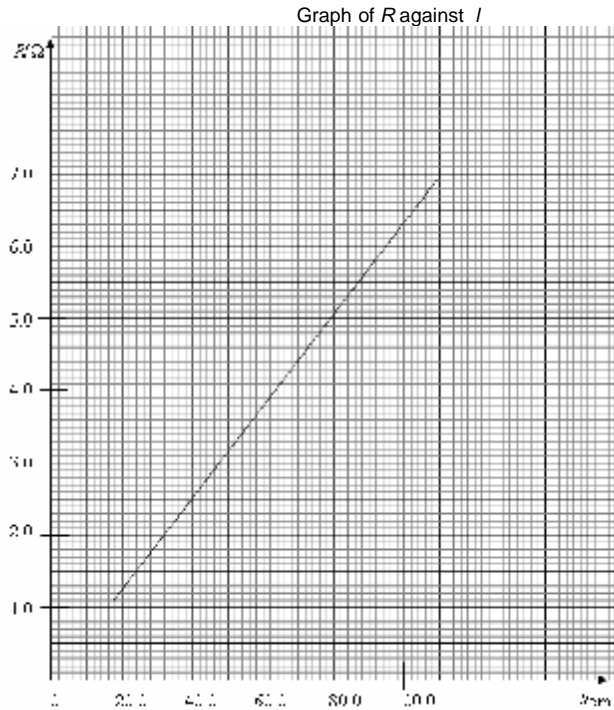


Diagram 2.9

(a) Based on the graph in Diagram 2.9, state the relationship between R and l .

..... [1 mark]

(b) The resistivity, r , is given by the formula $r = mA$, where m is the gradient of the graph and A is the cross-sectional area of the wire.

(i) Calculate the gradient, m , of the graph
Show on the graph how you determine the gradient.

$m =$

[3 marks]

(ii) Determine the value of r , if $A = 1.5 \times 10^{-5} \text{cm}^2$.

[2 marks]

(c) (i) Based on the graph in Diagram 2.9, determine the value of R when $l = 16.0$ cm.
Show on the graph, how you determine the value of R .

[2 marks]

(ii) Another identical constantan wire with the same resistance as 2 (c) (i) is connected in parallel to the wire. The effective resistance, R' , of two constantan

wire in parallel is given by the formula $\frac{1}{R'} = \frac{1}{R} + \frac{1}{R}$. Calculate R' .

[3 marks]

(d) State **one** precaution that can be taken to improve the accuracy of the readings in the experiment.

.....
.....

[1 marks]

Question 2.10

The graph of potential difference, V against electric current, I in Diagram 2.10 shows the results of the experiment to determine the electromotive force, E and the internal resistance, r of a dry cell.

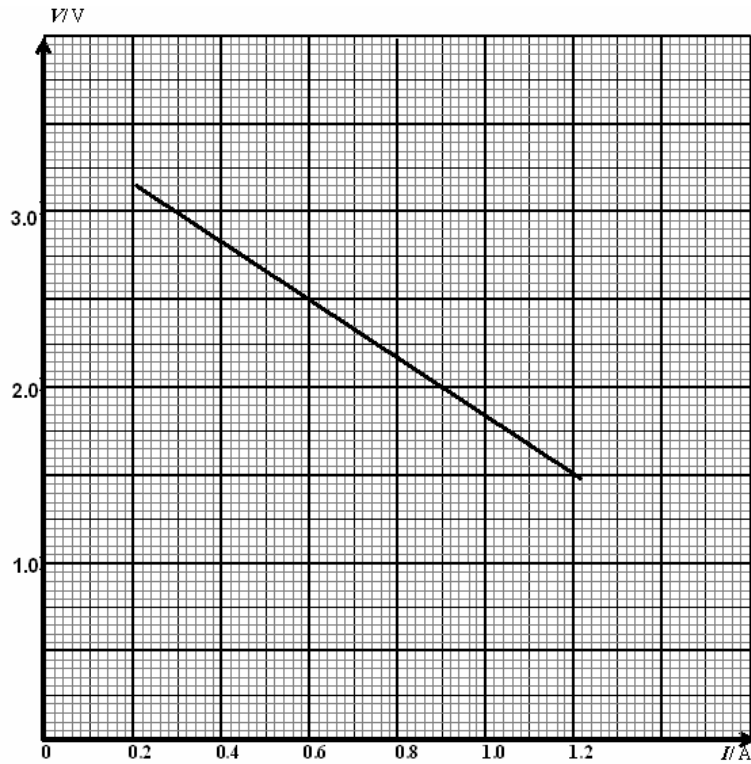


Diagram 2.10

(a) Based on the graph,

(i) State the changes to the potential difference, V , when the current, I increase.

.....
[1 mark]

(ii) Determine the value of the potential difference, V when the current, $I = 0.0$ A. Show on the graph, how you obtained the value of V .

[2 marks]

(b) The internal resistance, r , of a dry cell is given by $r = -m$, where m is the gradient of the graph. Calculate the value of r .

[3 marks]

(c) From the graph, state the value of V when $I = 0.80$ A. Show on the graph how you obtained the value of V .

$V =$
[2 marks]

(d) The electromotive force, e.m.f, E , of a dry cell is given by the equation below, $E = I (R + r)$. Calculate R when $I = 0.80$ A.

[2 marks]

Question 2.11

A student carries out an experiment to investigate the relationship between the electromotive force, E and internal resistance, r of a dry cell. The result of the experiment is shown in the graph Resistance, R against reciprocal of current, $\frac{1}{I}$ as shown in Diagram 2.11 .

Graph R against $\frac{1}{I}$

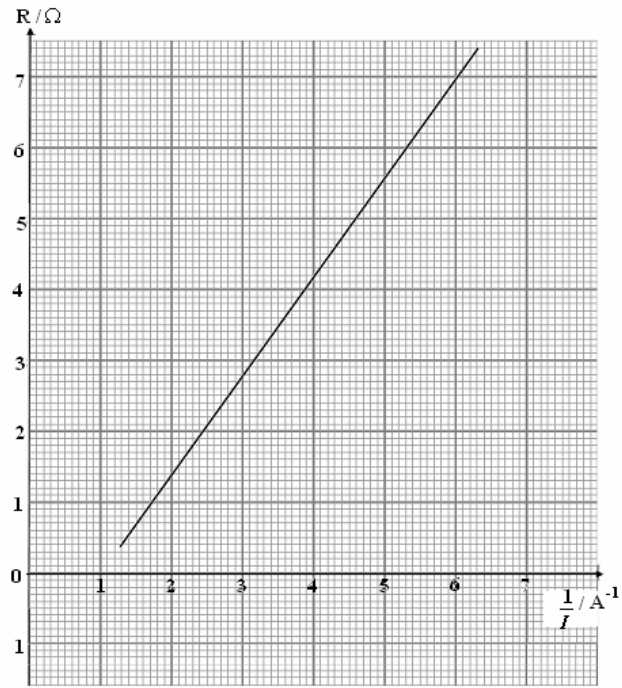


Diagram 2.11

(a) Based on the graph in Diagram 2.11,

(i) What happen to R when I decrease?

.....
[1 mark]

(ii) Determine the value of I when R = 5 Ω. Show on the graph how you determine value of R.

[3 marks]

(iii) Determine the R-intercept. Show on the graph how you determine value of R.

.....
[2 marks]

(iv) Calculate the gradient of the graph Show on the graph how you determine the gradient of graph.

Gradient =
[3 marks]

(b) The resistance, R is given by the formula

$$R = \frac{E}{I} - r$$

Where E is electromotive force and r is internal resistance.

Based on your answer in (a)(iii) and (a)(iv) , determine the E is electromotive force and r is internal resistance.

[3 marks]

Question 2.12

A physicist carried out an experiment to investigate the variation of the velocity, v, with time, t, of object falling in air. The results of the investigation is shown in the graph of v against t as shown in Diagram 2.12

Graph V against t

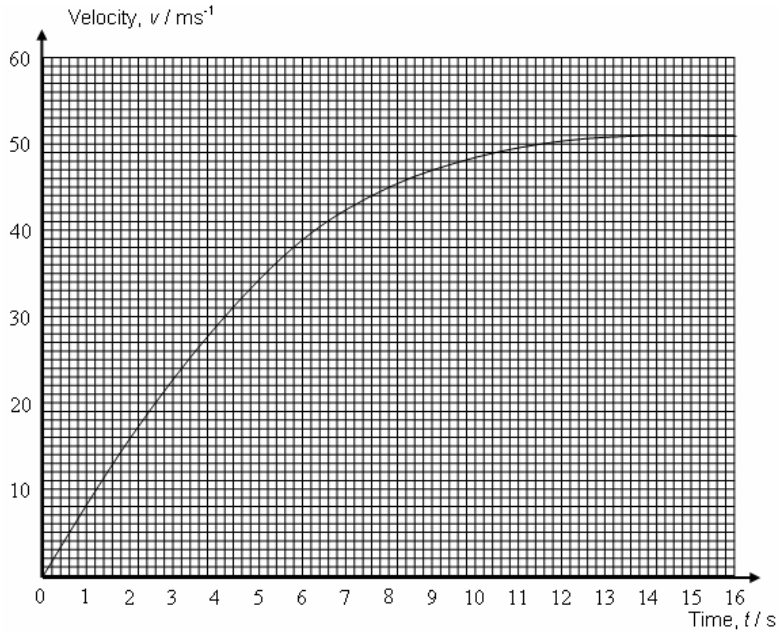


Diagram 2.12

[4 marks]

- (ii) If the mass of the object, $m = 0.20$ kg, calculate the magnitude of the resultant force, F , on the object when, $t = 6.0$ s.

[2 marks]

- (a) Based on the graph in Diagram 2.12, determine the value of v when $t = 3.8$ s. Show on the graph, how you determined the value of v .

[2 marks]

- (b) The terminal velocity of the object is defined as the maximum final velocity. Determine the terminal velocity of the object. Show on the graph, how you determined the value of the terminal velocity.

[2 marks]

- (c) The gradient of the graph represents acceleration. State how the acceleration of the object changes with time.

[2 marks]

- (d) The resultant force, F , on the object is given by the formula, $F = ma$, where, m is the mass of the object, a is the acceleration of the object

- (i) Calculate the gradient of the graph when, $t = 6.0$ s.

Question 3.1

Diagram 3.1. shows a man pushes a shopping trolley in two situations. The man experience the empty trolley is easy to start and stop but the fully trolley is hard to start and to stop.

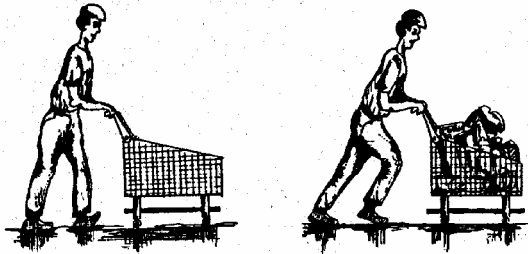


Diagram 3.1

Observe the positions of each of the park chute and the appearance of the student when he slides.

Based on the observations:

- (a) State **one** suitable inference that can be made. [1 Mark]
- (b) State **one** appropriate hypothesis for an investigation. [1 Mark]
- (c) With the use of apparatus such as , jigsaw blade , plasticine ,clamp and other apparatus , describe an experimental framework to test your hypothesis.
 In your description , state clearly the following:
 - (i) Aim of the experiment
 - (ii) Variables in the experiment
 - (iii) List of apparatus and materials
 - (iv) Arrangement of the apparatus
 - (v) The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable.
 - (vi) Way you would tabulate the data
 - (vii) Way you would analysis the data

Question 3.2

A boy pushes the boxes along a level walkway as shown in Diagram 3.2.1 The boy experiences that the boxes move slowly. When the boy removes one of the boxes as shown Diagram 3.2.2, he experiences that the boxes move faster than before although the same force was applied.

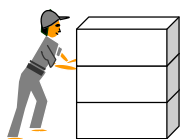


Diagram 3. 2.1

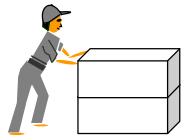


Diagram 3.2.2

Based on the information and observation above :

- (a) State **one** suitable inference.
- (b) State **one** suitable hypothesis .

- (c) With the use of apparatus such as a trolley, ticker timer, ticker tape, elastic cord and other apparatus, describe an experiment framework to investigate the hypothesis stated in (b). In your description, state clearly the following :
 - (i) Aim of the experiment.
 - (ii) Variables in the experiment.
 - (iii) List of apparatus and materials.
 - (iv) Arrangement of the apparatus.
 - (v) The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable.
 - (vi) The way you would tabulate the data.
 - (vii) The way you would analyse the data

Question 3.3

Each figure below shows two positions of a student on a swing. The initial position in each figure is different.



Observe the positions of each of the swing in each diagram and the appearance of the student when she swings.

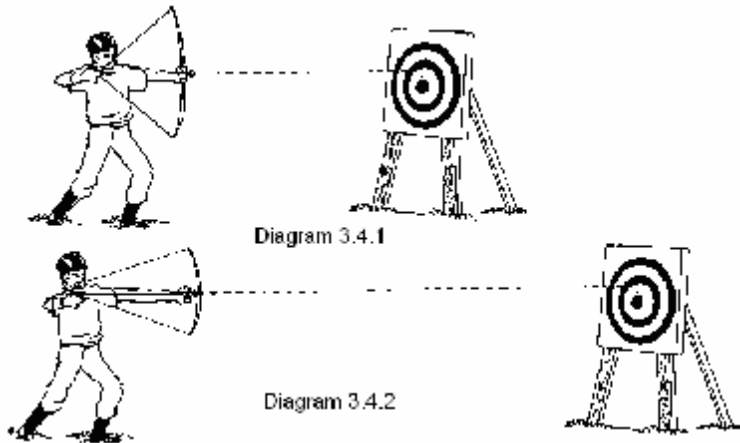
Based on the observations:

- (a) State **one** suitable inference that can be made. [1 Mark]
- (b) State **one** appropriate hypothesis for an investigation. [1 Mark]
- (c) With the use of apparatus such as trolley, ticker timer and other apparatus , describe an experimental framework to test your hypothesis.
 In your description , state clearly the following:
 - (i) Aim of the experiment
 - (ii) Variables in the experiment
 - (iii) List of apparatus and materials
 - (iv) Arrangement of the apparatus
 - (v) The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable.
 - (vi) Way you would tabulate the data
 - (vii) Way you would analysis the data

[10 Marks]

Question 3.4

Diagram 3.4.1 shows an archer shoots a target . Diagram 3.4.2 the archer shoots the same target but at different distance.



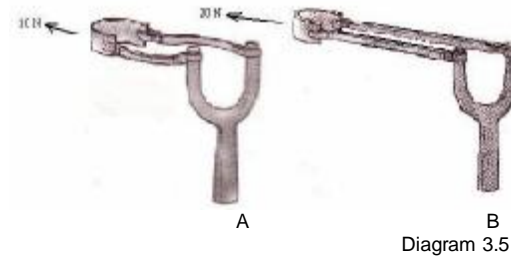
Observe the conditions of each bow and the distance of the target from the archer.
Based on the observations:

- (a) State **one** suitable inference that can be made. [1 Mark]
- (b) State **one** appropriate hypothesis for an investigation. [1 Mark]
- (c) With the use of apparatus such as trolley, ticker timer and other apparatus , describe an experimental framework to test your hypothesis.
In your description , state clearly the following:
 - (i) Aim of the experiment
 - (ii) Variables in the experiment
 - (iii) List of apparatus and materials
 - (iv) Arrangement of the apparatus
 - (v) The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable.
 - (vi) Way you would tabulate the data
 - (vii) Way you would analysis the data

[10 Marks]

Question 3.5

Diagram 3.5 shows two catapults A and B made from same catapult rubber. Difference forces are applied on the catapults.



Base on the information and observation above:

- (a) State **one** suitable inference. [1 mark]
- (b) State **one** suitable hypothesis. [1 mark]
- (c) With the use of apparatus such as spring, retort stands and other apparatus, describe an experiment framework to investigate the hypothesis stated in (b). In your description, state clearly the following:
 - (i) Aim of the experiment.
 - (ii) Variables in the experiment.
 - (iii) List of apparatus and materials.
 - (iv) Arrangement of the apparatus.
 - (v) The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable.
 - (vi) The way you would tabulate the data.
 - (vii) The way you would analyze the data. [10 marks]

Question 3.6

Diagram 3.6 shows two different situations of a woman road wearing a high heel shoes and then wearing a flat shoes walking on a muddy road

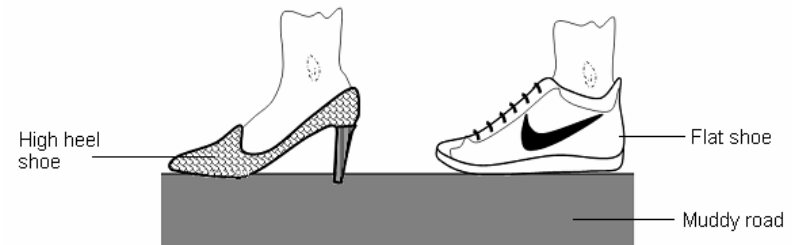


Diagram 3.6

Based on the observations:

- (a) State **one** suitable inference that can be made. [1 Mark]

- (b) State **one** appropriate hypothesis for an investigation. [1 Mark]
- (c) With the use of apparatus such as compression balance, plasticine, wooden rod and other apparatus, describe an experimental framework to test your hypothesis.
In your description, state clearly the following:
- Aim of the experiment
 - Variables in the experiment
 - List of apparatus and materials
 - Arrangement of the apparatus
 - The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable
 - Way you would tabulate the data
 - Way you would analysis the data

[10 Marks]

Question 3.7

Diagram 3.7 shows a model of a water tank in a house. When the pipe P and pipe R are open simultaneously it is observed that the water flow from the pipes with different speeds.

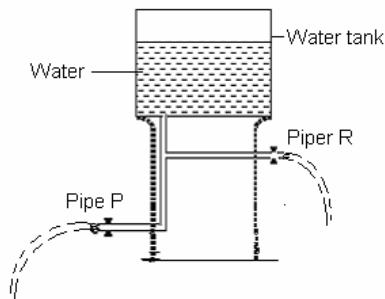


Diagram 3.7

Based on the observations:

- State **one** suitable inference that can be made. [1 Mark]
- State **one** appropriate hypothesis for an investigation. [1 Mark]
- With the use of apparatus such as measuring cylinder, thistle funnel, rubber tube and other apparatus, describe an experimental framework to test your hypothesis.
In your description, state clearly the following:
 - Aim of the experiment
 - Variables in the experiment
 - List of apparatus and materials
 - Arrangement of the apparatus
 - The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable.
 - Way you would tabulate the data
 - Way you would analysis the data

[10 Marks],

Question 3.8

Diagram 3.8.1 and Diagram 3.8.2 show two different situations when a woman is pulling a pail from water.

In Diagram 3.8.1, the woman finds it easy to pull the pail while most of the pail is in the water. However, the woman finds it difficult as the pail is emerging from the water surface as shown in Diagram 3.8.2.



Diagram 3.8.1

Diagram 3.8.2

Based on the observations:

- State **one** suitable inference that can be made. [1 Mark]
- State **one** appropriate hypothesis for an investigation. [1 Mark]
- With the use of apparatus such as spring balance, eureka can and other apparatus, describe an experimental framework to test your hypothesis.
In your description, state clearly the following:
 - Aim of the experiment
 - Variables in the experiment
 - List of apparatus and materials
 - Arrangement of the apparatus
 - The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable
 - Way you would tabulate the data
 - Way you would analysis the data

[10 Marks]

Question 3.9

Diagram 3.9.1 and Diagram 3.9.2 show a boat with different load.

It is observed that the boat in Diagram 3.9.2 sinks more than in Diagram 3.9.1.



Diagram 3.9.1

Diagram 3.9.2

Based on the information and observation above:

- State **one** suitable inference

- (b) State **one** suitable hypothesis [1 mark]
- (c) With the use of apparatus such as slotted masses, beaker and other suitable apparatus, describe an experiment framework to investigate the hypothesis stated in (b). In your description, state clearly the following: [1 mark]
- Aim of the experiment
 - Variables in the experiment
 - List of apparatus and material
 - Arrangement of the apparatus
 - The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable.
 - The way you would tabulate the data
 - The way you would analyze the data

[10 marks]

Question 3.10

Diagram 3.10 the arm of a student who is holding a sparkler. The boy's arm is not scalded when the sprinkles of the sparkles touch upon him but his arm is scalded when the glowing sparkler touch him.

The temperature of the glowing sparkler is same as the temperature of the sparkler sprinkles .

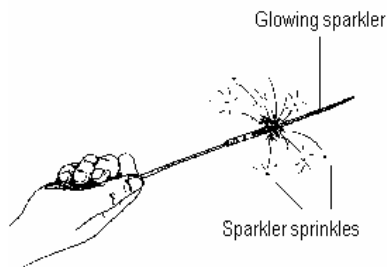


Diagram 3.10

Observe the conditions of the glowing sparkler and sparkler sprinkles and also the hand of the boy.

Based on the observations:

- State **one** suitable inference that can be made. [1 mark]
- State **one** appropriate hypothesis for an investigation. [1 mark]
- With the use of apparatus such as metal sphere, beaker, thermometer and other apparatus, describe an experimental framework to test your hypothesis. In your description, state clearly the following:
 - Aim of the experiment
 - Variables in the experiment
 - List of apparatus and materials
 - Arrangement of the apparatus
 - The procedure of the experiment which include the method of controlling the manipulated variable and the method measuring the responding variable.
 - Way you would tabulate the data
 - Way you would analysis the data

[10 Marks]

Question 3.11

Diagram 3.11.1 and 3.11.2 show two similar electric kettles used to boil water. The power ratings for the kettles are 240 V, 1000 W. It is found that the water in the kettle in Diagram 3.11.2 boils faster than the water in the kettle in Diagram 3.11.1



Diagram 3.11.1

Diagram 3.11.2

Based on the information and observation above :

- State **one** suitable inference. [1 Mark]
- State **one** suitable hypothesis. [1 Mark]
- With the use of apparatus such as immersion heater, measuring cylinder and other apparatus, describe an experiment framework to investigate the hypothesis stated in (b). In your description, state clearly the following :
 - Aim of the experiment.
 - Variables in the experiment.
 - List of apparatus and materials.
 - Arrangement of the apparatus.
 - The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable.
 - The way you would tabulate the data.
 - The way you would analyse the data

[10 Marks]

Question 3.12**Situation 1**

Diagram 3.12.1 shows an inverted beaker contains an air trapped is converted and immersed in the water. Diagram 3.12.2 shows the volume of air trapped in the beaker decreased when the beaker is pushed down in the water.

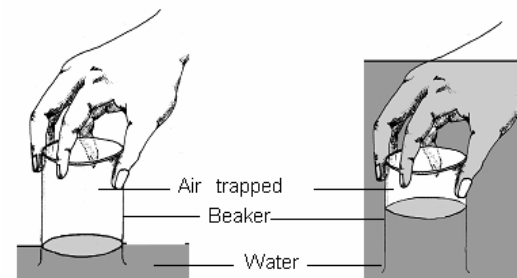


Diagram 3.12.1

Diagram 3.12.2

Based on the observations above ;

- (a) State **one** suitable inference. [1 Mark]
 (b) State **one** suitable hypothesis. [1 Mark]
 (c) With the use of apparatus such as 100 cm³ syringe, ruler, weight, clip, retort stand and other apparatus, describe an experiment framework to investigate the hypothesis stated in (b). In your description, state clearly the following :
- Aim of the experiment.
 - Variables in the experiment.
 - List of apparatus and materials.
 - Arrangement of the apparatus.
 - The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable.
 - The way you would tabulate the data.
 - The way you would analyse the data
- [10 Marks]

Situation 2

A customer at a pet shop was observing the bubbles of air coming out of an air stone. He noticed that the bubbles were smaller in size when they emerged from the stone but become larger as they approached the surface of the water as shown in Figure 3.12.3

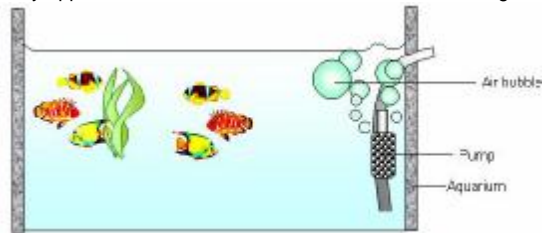


Diagram 3.12.3

- Based on the observations above ;
- (a) State **one** suitable inference. [1 Mark]
 (b) State **one** suitable hypothesis. [1 Mark]
 (c) With the use of apparatus such as 100 cm³ syringe, ruler, weight, clip, retort stand and other apparatus, describe an experiment framework to investigate the hypothesis stated in (b). In your description, state clearly the following :
- Aim of the experiment.
 - Variables in the experiment.
 - List of apparatus and materials.
 - Arrangement of the apparatus.
 - The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable.
 - The way you would tabulate the data.
 - The way you would analyse the data
- [10 Marks]

Question 3.13

Diagram 3.13.1 shows a cake before being baked. Diagram 3.13.2 show cake after being baked

Cake before being baked

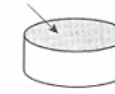


Diagram 3.13.1

Cake after being baked



Diagram 3.13.2

Based on the observations above ;

- (a) State **one** suitable inference. [1 Mark]
 (b) State **one** suitable hypothesis. [1 Mark]
 (c) With the use of apparatus such as capillary tube, beaker, retort stand, Bunsen burner, tripod stand, and other apparatus, describe an experiment framework to investigate the hypothesis stated in (b). In your description, state clearly the following :
- Aim of the experiment.
 - Variables in the experiment.
 - List of apparatus and materials.
 - Arrangement of the apparatus.
 - The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable.
 - The way you would tabulate the data.
 - The way you would analyse the data
- [10 Marks]

Question 3.14

Diagram 3.14.1 shows a dented ping-pong ball is soaked in cold water. Later, the ping-pong ball is soaked in hot water as shown in Diagram 3.14.2. Observe the change of shape of the ping-pong ball.

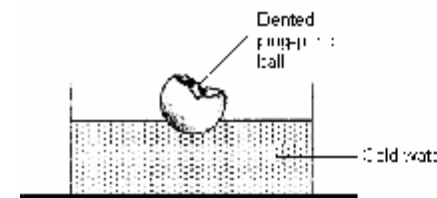


Diagram 3.14.1

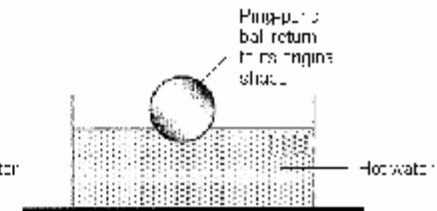


Diagram 3.14.2

Based on the observations above ;

- (a) State **one** suitable inference. [1 Mark]
 (b) State **one** suitable hypothesis. [1 Mark]
 (c) With the use of apparatus such as round flask, beaker, retort stand, Bunsen burner, tripod stand, wire gauze, Bourdon gauge, rubber tube and other apparatus, describe an experiment framework to investigate the hypothesis stated in (b). In your description, state clearly the following :
- Aim of the experiment.
 - Variables in the experiment.
 - List of apparatus and materials.
 - Arrangement of the apparatus.
 - The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable.
 - The way you would tabulate the data.
 - The way you would analyse the data
- [10 Marks]

Question 3.15

Diagram 3.14 shows a photograph of reeds growing in a pond. The image of the reeds can be seen in the water.



Diagram 3.15

Based on the observations above ;

- Satate **one** suitable inference. [1 Mark]
- State **one** suitable hypothesis . [1 Mark]
- With the use of apparatus such as plane mirror , ray box , white paper and other apparatus, describe an experiment framework to investigate the hypothesis stated in (b).In your description, state slearly the following :
 - Aim of the experiment.
 - Variables in the experiment.
 - List of apparatus and materials.
 - Arrangement of the apparatus.
 - The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable.
 - The way you would tabulate the data.
 - The way you would analyse the data

[10 Marks]

Question 3.16

Diagram 3.16 shows two containers containing water and a coin is displaced at the bottom of the containers. Observe the depth of water and the image of the coins.

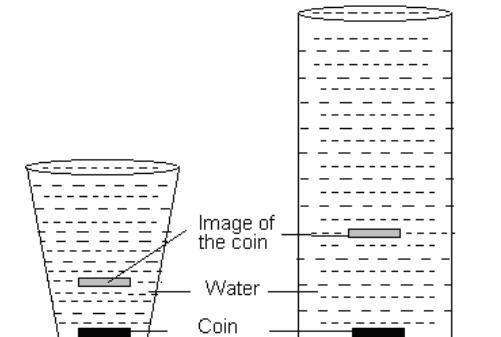


Diagram 3.16

Based on the information and obsevation above :

- Satate **one** suitable inference. [1 Mark]
- State **one** suitable hypothesis . [1 Mark]
- With the use of apparatus such as pin ,tall beaker and other apparatus, describe an experiment framework to investigate the hypothesis stated in (b).In your description, state slearly the following :
 - Aim of the experiment.
 - Variables in the experiment.
 - List of apparatus and materials.
 - Arrangement of the apparatus.
 - The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable.
 - The way you would tabulate the data.
 - The way you would analyse the data

[10 Marks]

Question 3.17

Diagram 3.17.1 shows a laboratory poster being observed through a convex lens.

Diagram 3.17.2 shows the laboratory poster observed through the same convex lens when the poster is brought closer to the lens.



Diagram 3.17.1

Diagram 3.17.2

Based on the above information and observation:

- State one suitable inference. [1 mark]
- State one suitable hypothesis. [1 mark]
- With the use of apparatus such as a convex lens, an object illuminated by a light bulb and other apparatus, describe an experimental framework to investigate the hypothesis stated in (b).
In your description, state clearly the following:
 - Aim of the experiment.
 - Variables in the experiment.
 - List of apparatus and materials
 - Arrangement of the apparatus.
 - The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable.
 - The way you would tabulate the data.
 - The way you would analyse the data.

[10 marks]

Question 3.18

Diagram 3.18 shows images of a straw when viewed through a beaker of water and a magnifying glass. Observe the size of the images.

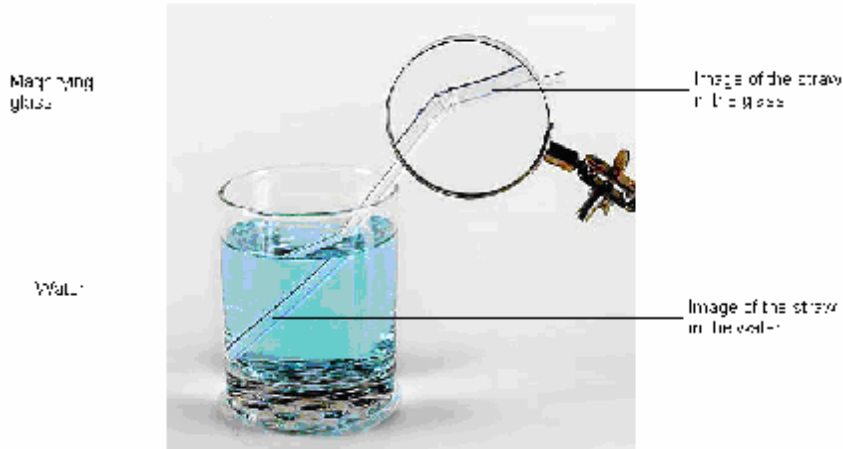


Diagram 3.18

Based on the observations:

- (a) State **one** suitable inference that can be made. [1 Mark]
- (b) State **one** appropriate hypothesis for an investigation. [1 Mark]
- (c) With the use of apparatus such as With the use of apparatus such as a convex lens, an object illuminated by a light bulb and other apparatus, describe an experimental framework to investigate the hypothesis stated in (b). In your description, state clearly the following; and other apparatus, describe an experimental framework to test your hypothesis.

In your description, state clearly the following:

- (i) Aim of the experiment
- (ii) Variables in the experiment
- (iii) List of apparatus and materials
- (iv) Arrangement of the apparatus
- (v) The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable
- (vi) Way you would tabulate the data
- (vii) Way you would analysis the data [10 Marks]

Question 3.19

Diagram 3.19.1 shows a 5 month -old baby in a spring cradle. Diagram 3.19.2 shows a 10-month old baby in another spring cradle. The spring cradle in Diagram 3.19.2 vibrates more slowly than the spring cradle in Diagram 3.19.1

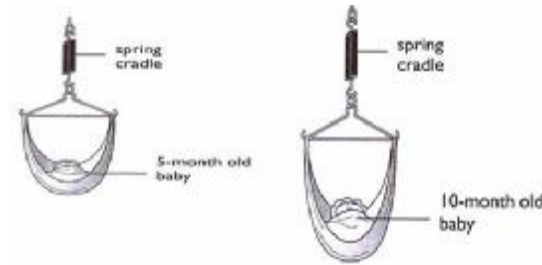


Diagram 3.19.1

Diagram 3.19.2

Based on the situation above,

- (a) State **one** suitable inference. [1mark]
- (b) State **one** appropriate hypothesis that could be investigated.. [1 mark]
- (c) With the use of apparatus such as spring, slotted weight and others apparatus, describe an experiment to investigate the hypothesis stated in (b)

In your description, state clearly the following;

- (i) Aim of the experiment,
- (ii) Variables in the experiment
- (iii) List of apparatus and materials,
- (iv) Arrangement of the apparatus,
- (v) The procedure of the experiment, which includes the method of controlling the manipulated variable and the method of measuring the responding variable
- (vi) The way to tabulate the data,
- (v) The way to analyse the data.

[10 marks]

Question 3.20

Diagram 3.20 shows water waves propagated from the sea towards the shore.



Diagram 3.20

Observed the wave pattern and the sea-bed.

Based on the observations:

- State **one** suitable inference that can be made. [1 Mark]
- State **one** appropriate hypothesis for an investigation. [1 Mark]
- With the use of apparatus such as ripple tank and other apparatus, describe an experimental framework to test your hypothesis.
In your description, state clearly the following:
 - Aim of the experiment
 - Variables in the experiment
 - List of apparatus and materials
 - Arrangement of the apparatus
 - The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable
 - Way you would tabulate the data
 - Way you would analysis the data

[10 Marks]

Question 3.21

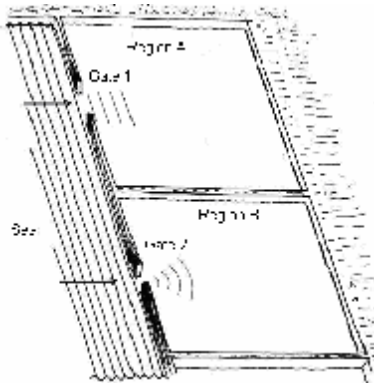


Diagram 3.21

Diagram 3.21 shows the sea water waves passing through two different gates at a harbour .

Based on the observations:

- State **one** suitable inference that can be made. [1 Mark]
- State **one** appropriate hypothesis for an investigation. [1 Mark]
- With the use of apparatus such as ripple tank, stroboscope and other apparatus, describe an experimental framework to test your hypothesis.
In your description, state clearly the following:
 - Aim of the experiment
 - Variables in the experiment
 - List of apparatus and materials
 - Arrangement of the apparatus
 - The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable
 - Way you would tabulate the data
 - Way you would analysis the data

[10 Marks]

Question 3.22

Diagram 3.22.1 shows a group of students stand at positions where loud sound can be heard in front of two loud speakers connected to an audio frequency generator.

Diagram 3.22.2 shows the position of the students when the distance between the two loud speakers are decreased.

[The two loud speakers are not shown in the diagrams]



Diagram 3.22.1



Diagram 3.22.2

Based on the observations:

- State **one** suitable inference that can be made. [1 Mark]
- State **one** appropriate hypothesis for an investigation. [1 Mark]
- With the use of apparatus such as ripple tank, stroboscope and other apparatus, describe an experimental framework to test your hypothesis.
In your description, state clearly the following:
 - Aim of the experiment
 - Variables in the experiment
 - List of apparatus and materials
 - Arrangement of the apparatus
 - The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable
 - Way you would tabulate the data
 - Way you would analysis the data

[10 Marks]

Question 3.23

Situation 1

The starter motor in Diagram 3.23.1 rotates faster than starter motor in Diagram 3.23.2

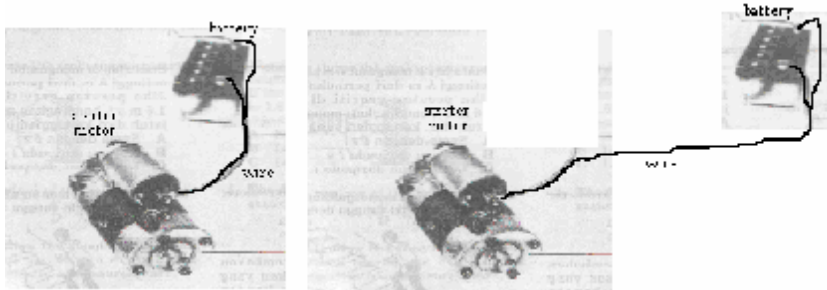


Diagram 3.23.1

Diagram 3.23.2

Based on the observations:

- (a) State **one** suitable inference that can be made. [1 Mark]
- (b) State **one** appropriate hypothesis for an investigation. [1 Mark]
- (c) With the use of apparatus such as ammeter, voltmeter, constantan wire and other apparatus, describe an experimental framework to test your hypothesis. In your description, state clearly the following:
 - (i) Aim of the experiment
 - (ii) Variables in the experiment
 - (iii) List of apparatus and materials
 - (iv) Arrangement of the apparatus
 - (v) The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable
 - (vi) Way you would tabulate the data
 - (vii) Way you would analysis the data

[10 Marks]

Situation 2

The lamp in Diagram 3.23.3 brighter than the lamp in Diagram 3.243.4

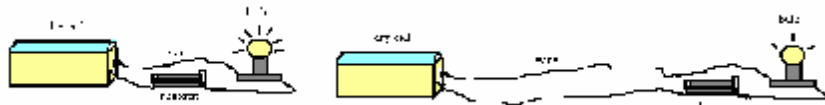


Diagram 3.23.3

Diagram 3.23.4

Based on the observations:

- (a) State **one** suitable inference that can be made. [1 Mark]
- (b) State **one** appropriate hypothesis for an investigation. [1 Mark]
- (c) With the use of apparatus such as ammeter, voltmeter, constantan wire and other apparatus, describe an experimental framework to test your hypothesis. In your description, state clearly the following:
 - (i) Aim of the experiment
 - (ii) Variables in the experiment
 - (iii) List of apparatus and materials
 - (iv) Arrangement of the apparatus
 - (v) The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable
 - (vi) Way you would tabulate the data
 - (vii) Way you would analysis the data

[10 Marks]

Question 3.24

Situation 1

Diagram 3.24.1 shows an electromagnet at the end of the arm of a crane lifting up some scrap iron.

Diagram 3.24.2 shows some pieces of scrap iron dropping off when the current in the electromagnet is reduced.



Diagram 3.24.1

Diagram 3.24.2

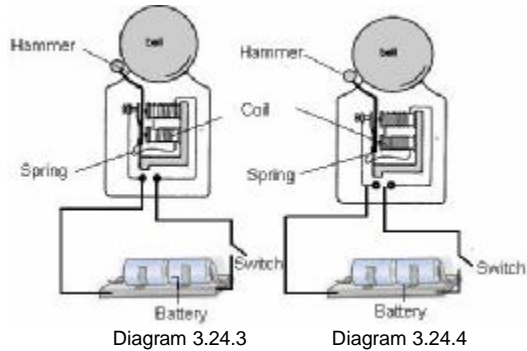
Based on the observations:

- (a) State **one** suitable inference that can be made. [1 Mark]
- (b) State **one** appropriate hypothesis for an investigation. [1 Mark]
- (c) With the use of apparatus such as ammeter, solenoid, connection wires and other apparatus, describe an experimental framework to test your hypothesis. In your description, state clearly the following:
 - (i) Aim of the experiment
 - (ii) Variables in the experiment
 - (iii) List of apparatus and materials
 - (iv) Arrangement of the apparatus
 - (v) The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable
 - (vi) Way you would tabulate the data
 - (vii) Way you would analysis the data

[10 Marks]

Situation 2

Diagram 3.24.3 and 3.23.4 show the electric bell which are connected to the similar batteries.



When the switch is on, the bell in Diagram 3.24.4 ring loudly than the bell in Diagram 3.24.3
Based on the observations:

- (a) State **one** suitable inference that can be made. [1 Mark]
- (b) State **one** appropriate hypothesis for an investigation. [1 Mark]
- (c) With the use of apparatus such as ammeter, solenoid, connection wires and other apparatus, describe an experimental framework to test your hypothesis.
In your description, state clearly the following:
 - (i) Aim of the experiment
 - (ii) Variables in the experiment
 - (iii) List of apparatus and materials
 - (iv) Arrangement of the apparatus
 - (v) The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable
 - (vi) Way you would tabulate the data
 - (vii) Way you would analysis the data

[10 Marks]

Question 3.25

Situation 1

Diagram 3.25.1 shows a model of direct current motor. A student investigate that affected the speed of the motor rotation

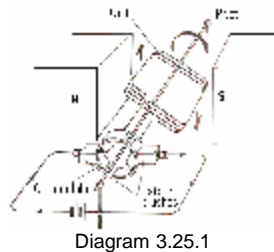


Diagram 3.25.1

He found that the rotation of the coil speed up when he use more batteries.

Based on the observations:

- (a) State **one** suitable inference that can be made. [1 Mark]
- (b) State **one** appropriate hypothesis for an investigation. [1 Mark]
- (c) With the use of apparatus such as magnadur magnets , U-shaped iron yoke , thick copper wire , short cooper wire and other apparatus, describe an experimental framework to test your hypothesis.
In your description, state clearly the following:
 - (i) Aim of the experiment
 - (ii) Variables in the experiment
 - (iii) List of apparatus and materials
 - (iv) Arrangement of the apparatus
 - (v) The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable
 - (vi) Way you would tabulate the data
 - (vii) Way you would analysis the data

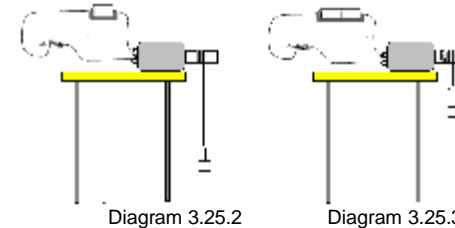
[10 Marks]

Situation 2

A student investigating the performance of a dc motor ..

Diagram 3.25.2 shows the final position of the load if the student connected the motor to a dry cell. Then the student connected the motor to two dry cell and the final position of the load lifted is shown in Diagram 3.25.3.

Both of the experiment are started which the load is on the floor..



Based on the observations:

- (a) State **one** suitable inference that can be made. [1 Mark]
- (b) State **one** appropriate hypothesis for an investigation. [1 Mark]
- (c) With the use of apparatus such as magnadur magnets , U-shaped iron yoke , thick copper wire , short cooper wire and other apparatus, describe an experimental framework to test your hypothesis.
In your description, state clearly the following:
 - (i) Aim of the experiment
 - (ii) Variables in the experiment
 - (iii) List of apparatus and materials
 - (iv) Arrangement of the apparatus
 - (v) The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable
 - (vi) Way you would tabulate the data
 - (vii) Way you would analysis the data

[10 Marks]

Question 3.26

Diagram 3.26 shows a boy rides his bicycle at night. The brightness of the bicycle light increases ,when his bicycle down a slope .

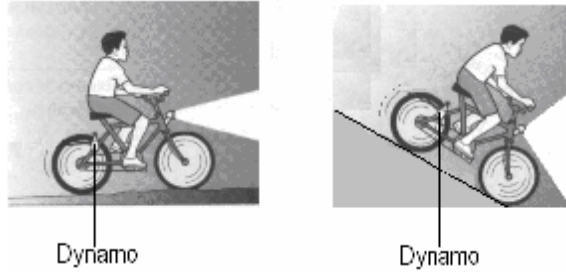


Diagram 3.26

Based on the information and the observation above:

- (a) State **one** suitable inference. [1 Mark]
- (b) State **one** suitable hypothesis. [1 Mark]
- (c) With the use of apparatus such connection wires, bar magnet , solenoid and other apparatus, describe an experiment framework to investigate the hypothesis stated in (b). [10 Marks]
- In your description, state clearly the following:
- Aim of the experiment
 - Variables in the experiment
 - List of apparatus and materials
 - Arrangement of the apparatus
 - The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable
 - The way you would tabulate the data
 - The way you would analysis the data

KNOWLEDGE

CHAPTER 1 : INTRODUCTION TO PHYSICS			
NO	TERMS	DEFINITIONS / MEANING	FORMULA
1.	Physical quantities	Quantities that can be measured	
2.	Base quantities	Physical quantities that cannot be defined in terms of other quantities	
3.	Derived quantities	Physical quantity obtained from the combination of base quantities through multiplication or division or both	
4.	Base units	Units that cannot be defined in terms of other units	
5.	Derived units	Units which are obtained from the combination of base units through multiplication or division or both	
6.	Consistency	The ability (of a measuring instrument) to measure a quantity with little or no deviation among the measurements	
7.	Accuracy	The closeness of a measurement to the actual value	
8.	Sensitivity	The ability (of a measuring instrument) to detect a small change in the quantity to be measured	
9.	Error	The difference between the measured value and the actual value.	
10.	Systematic errors	Errors in the calibration of instruments or the non-zero reading when the actual reading should be zero	
11.	Random error	Errors due to the mistakes made by the observer when taking measurement either through incorrect positioning of the eye or the instrument	

12.	Parallax error	Error due to the incorrect positioning of the eye when reading a measurement	
13.	Zero error	The non-zero reading when the actual reading should be zero that is the pointer of the instrument does not return to the zero position when it is not being used	
CHAPTER 2 : FORCES AND MOTION			
NO	TERMS	DEFINITIONS / MEANING	FORMULA
1.	Vector quantity	Physical quantities that have both magnitude and direction	
2.	Scalar quantity	Physical quantities that have magnitude only	
3.	Distance	The total path length travelled from one location to the other	
4.	Displacement	The distance between two locations measured along the shortest path connecting them in a specified direction	
5.	Speed	Rate of change of distance OR Distance travelled per unit time	
6.	Velocity	Rate of change of displacement	$v = \frac{s}{t}$
7.	Acceleration	Rate of change of velocity	$v = \frac{s}{t}$
8.	Deceleration	Rate of decrease in velocity	$a = \frac{v - u}{t}$
9.	Inertia	The tendency of the object to remain at rest or if moving to continue its motion	
10.	Mass	The quantity of matter in an object	
11.	Momentum	Product of mass and velocity	$p = mv$

12.	Principle of conservation of momentum	In a closed system, the total momentum before collision is equal to the total momentum after collision provided there is no external force	$m_1u_1+m_2u_2 = m_1v_1+m_2v_2$
13.	Elastic collision	A collision in which the objects do not combine after collision	
14.	Non-elastic collision Force	A collision in which the objects are combined after collision	$F = ma$
15.	Unbalanced / net / resultant force	A single force that represents the combined effect of two or more forces with magnitude and direction	
16.	Balanced forces / Forces in equilibrium	Situation in which forces acting on an object produces no net force . The object is stationary or moves with a constant velocity in a straight line.	$F = \frac{m(v - u)}{t}$
17.	Force / Impulsive force	Rate of change of momentum	$impulse = mv - mu$ $Impulse = Ft$
18.	Impulse	Change in momentum	
19.	Gravitational field	The region around the earth which an object experiences a force towards the centre of earth	$g = 10 \text{ N kg}^{-1}$
20.	Gravitational field strength	The gravitational force acting on a mass of 1 kg placed at that point	$g = 10 \text{ m s}^{-2}$
21.	Gravitational acceleration	The acceleration of an object due to the pull of the gravitational force	
22.	Free fall	The motion in which the object falls due to gravitational force only	$W = mg$
23.	Weight	The gravitational force acting on the object	$F = \frac{m(v - u)}{t}$
24.	Newton's Second Law of Motion	The acceleration produced by a net force on an object is directly proportional to the magnitude of the net force applied and is inversely proportional to the mass of the object.	

25.	Resolution of forces	The separation of a single force into two perpendicular components called the vertical and the horizontal component	$F_x = F \cos \Theta$ $F_y = F \sin \Theta$
26.	1 Newton	Is the force which acts on a body of mass 1 kg and causes the body to accelerate at 1 m s^{-2}	$F = ma$ $1\text{N} = 1\text{kg} \times 1\text{ms}^{-2}$
27.	Energy	The ability to do work	
28.	Work done	The product of the applied force and the displacement in the direction of the applied force	$W = Fs$
29.	Power	The rate at which work is done OR the amount of work done per second	$P = \frac{E}{t}$ $P = W / t$
30.	1 watt	The power generated when 1 J of work is done in 1 s	$1W = 1J/1s$
31.	Kinetic energy	The energy of an object due to its motion	$E_k = \frac{1}{2}mv^2$
32.	Gravitational potential energy	The energy of an object due to its higher position in the gravitational field	$E = mgh$
33.	Density	Mass per unit volume	$\rho = \frac{m}{V}$
34.	Principle of Conservation of energy	Energy cannot be created or destroyed. Energy can be transformed from one form to another. The total energy in a closed system is constant .	
35.	Efficiency	The percentage of the energy input that is transformed into useful energy	$Ef = \frac{P_{out} \times 100}{P_{in}}$ $Ef = \frac{E_{out} \times 100}{E_{in}}$
36.	Elasticity	The ability of an object to return to its original size / length / shape when the force that is acting on it is removed.	

37.	Hooke's Law	The extension of a spring is directly proportional to the applied force provided the elastic limit is not exceeded	$F = k x$
38.	Elastic limit	The maximum force which can act on an object before it loses its elasticity	
39.	Force constant / spring constant	Force per unit extension	$k = \frac{F}{x}$
40.	Elastic potential energy	The energy stored in an object when it is stretched or compressed	$E = \frac{1}{2}Fx$ $E = \frac{1}{2}kx^2$

CHAPTER 4 : HEAT			
NO	TERM	DEFINITION / MEANING	FORMULA
1.	Thermal equilibrium	The situation in which two objects which are in thermal contact have the same rate of heat transfer and the same temperature The NET heat flow between the two objects is zero	
60.			
2.	Lower fixed point / ice point	The temperature at which pure ice melts under the standard atmospheric pressure	
3.	Upper fixed point / Steam point	The temperature of steam from pure water that is boiling under standard atmospheric pressure	
4.	Heat capacity	The amount of heat required to increase the temperature of an object by 1°C	
5.	Specific heat capacity	The amount of heat that must be supplied to an object of mass 1 kg to increase its temperature by 1°C	$c = \frac{Q}{m\theta}$
6.	Specific latent heat of fusion	The amount of heat required to change 1 kg of a substance from solid to liquid without any change in temperature	$l = \frac{Q}{m}$
7.	Specific latent heat of vaporisation	The amount of heat required to change 1 kg of a substance from liquid to gas without any change in temperature	$l = \frac{Q}{m}$
8.	Boyle's Law	For a fixed mass of gas, the pressure of the gas is inversely proportional to its volume when the temperature is kept constant	$P_1V_1 = P_2V_2$
9.	Charles' Law	For a fixed mass of gas, the volume of the gas is directly proportional to the absolute temperature of the gas when the pressure is kept constant	$\frac{V_1}{T_1} = \frac{V_2}{T_2}$

CHAPTER 3 : FORCES AND PRESSURE			
NO	TERM	DEFINITION / MEANING	FORMULA
1.	Pressure	Magnitude of force acting perpendicularly to a surface per unit area of the surface	$P = \frac{F}{A}$
2.	1 pascal or 1 N m ⁻²	The pressure exerted on a surface when a force of 1 N acts perpendicularly to an area of 1 m ²	
3.	Atmospheric pressure	The pressure due to the weight of the air acting per unit area on the earth's surface	
4.	Pascal's Principle	The pressure applied to an enclosed fluid is transmitted uniformly to every part of the liquid.	$\frac{F_1}{A_1} = \frac{F_2}{A_2}$
5.	Buoyant force	The upward force exerted by a fluid when an object is wholly or partially immersed in the fluid	$F = \rho V g$
6.	Archimedes' Principle	For a body wholly or partially immersed in a fluid, the buoyant force is equal to the weight of the fluid it displaces	
7.	Bernoulli's Principle	In a moving fluid, where the speed is low, the pressure is high and where the speed is high, the pressure is low	

10.	Pressure Law	For a fixed mass of gas, the pressure of the gas is directly proportional to the absolute temperature of the gas when the volume is kept constant	$\frac{P_1}{T_1} = \frac{P_2}{T_2}$
11.	Absolute zero	The lowest temperature in theory in which the pressure and the kinetic energy of gas molecules are zero	

CHAPTER 5 : LIGHT			
NO	TERM	DEFINITION / MEANING	FORMULA
1.	Law of reflection	i)The incident ray, the reflected ray and the normal all lie in the same plane ii) The angle of incidence is equal to the angle of reflection	
2.	Principal axis of a curved mirror	The line passing through the vertex, P and the centre of curvature, C	
3.	Centre of curvature,C	The centre of the sphere that forms the curved mirror	
4.	Focal point, F of a concave mirror	The point on the principal axis where the reflected rays converge that is meet and intersect	
5.	Focal point, F of a convex mirror	The point on the principal axis where the reflected rays diverge that is appear to spread out from behind the mirror	
6.	Real image	The image that can be formed / displayed on a screen	
7.	Virtual image	The image that cannot be formed on a screen	
8.	Reflection of light	The return of light waves when they hit a reflector (mirror)	
9.	Refraction of light	The bending of light ray at the boundary as it travels from one medium to another of different optical densities	

10.	Law of refraction	The incident ray, the refracted ray and normal all lie in the same plane. The ratio of sin i / sin r is a constant (Snell's Law)	
11.	Refractive index, n	The value of the constant (sin i / sin r) for a light ray passing through a vacuum into a given medium	$n = \frac{\sin i}{\sin r}$
12.	Real depth	The distance of the real object from the surface of a medium (eg water, glass)	$n = \frac{v}{u}$
13.	Apparent depth	The distance of the virtual image from the surface of the medium (eg water, glass)	$n = \frac{H}{h}$
14.	Critical angle, c	The angle of incidence in the denser medium when the angle of refraction in the less dense medium is 90°	$n = \frac{1}{\sin c}$ $c = \sin^{-1} \frac{1}{n}$
15.	Total internal reflection	The condition in which the light ray from a denser medium to a less dense medium is reflected back into the denser medium when the angle of incidence is greater than the critical angle	
16.	Focal point , F of a lens	A common point on the principal axis where all the rays parallel to the axis converge to it after passing through a convex lens or appear to diverge from it after passing through a concave lens	$f = 1/P$
17.	Focal length, f	The distance between the focal point and the optical centre	
18.	Power of lens	The reciprocal of the focal length	$P = 1/f$
19.	Linear magnification	The ratio of the image size to the object size OR the ratio of the image distance to object distance	$m = \frac{v}{u}$ $m = \frac{\text{image size}}{\text{object size}}$

CHAPTER 6 : WAVES			
NO	TERM	DEFINITION / MEANING	FORMULA
1.	Wave	A travelling disturbance from a vibrating or oscillating source which carries energy along with it in the direction of the propagation	
2.	Vibration / oscillation	A uniform to –and-fro motion of an object / particle from a vibrating source	
3.	Transverse wave	A wave in which the particles of the medium oscillate in the direction perpendicular to the direction in which the wave moves (eg water, light, all EM waves)	
4.	Longitudinal wave	A wave in which the particles of the medium oscillate in the direction parallel to the direction in which the wave moves (eg sound)	
5.	Wavefront	An imaginary line that joins all identical points on a wave	
6.	One complete oscillation	The to-and-fro motion of an object / particle from one particular point	
7.	Amplitude, a (SI unit : m)	The maximum displacement from the mean position of a wave	
8.	Period, T (SI unit :s)	The time taken to complete one oscillation	$T = \frac{1}{f}$
9.	Frequency, f (SI unit : Hz)	The number of complete oscillations made in 1 second	$f = \frac{1}{T}$
10.	Wavelength, λ	The horizontal distance between two successive equivalent points on a wave	
11.	Damping	Energy loss from an oscillating system to the surrounding in the form of heat energy	$\lambda = v / f$ $v = f \lambda$
12.	Natural frequency	The frequency in which an oscillating system vibrates when no external force is applied	
13.	Resonance	The phenomena in which an oscillating system is driven at its natural frequency by a periodic force. Maximum energy transfer occurs to the system and it oscillates at a large amplitude	

14.	Reflection of waves	The phenomena when all or part of the wave return after they encounter an obstacle known as reflector	
15.	Refraction of waves	The phenomena in which there is a change of direction of propagation due to a change of speed when water waves travel one area to another of different depths	
16.	Diffraction of waves	The phenomena that refers to the spreading out of waves when they move through a gap or round an obstacle	
17.	Interference of waves	The phenomena in which two sets of coherent waves meet / combine	
18.	Coherent waves	Waves which maintain a constant phase difference, amplitude and frequency	
19.	Principle of Superposition	The combined wave forms of two or more interfering waves waves is given by the sum of the displacement of the individual wave at each point of the medium	
20.	Constructive interference	The combination / superposition of two coherent waves in which the vertical displacements of the two waves are in the same direction	
21.	Destructive interference	The combination / superposition of two coherent waves in which a positive displacement of a wave meets a negative displacement of another wave and the combined amplitude becomes zero	
22.	Audio waves	Sound waves generated between 20 Hz and 20 kHz and can be heard by normal human ears	
23.	Infrasound	Sound with frequency below 20 Hz	
24.	Ultrasound	Sound with frequency above 20 kHz	
25.	Electromagnetic spectrum	Consists of a group of waves with similar natures and are arranged in increasing frequencies and decreasing wavelengths	
26.	Electromagnetic waves	Waves which consist of a joint electric and magnetic fields which oscillate perpendicular to each other	

CHAPTER 7 : ELECTRICITY			
NO	TERM	DEFINITION / MEANING	FORMULA
1.	Electric current	The rate of charge flow in a circuit	$I = \frac{Q}{t}$
2.	1 ampere	The electric current that flows through a conductor if 1 coulomb of charge flows through the conductor in 1 second	$A = C s^{-1}$ $1A = \frac{1C}{1s}$
3.	Electric field	A region in which an electric charge experiences an electric force	
4.	Potential difference	The work done or the energy that would be required to move 1 C of charge from one point to another in a circuit	$V = \frac{E}{Q}$
5.	1 volt	The work done to move 1C of charge between two points is 1 J	$V = J C^{-1}$ $1V = \frac{1J}{1C}$
6.	Resistance	The ratio of potential difference across a conductor to the electric current flowing through the conductor	$R = V / I$
7.	Ohm's Law	The electric current passing through an ohmic conductor is directly proportional to the potential difference between its end provided that the temperature and other physical properties of the conductor are constant	$V = IR$
8.	Series circuit	All the components are connected one after another in a single path	
9.	Parallel circuit	All the components are connected with their corresponding ends joined together at common points to form separate and parallel paths	$E = I(R+r)$
10.	Electromotive force (EMF)	The work done by a source (dry cell / battery) in driving a unit charge around a complete circuit	$r = \frac{E-R}{I}$
11.	Internal resistance, r	The resistance against the moving charge due to the electrolyte in the cell / battery	$P = \frac{W}{t}$
12.	Electrical power	The rate of electrical energy dissipated or transferred	

CHAPTER 7 : ELECTROMAGNETISM			
NO	TERM	DEFINITION / MEANING	FORMULA
1.	Electromagnet	A temporary magnet made by winding a coil of insulated wire round a soft iron core	
2.	Magnetic field	A region round a current –carrying conductor in which a magnetic force acts	
3.	Catapult field	The resultant magnetic field due to the combination of the magnetic field due to the current in the conductor and the external magnetic field	
4.	Electromagnetic induction	The setting up of an electromotive force in a conductor due to a change in the magnetix flux caused by the relative motion of the conductor and a magnetic field. The induced emf will cause induced current to flow	
5.	Lenz's Law	The direction of the induced current in such that the change producing it will be opposed	
6.	Faraday's Law	The magnitude of the induced emf is directly proportional to the rate of change of magnetic flux or the rate of cutting of the magnetic flux	
7.	Direct current	A current that flows in one direction only in a circuit and the magnitude of the current maybe constant or changes with time	
8.	Alternating current	A current which flows to and fro in two opposite directions in a circuit and it changes its direction periodically	
9.	Transformer	A device which works on the principle of electromagnetic induction which steps up or steps down alternating current voltages	$\frac{N_s}{N_p} = \frac{V_s}{V_p}$ $E_f = \frac{V_s I_s \times 100}{V_p I_p}$
10.	Step-up transformer	A transformer where the number of turns in the secondary coil is greater than the number of turns in the primary coil, the voltage across the secondary coil is greater than the voltage across the primary coil	
11.	Step-down transformer	A transformer where the number of turns in the secondary coil is less than the number of turns in the primary coil, the voltage across the secondary coil is less than the voltage across the primary coil	

12.	Ideal transformer	A transformer in which the output power is equal to the input power and there is no energy loss during the process of transforming the voltage	$P_{out} = P_{in}$ $V_s I_s = V_p I_p$
13.	Eddy current	The current induced in the soft iron core due to the changing magnetic field produced by the alternating current in the coils	
14.	National Grid Network	A network system of cables which connects all the power stations and substations in the country to the consumers in a closed network to transmit electricity	

9.	Forward bias	The connection in which the p-type (anode) of the diode is connected to the positive terminal of a battery and the n-type (cathode) is connected to the negative terminal of the battery	
10.	Reverse bias	The connection in which the p-type (anode) of the diode is connected to the negative terminal of a battery and the n-type (cathode) is connected to the positive terminal of the battery	
11.	Rectifier	An electrical device that converts alternating current to direct current	
12.	Half-wave rectification	A process where only half of every cycle of an alternating current is made to flow in one direction only.	
13.	Full-wave rectification	A process where both halves of every cycle of an alternating current is made to flow in the same direction	
14.	Transistor	An electronic device which has three terminals labelled base, collector and emitter, made by coalescing (fusing) the n-type and p-type semiconductors	
15.	Logic gates	A switching circuit made up of a combination of transistor switches which has one or more inputs but only one output	
16.	Truth table	A record of all the possible combinations of inputs and the corresponding outputs for a particular logic circuit	

CHAPTER 9 : ELECTRONIC			
NO	TERM	DEFINITION / MEANING	FORMULA
1.	Thermionic emission	The process of emission of electrons from the surface of a heated metal	
2.	Cathode ray	The stream of electrons which moves from cathode to anode at high speed across a vacuum	
3.	Semiconductor	A material which can conduct electricity better than insulator, but not as well as conductor	
4.	Doping	A process of adding a certain amount of specific impurities called dopants to a semiconductor to increase its conductivity	
5.	n-type semiconductor	Semiconductor obtained when pentavalent atoms which are doped into the intrinsic semiconductor contribute extra electrons. Free electrons become the majority charge carrier and the holes become the minority carrier	
6.	p-type semiconductor	Semiconductor obtained when trivalent atoms which are doped into the intrinsic semiconductor contribute extra holes. Free electrons become the minority charge carrier and the holes become the majority charge carrier	
7.	p-n junction	Formed when pieces of n-type and p-type semiconductors are fused together	
8.	semiconductor diode	An electronic device made from a p-n junction that allows current to flow in one direction only but blocks it in the opposite direction	

CHAPTER 10 : RADIOACTIVITY			
NO	TERM	DEFINITION / MEANING	FORMULA
1.	Proton number, Z	The number of protons in the nucleus of an atom	
2.	Nucleon number, A	The total number of protons and neutrons in the nucleus of an atom	
3.	Isotopes	Atoms of an element which have the same proton number but different nucleon number	
4.	Radioactivity	The spontaneous disintegration of an unstable nucleus accompanied by the emission of an energetic particle or a photon (or radioactive emission)	

5.	Radioactive decay	The process in which an unstable nucleus changes into a more stable nucleus by emitting radiation
6.	Radiation	The energy given out by an unstable nucleus in the form of energetic particles or photon
7.	Ionising effect	The production of charged particles called ions when the energetic particle or photon passes through a medium, it can knock electrons out of the atoms and molecules of the medium.
8.	Half-life	The time taken for the number of the undecayed nuclei in the sample to be reduced to half of its original number
9.	Radioisotopes	Unstable nuclei of an element which have the same number of protons but different number of neutrons which decay and give out radioactive emissions
10.	Atomic mass unit (amu or u)	1/12 of the mass of the carbon-12 atom
11.	Nuclear fission	The process of splitting a heavy nucleus into two lighter nuclei which releases enormous amount of energy
12.	Chain reaction	Self-sustaining reaction in which the products of a reaction can initiate another similar reaction
13.	Nuclear fusion	The process of combining two lighter nuclei to form a heavier nucleus which releases enormous amount of energy
14.	Einstein's Principle	Mass and energy are not conserved separately and can be exchanged one for the other by using this equation : $E = mc^2$ where E = energy released(J), m=mass defect(kg) c = speed of light ($3 \times 10^8 \text{ ms}^{-1}$)

UNDERSTANDING

- 2.1** Arms and legs are open :
Increases the surface area, Increases the air resistance
Resultant force decreases
Reduce the velocity during falling
- 2.2** It shape is width to reduce the pressure and avoid hurt.
Avoid injury to the driver.
Can be stretch.
Add the time of impact / reduce impulsive force
- 2.3** In upwards direction the ball decelerates
The gravitational force acts in opposite direction to direction of the ball.
In downwards direction the ball accelerates
The gravitational force acts in same direction as the direction of the ball.
- 2.4** There are two forces acting on the molecules in the substance.
The forces are the repulsion force and attraction force.
When a stretching force acting on the substance,
it molecules will against the force using attraction force.
When a compression force acting on the substance,
it molecules will against the force using repulsive force.
This action will cause the substance has an elasticity.
- 2.5** Upthrust = weight of the boat
Sea water is denser.
Boat displaced less sea water and gain the same upthrust .
Therefore boat sinks less in sea water
- 2.6** When the boy jumps onto the river bank, his momentum is forward.
Using the Principle of conservation of momentum
the total momentum before and after jumping is equal.
The boat moves backward to balance the forward momentum
- 2.7** When the girl jumps on the trampoline bed, the force of the jump stretches the springs.
As the springs are stretched, they store elastic potential energy.
At that point, the potential energy in the springs is converted to kinetic energy, and
the springs begin to restore themselves to their initial position.
The kinetic energy provided by the springs pushes the girl up into the air and change to
potential energy.
- 3.1** To support the weight of users and vehicles that moves on it // total weight of users and
vehicles > maximum weight .
- 3.2** Spinning ball moving in the opposite direction with air flow at the upper surface
Spinning ball moving in the same direction with air flow at the lower surface
Lower surface spins more faster than the upper surface of the ball
- 3.3** The submarine has a ballast tank in front and at the end of submarine.

A water is filled in the ballast tank to increase the density of the submarine // the weight of submarine.
The submarine will sank in the sea when it weight is bigger than buoyant force.

- 3.4** Atmospheric pressure higher than air pressure inside dust bin //different pressure //
Forces occurred pushed the dust inside //
- 3.5** The area in contact with the ground for the shoes in figure 3.5.2 is larger than the shoes in figure 3.5.1
The pressure exerted by the shoes in figure 3.5.2 is lower than the shoes in figure 3.5.1
The shoes in figure 3.5.2 is difficult to sink into the ground compared to the shoes in figure 3.5.1.
So, it is easier to run using the shoes in figure 3.5.2.
- 3.6** A cargo ship displaces a larger volume of water
The buoyant force acted on the ship is higher compare to iron nail
- 3.7** B is denser than A.
The weight of water displaced is the same of the weight of the rod.
Weight of B is greater than weight of A
B will displace more volume of water
- 3.8** when the small piston, X is pressed down, the pressure is exerted under the piston X.
the liquid transmit pressure to all directions and to large piston, Y.
when the pressure acted on larger piston, Y it will produced a large force.
the large force will push the load up
- 3.9** The shape of cross section of the wing causes the speed of airflow
Above the wings to be higher than the speed of airflow below
When the speed of moving air is higher ,the pressure is lower
Hence air pressure below the wings is higher compare to above the wings
- 4.1** The specific heat capacity land less than sea water.
During the day time, the land is warmer than the sea.
Air above the land is hot and less dense, so it will move up.
The cooler air from sea more dense move to land
- 4.2** The paper doesn't burned initially
Heat transferred to the iron rod
Until the temperature of paper is equal to temperature of the iron rod at 230°C
The paper will burned after.
- 4.3** Put the thermometer in melting ice , mark the lower part of mercury thread, l_0
Place the same thermometer in the boiling water,mark the top part of the mercury thread, l_{100}
Divide the length between the two marks into 100 equal divisions
Each division is now equal to 1 ° C

4.4 Cup B
The ice is exposed to the surroundings
The ice absorb heat from the surrounding

4.5 It doesn't react to the inner part of the engine
high specific heat capacity
can absorb large amount of heat energy
cheap and easily available

4.6 The energy transferred from a hot object to a cold object // the energy transfer because of the difference in temperature
The temperature of the forehead is higher than the temperature of the pad
Heat is transferred from the forehead to the pad

5.1 Concave surface gives inverted image
Sketch a ray diagram to show a diminished inverted real image
Convex surface give upright image
Sketch a ray diagram to shown diminished upright virtual image.

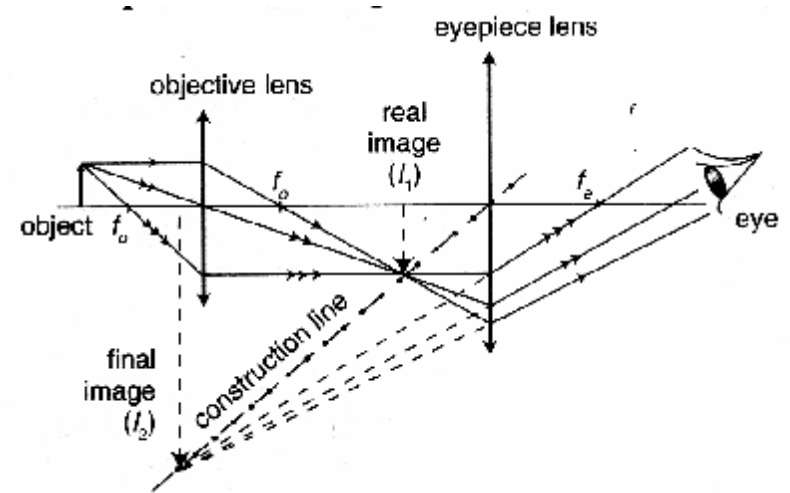
5.2 the layer of air near the ground are hotter and less dense medium //
the layer of air higher up are cooler and denser medium
light from the sky in refracted towards normal after passing through less dense medium from denser medium.
Near the ground, the angle of incidence is greater than the critical angle
the total internal reflection occur and the light is reflected to the eye's observer.
the layer of air near the ground are hotter and less dense medium //
the layer of air higher up are cooler and denser medium

5.3 Increase the angle of incidence, i , then angle of refraction, r will also increase
Keep on increasing the angle of incidence until angle of refraction is 90°
The angle of incidence is called critical angle
Increase the angle of incidence more than the critical angle
The ray will be reflected.

5.4 The convex lens with its holder is aimed at a distant object like a tree.
Adjust a screen until you see a very sharp and clear image of the distant object.
When parallel light rays from a distant object pass through a convex lens, they will converge to a point called focal point/ label on a diagram
Measure the distance between the convex lens and screen./ label on a diagram

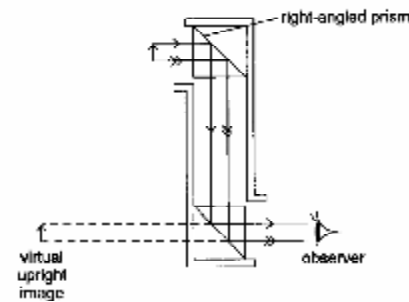
5.5 draws the objective and eyepiece lenses.
correct label of objective and eyepiece
label f_o and f_e correctly
draw the correct position for the object ($f_o < u_1 < 2f_e$)

draw ray diagrams to show the position of image 1
draw ray diagrams to show the final image



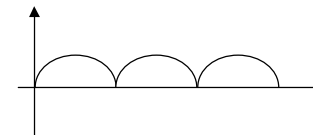
5.6 C is centre of a circle or CM is radius of circle
The light strike perpendicular to the mirror.
Incident angle is 0° .
reflection angle is 0° or reflection law is obeyed

5.7 Draw a correct ray diagram with at least 2 rays
Box
Using two right-angled prisms
Arrangement of prism
Total internal reflection



- 5.8** Draw a diagram to show the rays of light
Total internal reflection.
180° fish eye view
Obstacle
- 5.9** The refractive index of the internal layer of the optical fibre is greater than the external layer or air
Angle of incidence, $i >$ critical angle, c
Total internal reflection occur
- 6.1**
- Sound waves from two loudspeakers produced two coherent sources
 - Sounds wave interfere
 - Constructive interference produced loud sound
 - Destructive interference produced soft sound
- 6.2**
- At the centre of the ocean the water waves travel at uniform speed as the depth of the sea is uniform reduced, refraction occurs when the waves reach the shore
 - ,the water is shallower wave speed
 - Refraction causes the wave front bend toward the normal
 - This results the wave front following the shape of of coastline
- 6.3** The distance between the water molecules is closer compared to air molecules.
Thus, the sound energy can be transferred faster.
- 6.4** Sound wave produces by audio generator and aeroplane engine are coherent
Interference occur between two sound waves
The distance between generator and aeroplane are short
To produce destructive interference
- 6.5** Light ray is refracted through the diamond
Light ray is totally reflected back before refracted out
The light is spread out into a spectrum of colour
- 6.6** When the wave passing through shallow water// convex area, the wavelength and speed decrease
After the wave passing through shallow water// convex area, the circular waves converge at focal point an then diverge from the focal point
- 6.7** The kinetic energy of the stone
makes the water surface move up and down near where the stone lands and ripples spread out outwards

- 6.8** Ships send the sound waves
The time interval is measured between a pulse of sound and its echo from the sea bed.
Distanced travelled by pulsed = speed x time/2
- 7.1** The two dry cells are connected in parallel
The effective e.m.f. remains the same
The effective internal resistance of the two cells is smaller
A larger current will flow through the bulb to make it brighter
- 7.2**
State the situation when touching the live wire correctly
Our bodies are at earth potential (0V)
If we touch the live wire, there will be a large potential difference (p.d) the live wire and our body. A large current flow through it, probably fatal.
State the situation when touching the neutral wire correctly
The neutral wire stays at earth potential (0V), roughly at the same potential as our bodies.
If we touch the neutral wire, there is no p.d. across us and so no current flows.
- 7.3**
The lighted candle / the heat from the candle causes the air molecules (surrounding it) to be ionized.
The positive charges would be attracted to the negative plate and/or the negative charges would be attracted to the positive plate
The flame of the candle would be dispersed (flattened) into top parts // suitable diagram
More the flame is attracted to the negative plate //diagram
Positive charges are heavier than negative charges.
(any 4 correct)
- 7.4** The current through each electrical appliance is higher//The bulbs in the parallel circuit light up brighter compared to the same bulbs in series circuit// Effective resistance is much smaller when connected in parallel circuit
If any devices/components broke down, others can still be used
The circuit breaker / fuse can be connected to each path for safety
Only certain devices that are not in used can be switched off. The current can still flow through the other path
- 8.1** Magnetic flux is cut , induced current is produced
When $\Theta = 90^\circ$ maximum current produced //
 $\Theta = 0^\circ$ minimum current produced
Commutator is used to ensure the direction of the current that flows through the external circuit is in one direction



- 8.2** Electric current flow trough copper strips from ZY to WX.

Magnetic field produced in the copper strips when the current flows.// Diagram.
 The direction of the magnetic fields is the same. // Diagram
 The copper rods repel to each other// the copper rods bent// diagram.

8.3 Solenoid experiences a change in magnetic field.
 An induced current / e.m.f induced in the solenoid

8.4 (a) Force acting on the copper rod
 moved the copper rod towards the magnet

(b) the copper rod vibrates
 as current change direction

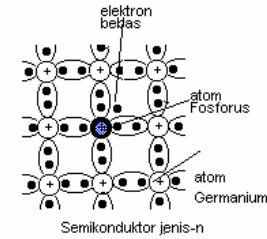
8.5 When the current flow into the coil, magnetic field is produced.
 And forces are produced
Catapult field is produced
 The forces are in the opposite direction
 These pair of forces produce the turning effect on
 the coil.

8.6 When the switch is on, the soft iron core becomes electromagnet. End A becomes north pole.
 End B becomes south pole
 Magnet P repels from end A
 Magnet Q attracts to end B

8.7 When the switch is on, current flows in the solenoid, soft iron core becomes electromagnet
 electromagnet attracts the iron armature, the hammer hits the gong and bell rings
 when the hammer moves towards the gong, the contacts open, current stops flowing
 The iron core loses its magnetic

8.8 When an alternating current (a.c.) is passed through the primary coil, an alternating magnetic flux occurs.
 The iron core becomes an electromagnetic
 The magnetic flux grows outward from the primary coil and they cut the secondary coil
 An alternating electromagnetic force (emf) is induced in the secondary coil

9.1 Doping process
 With pentavalent atom // Diagram
 To produce covalent bonds // Diagram
 Have one extra electron // Diagram



9.2

Connect the dry cell terminal to the Y-input of CRO.
 The Y-gain is set to a value so that the direct current wave form displayed on the screen CRO
 Determine the distance / part of y-axis.
 Potential different = (Y-gain scale) x (Vertical distance of direct current wave)

9.3



- 1.
2. when current flow, (capacitor) charged up
3. when no current flow, (capacitor) is discharged
4. capacitor connected parallel // diagram

9.4 At night, no light fall on the LDP, resistance, R of LDP ↑.
 As R ↑, the voltage, V across the LDP also ↑.
 V across the base circuit > V_{min}, this will switch on the transistor and the collector circuit works.

10.1

Penetration power α ray is weak and can't penetrate aluminium plate.
 Penetration power γ ray is too high and effect our health.

10.2

Put the radioactive source opposite the detector
 Detector is connected to the thickness indicator
 Detector detect the reading of the changes in counts
 Thickness is measured with the thickness indicator
 If the reading of the detector is less than the specified value, the thickness of the paper is too tick/ vice versa

10.3

The resulting nucleus (nuclei) formed has a smaller mass than the original nucleus (nuclei)
 The mass defect caused energy to be released (resulting in a more stable nucleus /nuclei)

10.4

The fertilizer that contains a radioisotope of one of the elements is injected into the soil/plant
 Wait for a few days for the fertilizer to be absorbed

Use the G-M tube and ratemeter to detect the radiations
The locations of where the fertilizer has gone to are located and analysed

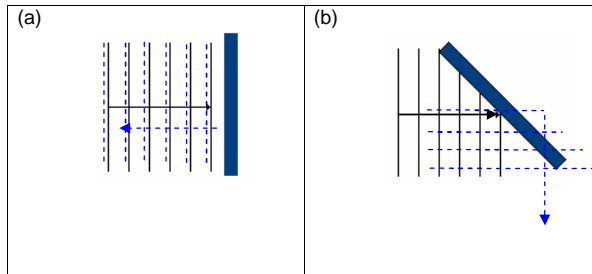
- 10.5** Put a radioactive substance into the water and let the water flow to the location of the leak
After some time use a radiation detector above the ground to detect the location of increased activity
This position is the location of the leak
The radioactive substance would flow out together with the water and remained outside the pipe

APPLICATION

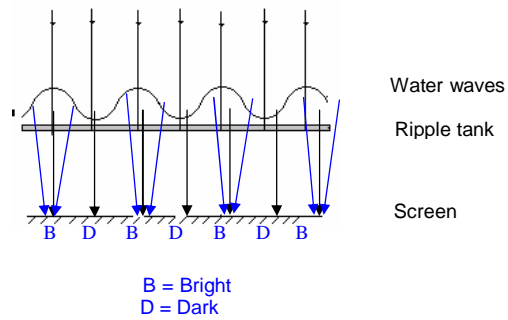
- 1.1 Group 1
= 51.25g
Group 2
= 56.25g
- 1.2 Reading
= (6.5 + 0.47) - 0.02
= 6.95mm
- 2.1 = 12.3cm
- 2.2 = 100cm
- 2.3 = 10Ns
- 2.4 More than 10N
- 2.5 6ms^{-2}
ii) 1212N
- 2.6 140m
- 3.1 = $2.3 \times 10^4\text{Pa}$
- 3.2 11.0cm Hg
- 3.3 i) 2.5Ncm^{-2}
ii) $F = 12.5\text{N}$
- 3.4 4000N
- 4.1 metal Y has the highest specific heat capacity
- 4.2 $T = 23.33^\circ\text{C}$
- 4.3 $L = 12.43\text{cm}$
- 4.4 (a) 300s
(b) $L = 1.5 \times 10^5\text{Jkg}^{-1}$
 $m = 2.5$
- 5.1 height of image = 6cm
5.2 apparent depth = 22.5cm
- 6.1 a) $30/15 = 2\text{ Hz}$
b) $T = 1/f = \frac{1}{2}\text{ s} = 0.5\text{ s}$
- 6.2 a) 5 cm
b) 4 s
c) $f = 1/T = \frac{1}{4} = 0.25\text{ s}$
- 6.3 a) 5 cm
b) 4 cm

6.4 Amplitude = 2 cm
Wavelength = 10 cm
Speed = 120 cm s⁻¹

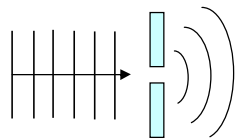
6.5



6.6

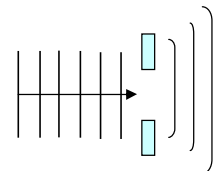


6.8 (a)

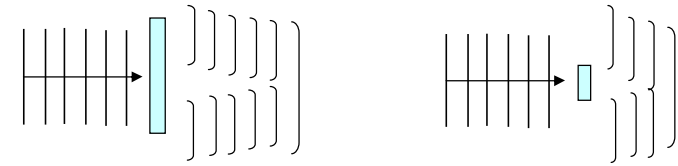


(c)

(b)



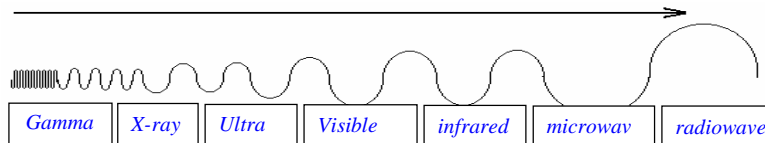
(d)



6.9	Before superposition	During superposition	After superposition
6.10	a) A, B b) C, D, E, F		
6.11	(a) $\lambda = 633 \text{ nm} = 633 \times 10^{-9}$ $a = 0.5 \text{ mm} = 0.5 \times 10^{-3} \text{ m}$ $D = 4 \text{ m}$ $x = \frac{633 \times 10^{-9} \times 4}{0.5 \times 10^{-3}}$ $x = 5.064 \times 10^{-3} \text{ mm}$		
6.12	$d = 1250 \times 0.6 = 750.0 \text{ m}$ $f = 5.8 \times 10^5 \text{ Hz}$ $v = 1250 \text{ ms}^{-1}$		

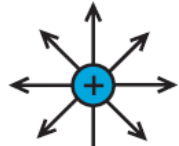
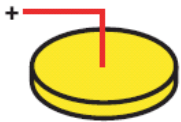
$$\lambda = 0.00215 \text{ m} / 2.15 \times 10^{-3} \text{ m}$$

6.13

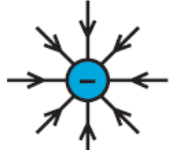
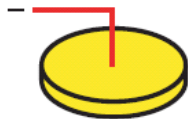


7.1

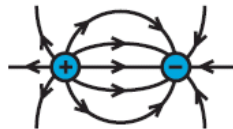
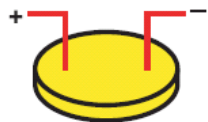
ELECTRIC FIELD AROUND A POSITIVE CHARGE



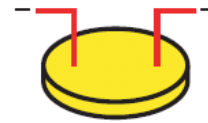
ELECTRIC FIELD AROUND A NEGATIVE CHARGE



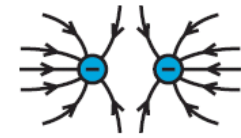
ELECTRIC FIELD AROUND A POSITIVE AND NEGATIVE CHARGE



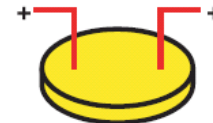
ELECTRIC FIELD AROUND TWO NEGATIVE CHARGES



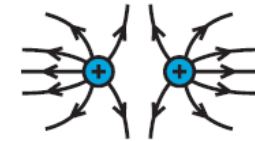
two electrodes



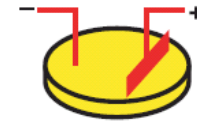
ELECTRIC FIELD AROUND TWO POSITIVE CHARGES



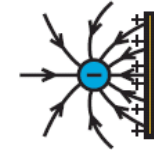
two electrodes



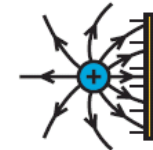
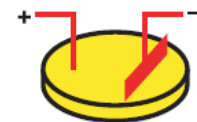
ELECTRIC FIELD AROUND A NEGATIVE CHARGE AND A POSITIVELY CHARGED PLATE

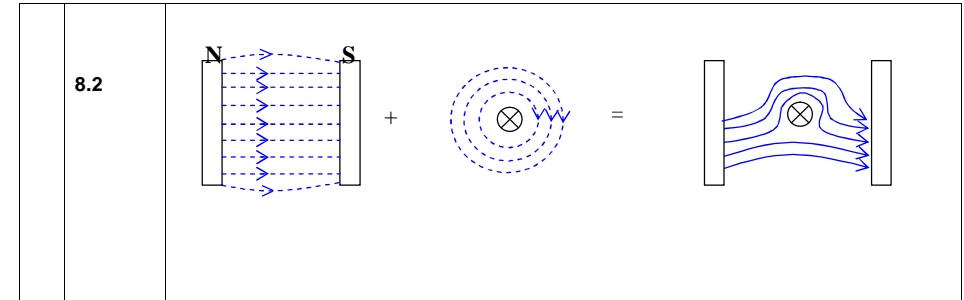
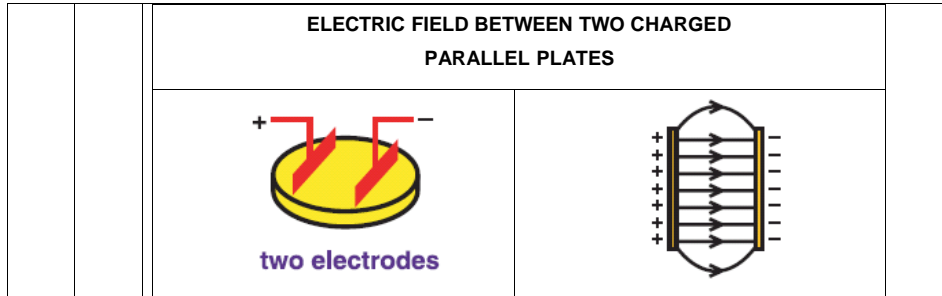


two electrodes



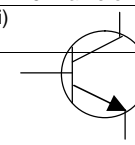
ELECTRIC FIELD AROUND A POSITIVE CHARGE AND A NEGATIVELY CHARGED PLATE





7.2	<p>i) $R_p > R_Q > R_r$</p> <p>ii) From V-I graph, resistance = gradient The greater the gradient, the greater the resistance Gradient of P > Gradient of Q > Gradient of R</p>
7.3	1. X with K Y with M Z with L
7.4	2. Mk 1 – all symbols correct Mk 2 – circuit is correct
7.5	<p>$E = 3.0 \text{ V}, V = 1.35 \text{ V}, I = 0.3 \text{ A}$</p> <p>Substitute in : $E = V + Ir$ $1.5 = 1.35 + 0.3(r)$ $r = 0.5 \Omega$</p>
7.6	<p>$E = VI t$ $= 24 (5) (2 \times 60)$ $= 144 000 \text{ J}$</p>
8.1	

8.3	<p>10.2 - no relative motion between the magnet and the coil //</p> <p>10.3 - there is relative motion Number of turns in 10.3 is less than number of turns in 10.4 Number of turns increases, The change in magnetic flux increases Induced current increases Faraday's Law</p>
8.4	<p>i) - $12 \times 1500 \div 240$ - 75 turns</p> <p>ii) - $0.1 \times 240 \times 0.85 / 0.1 \times 240 \times 85 / 100$ - 20.4 W</p>
9.1	<p>i) alternating current ii) $T = 3 \times 0.02 = 0.06 \text{ s}$ $f = 1 / T = 1 / 0.06 = 16.7 \text{ Hz}$ iii) sketch the waveform correctly - sinusoidal with one complete cycle</p>
9.2	<p>1. Current in transformer is alternating current. 2. In diagram 10.1 the current through R flows in the first cycle, stops flowing in the second cycle / half wave rectification / diagram 3. In diagram 10.2 the current through R flows in the first cycle and also flow during the second cycle. / full wave rectification / diagram 4. The direction of current in both diagram is in one direction / direct current 5. Name of process – rectification</p>
9.3	<p>i)</p>



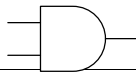
Transistor NPN
 ii) 7.5 V

9.4

Input		Output
A	B	C
0	0	1
0	1	1
1	0	1
1	1	0

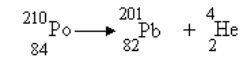
Input		Output		
P	Q	R	S	T
0	0	1	1	0
0	1	1	1	0
1	0	1	1	0
1	1	0	0	1

AND GATE

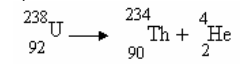


10.1

i)



ii)



10.2

5400 per minute

10.3

- E

2. the most radioactive emission pass through the juice

10.4

$8.45 \times 10^{-4} \text{ J}$

CONCEPTUALISING

Buoyant force = weight of water displaced
object float because buoyant force = weight of object

- 3.2** The depth of the water in Diagram 3.2.1 > 3.2.2
The water spurts out in Diagram 3.2.1 > 3.2.2
The water spurts out further in Diagram 3.2.1 > 3.2.2
The deeper the water, the further the distance of water spurt
The deeper the water, the higher the pressure of the water
The pressure of water increases with the depth of the water
- 4.1** More ice cube in diagram 4.1.1 > diagram 4.1.2
Thermometer reading is 0°C // Thermometer reading is the same // No increase in thermometer reading // constant // unchanged
Heat did not use to increase kinetic energy (temperature) of molecule // Heat is used to break bonds of the molecule // Heat is used to change its state of matter.
Latent heat
- 4.2** the mass of naphthalene in the Figure 4.2.1 < 4.2.2
the time taken for the naphthalene in Figure 4.2.1 to solidify < 4.2.2
the latent heat released in Figure 4.2.1 < 4.2.2
Latent heat released depends on mass of naphthalene
The smaller the mass, the smaller the latent heat released // $Q = mL = Pt$

2.1 Force that acted on the springs are the same

Daya yang bertindak pada kedua-dua spring adalah sama

Both springs are extended
Kedua-dua spring mengalami pemanjangan

Spring N is extended more than spring M
Spring N mengalami pemanjangan yang lebih daripada spring M

Spring M has a bigger spring constant than spring N
Spring M mempunyai pemalar spring yang lebih besar dari spring N

The shorter the spring the bigger the spring constant //
The longer the spring the smaller the spring constant
*Spring yang lebih pendek mempunyai pemalar spring yang lebih besar //
Spring yang lebih panjang mempunyai pemalar spring yang lebih kecil.*

2.2 Diagram 2.2.1 – time for change of momentum is shorter

Diagram 2.2.2 – time for change of momentum is longer.

Rate of change of momentum produces impulsive force.

Both diagram have same impulsive force//change of momentum is same

Time for change of momentum is longer so the impulsive force is smaller // vice versa

3.1 Mass of 3.1.2 > 3.1.1

Volume of water displaced in 3.1.2 > 3.1.1

Buoyant force in 3.1.2 > 3.1.1

5.1 The thickness of lens J > K

The focal length of K > J

The high of image lens J > K

The focal length is the distance between optical centre and focal point

As the focal length increases the power decreases // inversely proportional // $P = \frac{1}{f}$

5.2 (a) same

(b) diagram 5.2.2 > 5.2.1

(c) diagram 5.2.2 < 5.2.1

(d) the further the object from the mirror, the smaller the image formed
the further the object, the smaller the linear magnification

5.3 Refractive index diagram 5.3.2 > 5.3.1

Refraction angle diagram 5.3.2 < 5.3.1

Critical angle diagram 5.3.1 > 5.3.2

When the refractive index is large, the critical angle is small

6.1 Sea bed and cave are hard surface

The wavelength unchanged after hit the sea bed or the cave

Amplitude of the sound wave unchanged

The angle of incidence = angle of reflection

Reflection

6.2 Two coherent sources

Double slits or two loud speakers

Yellow fringes and dark fringes // loud sound and soft sound

Yellow fringes // loud sound caused by the constructive interference
Dark fringes // soft sound caused by the destructive interference

- 7.1** The bulb in parallel circuit // Diagram 7.1.2 is brighter than those in series circuit // Diagram 7.1.1

The potential difference across each bulb in the parallel circuit is the same as that of the battery // dry cell.

The potential difference across each bulb in the series circuit is smaller than that of the battery // dry cell.

The current flowing through each bulb in the parallel circuit is higher than the current flowing in the series circuit.

When the potential difference across each bulb is higher, the current flowing through it is also higher and the bulb is brighter

- 7.2** The voltmeter in Figure 7.2.1(a) is parallel to the resistor while in Figure 7.2.2(a) the voltmeter is parallel to the battery.
The graph in 7.2.2(b) shows that potential difference is directly proportional to current. Obeys Ohm's law
Voltage drop is due to the internal resistance of the battery
Graph in Figure 7.2.2(b) shows that the potential difference across the cell decreases when the current flowing through it increases. // V decreases linearly with I

- 8.1** 8.1.2 - no relative motion between the magnet and the coil //

8.1.3 - there is relative motion

Number of turns in 8.1.2 is less than number of turns in 8.1.3

Number of turns increases,

The change in magnetic flux increases

Induced current increases

Faraday's Law

- 8.2** Production of e.m.f. /current in a conductor produced by the relative motion between the conductor and the magnetic field
The induced current in the alternator is bigger
The induced current in the dynamo is smaller
Magnets used in the alternator are stronger than in the those used in the dynamo
The number of turns in the coil is larger in the alternator than in the dynamo
The speed of rotation of the alternator is faster
Physics concept: Electromagnetic induction

- 8.3** Number of turns in solenoid in Diagram 8.3.1 is more
The magnitude of current flowing in Diagram 8.3.1 is bigger
The number of paper clips attracted to solenoid in Diagram 8.3.1 is more
The strength of the magnetic field increases when the magnitude of current increases
The strength of the magnetic field increases when the number of turns in solenoid increases

- 9.1** Current in transformer is alternating current.

In diagram 9.1.1 the current through R flows in the first cycle, stops flowing in the second cycle / half wave rectification / diagram
In diagram 9.1.2 the current through R flows in the first cycle and also flow during the second cycle./ full wave
The direction of current in both diagram is in one direction
Name of process – rectification

- 10.2** Time elapsed for Diagram 10.2.1 is larger than Diagram 10.2.2
The radioactive mass for both source are the same initially
The radioactive mass decrease exponentially with time
The mass for the radioactivity and fraction of radioactive is inversely proportional with the time elapsed
Half-time is the time taken for the radioactive of any given sample to fall to half of it's the original value

PROBLEM SOLVING

water	
Three / four wings	The rotation motions not occur
The angle is 45°	The time to fly increases

2.1

Design / way / modification	Reason/Explanation
Surface area of outside sailboard larger than inside.	To produce larger different velocity / pressure of wind / air.
Outside surface of sailboard more curve.	Air travel more quickly round the outside of the sailboard than inside.
Designing can be rotated easily by using steering or rudder.	To control the direction of the yacht // To push the boat sideways easily.
Use more lightly (low density) strength material beam to build curve shape	Reduce mass, acceleration increases // Withstand the curve shape to the wind // Easy to control.
Using the strength material of sailboard.	Using the strength material of sailboard.
Attach at the centre of the yacht's keel	The yacht more stable and can be controlled more easily

2.2

Design / way / modification	Reason / Explanation
The bottle in inverted position (drawing)	To exhaust water downward / backwards.
At the top end of the bottle in a cone shape	Aerodynamic shape reduce air resistance
Polystyrene / plastic	Strong / light
The volume of water $\frac{1}{3}$ the height of the bottle // less than half of the height of the	Required a large air space // light

2.3

Suggestion / Design / Modification	Explanation / Reason
1. Wearing tight costumes.	1. Reduce air resistance.
2. Wearing light costumes.	2. Reduce mass, can increase acceleration and jumping.
3. Wearing spike shoes.	3. Avoid skidding and increasing grip when running.
4. Body posture must be bent when running.	4. Aerodynamic shape increasing velocity // Stored more kinetic energy.
5. Jumping with bending the body on air upside of bar.	5. Increasing lift force to increase high of jumping.
6. Using an elastic pole.	6. Store more elastic potential energy from kinetic energy to change to gravitational potential energy.
7. Put thicker mattress at the landing area.	7. Lengthen impact time to reduce impulsive force.
8. Landing on the centre of thick mattress.	8. To ensure the force can be absorbed by mattress effectively.

3.1

Design / way / modification	Reason / Explanation
The bottom wall must be thicker	Withstand to the water pressure at the bottom as the depth of water increases
The wall is constructed using stronger materials / Using reinforced concrete	To avoid the wall from breaking / To increase the strength of the wall / To avoid leaking
Locate at the high region	To ensure water can flow easily
Equipped with the water overflow system	To avoid flooding / To channel away the overflow water
Built tunnel to flow water to public supply	Water can be filtered and chlorinated to be used as public water supply
Built tunnel for electrical generation	To drive turbines for the generation of hydroelectricity

3.2

Design / way / modification	Reason / Explanation
Large piston of bigger cross-sectional area	Can support greater force (weight) // Produces large force
Low density material	Lightweight // easy to carry
Incompressible liquid	Piston can be lifted up efficiently

Longer handle	Less effort needed to press the small piston
Attach released valve between small and main reservoir	Liquid can be released into small reservoir to moves down the load

4.1

Modification	Explanation
Made from material with low specific heat capacity	Temperature in the pot can be increased quickly when heated. This saves fuel / cooking gas.
Made from a low density material	Pot is light and more portable
Made from material that is not easily corroded or oxidized	Pot is more durable and will not contaminate the food with dangerous material
The handle of the pot is made from material with high specific heat capacity	The handle becomes hot slower and can be held without scorching the hand
The pot is designed to have vertical compartments which can be added or removed	This makes the pot versatile because different food can be cooked at the same time

4.2

Modification	Explanation
Use insulator behind the absorber panel	To prevent the loss of heat energy
Use an absorber panel which is painted black.	A black surface is a good absorber of radiation so it will absorb heat faster
The pipe inside the plate must be made of metal	Metal is a good heat conductor, so it will transmit heat to water easily
Pipe embedded in plate must be long	Longer pipe will enlarge surface area will absorbs heat faster
A storage tank must be place at a higher level	To give higher pressure
Use glass cover on the top of the panel	To trap heat energy.(energy is radiated in, but cannot radiate out again).

4.3

Modification	Explanation
Coiled pipe is used around freezer box	Absorb more heat
Low specific heat capacity material	Good conductor/ Absorb heat faster
Used Freon	Easily change to steam/gas
Box is made up of insulator	Prevent short circuit
Used thermostat	Control the temperature
Freezer is at the top	Cold air moves downward

5.1

Modification	Explanation
An inner core of higher refractive index	Light ray is reflected more easily through total internal reflection
Outer layer of medium with a lower refractive index	Light ray is reflected more easily through total internal reflection
Lower density	The optical fibre will be lighter
The thickness of the glass is thin	Save pace / can be used in narrow space
Strong and flexible	Does not break easily and the shape can be adjusted

5.2

Modification	Explanation
Convex mirror	The image formed is virtual, upright an diminished
Large diameter	More object can be seen
More curve the mirror	Wider field view
Less thickness	Avoid multiple image formed
Top corner	Can look easily by observer

6.1

Design / way / modification	Reason
Build a slanting barrier (to reduce the deepness of the sea)	Speed / amplitude / energy / wavelength of the wave is reduced when depth of water is reduced
The surface of the barrier is made rough / uneven / porous	4. To reduce reflection of the waves / to absorb the waves
Build the new jetty at the bay	Water is calm in the bay
Build a barrier with a small opening, surrounding the bay	Diffraction of waves happens at the opening
Barrier is made of concrete / rigid material	Not easily eroded / broken down by strong waves
High retaining wall	Sea water cannot reach the house

6.2

Design / way / modification	Reason
<i>The roof gradient is small</i>	To reduce the difference of pressure
The roof with large mass	Required large force to lift the roof
The concrete wall	More strong // withstand high pressure
The house is built at the bay / far from cape	Small amplitude/ small wave

Wall in front the house	To reflect the water waves
-------------------------	----------------------------

6.3

Suggestion / Modification	Explanation / Reason
Build near bay	Waves are calmer due to divergence of energy Convergence of waves at the cape The bay is shallower . The speed of waves decreases. The amplitude of waves at the bay is small.
Build retaining walls	Reduce direct impact of the waves on the shore. To reflect the waves from the shore. Protect the area from large waves
Build concrete structures with a gap in between at designated area for children	Waves passing through the gap will be diffracted in the children's area. . Smaller amplitude of the diffracted waves causes the sea to be calmer there. Energy of waves decreases.
Build near bay	Waves are calmer due to divergence of energy Convergence of waves at the cape The bay is shallower . The speed of waves decreases. The amplitude of waves at the bay is small.
Build retaining walls	Reduce direct impact of the waves on the shore. To reflect the waves from the shore. Protect the area from large waves

6.4

Suggestion / Modification	Explanation / Reason
Gelombang radio dihasilkan oleh litar pengayun elektrik	Amplitud kekal @ rajah
Guna aerial untuk dipancarkan ke penerima melalui udara	Frekuensi gelombang audio dan radio dimodulasi @ rajah
Gunakan gelombang radio yang panjang gelombangnya panjang	Gelombang dibelaukan oleh bukit dan bangunan /gelombang sampai ke penerima walaupun terlindung bukit / bangunan kerana belauan
Gelombang diterima di beberapa substesen	Gelombang ditinggikan frekuensi /tambah tenaga di substesen
Gunakan gelombang mikro	la mempunyai tenaga tinggi/boleh bergerak pada jarak jauh

7.1

Suggestion / Modification	Explanation / Reason
Attach one fuse to the live wire in the consumer	To break/switch off the circuit when large

unit/ fuse box	current before the wire become hotter and produce fire.
Using the insulating wires // thicker wires	To prevent short circuit // To reduce resistance, improve efficiency
Attach switch for each lamp	To allows each lamp to be switched on and off independently
Connect the metal fitting lamp to the earth wire/cable	To flows electron (extra) to earth to avoid lethal shock
Using only 240 V light bulb.	To ensure the bulbs light up with normal brightness

7.2

Suggestion / Modification	Explanation / Reason
Diameter of wire used as flexible cable must be thicker	So that the resistance will be reduced. A thinner wire has a higher resistance. If large current flows through it, it becomes overheated and may burn and cause a fire.
Length of cable is shorter	So that the resistance is smaller
Heating element must made of material with high resistivity such as nichrome	Can produce the higher heat energy with small current. So that water will boil faster
The kettle is made of good heat insulator	So that the heat will not loose to the surroundings and water will boil faster. It is safer to handle
Use a suitable fuse. The current flow through the cable is 8.33 A. The suitable fuse is between 11 A to 13 A	If there is a short-circuit, a very high current flows and melt the fuse wire. The kettle will not be damaged.

8.1

Modification	Explanation
The sensitivity of the ammeter can be increased by using a hairspring of lower stiffness // increasing the strength of the permanent magnet // increasing area of the coil // increasing the number of turns of the coil // smaller mass of the coil and indicator.	To produce a larger of rotation of the coil
Using a pair of concave permanent magnet	To produced a radial magnetic field
The core used is cylinder in shape	To supply the total magnetic flux uniformly to the coil
Using the soft iron core	To concentrate the magnetic flux
Using the linear scale	Because the angle of the rotation of the indicator is linear

9.1

Modification	Explanation
LDR is needed to remove	Sensitive to the intensity of light
LED is needed to remove	Emits light and difficult to see when fire occur

Use thermistor	Sensitive to the temperature
Use alarm	Emit sound and easy to hear when fire occur
Replaced R with thermistor and LDR with R	Transistor is switched on when fire occur
Replaced LED with alarm	To produce sound when fire occur

Use siren	Faster warning when leakage
Wearing photographic films	Detect the exposure radiations

10.1

Suggestion	Explanation
Choose a small amount of Thallium-201//Natrium-24//Technetium-99	The most penetrating radiation which would be able to penetrated the patient's body Produce / emit X-ray
Short half-life of a few days	not pose any serious health risk
GM tube can be as a detector	To detect the gamma ray emitted in practice
The thallium will reach those region of the body	Have an adequate blood supply.
Analysing the reading of a gamma ray	Identify the region that is not receiving enough blood.// Higher reading means blockages

10.2

Suggestion	Explanation
The half-life should be a few days long	This allows for the location to be detected and thereafter the radioactive contamination is reduced
The source should emit γ particles	This allows the radiation to be able to be detected above the ground
The detector should be able to detect γ particles (low ionising particles)	High ionising particles like α and β particles are absorbed by the ground

10.3

Modification	Suggestion
Uses thick lead box	Radioactive rays cannot pass through
Packed into concrete drum and buried underground	Prevent the radioactive waste discharged to the environment
Use forceps/ robotic hand	Avoid direct contact

DECISION MAKING

Density is small	The spring is lighter
Elastic limit is high	Elastic for a large range of force / Can support the large force
The strength is high	Can support the large force

The most suitable spring is C

Because more elastic, lighter, elastic for a large range of force and can support the large force

2.3

Characteristic	Reason / Explanation
Fibre composite	Easy to float
Volume is bigger	Volume of water displaced is bigger// increased the buoyant force
Distance of the plimsoll line is further	Difficult to sink
Size of the propeller is big	Increased the force

The most suitable boat is Q

Because fibre composite, volume is bigger, distance of plimsoll line is further and the size of the propeller is big

2.1

Characteristic	Reason / Explanation
Number of wheel must be large and all rear wheels must be doubled	Increase the contact surface area on the road to reduce pressure.
Size of tyres must be large and wider.	Increase frictional force, easy to move. // Can convey more water / load.
Using air brake system and antilock brake system (ABS).	Inertia and momentum is high, need to reduce velocity slightly.
Space of tanker must be divided to small partitions.	To reduce concentration of weight / inertia when brake applied / accident. // Liquid in tanker is fluid can flow concentrate to forward.

The most suitable tanker is L

Because large number and doubled rear wheels, large size and wider tyres, using air brake system and space of tanker divided to small partitions.

2.2

Characteristic	Reason / Explanation
Spring constant is small	More elastic

3.1

Characteristic	Reason / Explanation
Type of liquid is oil	Incompressible
Thickness of brake transmission line is high	Withstand the high pressure from the liquid
The ratio of cross sectional area for wheel piston and master piston is high	To produce larger force on wheel piston
The type of brake for front wheel is disc and rear wheel is drum	Disc brake is more efficient than drum brake

The most efficient hydraulic brake system is S.

Because liquid used is oil, high thickness of brake transmission line, high ratio of cross sectional area wheel piston and master piston, and using disc for front wheel and drum for rear wheel.

3.2

Characteristic	Reason / Explanation
Type of liquid is oil.	No corrosion inside hydraulic jack.

Incompressible liquid.	Transmits pressure equally to all directions.
Has lower density	The hydraulic jack is not heavy / light
Has lower rate of vaporization	Volume of liquid will not easily vaporize

The most suitable liquid is L

Because L has the type of liquid is oil, incompressible liquid, lower density and lower rate of vaporization.

4.1

Characteristic	Reason
Specific heat capacity is low	Faster to get hot
Melting point is high	Does not melt easily
Good conductor of heat	The heat can be lost easily
Rate of expansion is moderate	The shape of the fin unchange

I choose P because specific heat capacity is low, melting point is high, conductor heat is good, rate of expansion is moderate

4.2

Characteristic	Reason
High specific heat capacity	Friction between pads and discs will cause an increase in temperature but the increase in temperature is slow.
High melting point	Does not melt easily if there is an increase in temperature.
Difficult to compress.	Pressure will be transmitted uniformly in all directions/ flows easily
High degree of hardness	Can withstand great force / does not break easily

I choose S because high specific heat capacity and high melting point for the brake discs the brake fluid is difficult to compress, the degree of hardness of the brake pads is high

4.3

Characteristic	Reason
Use concave mirror	Reflect and converge the sun light to the furnace
Concave mirror with small curvature	Short focal length // focu strongly
Black wall	The rate of heat absorption is high

Specific heat capacity is small	The container hot faster
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I choose R because Use concave mirror, concave mirror with small curvature, black wall and specific heat capacity is small

5.1

Characteristic	Reason
Shape should be convex	Gives wider field of view and upright image.
Excellent weather resistance	So that mirror will not get blur under heat, light and rain.
Height impact resistance	prevent damage due to strong force cause by accident or vandalism.
High reflectivity	Produce brighter image under dim light.

I choose R because convex, excellent weather resistance, high impact resistance, high reflectivity

5.2

Characteristic	Reason
High refractive index	Total internal reflection can occur easily
Small amount of light energy being absorbed by the material	The object under observation can be seen clearly // more light can be transmitted
Material with weak rigidity	The optical fibre can be bent easily
Material with high strength	The optical fibre can last longer/not easily spoil

I choose R because high refractive index, low % of light energy absorbed, weak rigidity, height strength

6.1

Characteristic	Reason
High amplitude	More energy / can propagate longer distance
Long wavelength	Can diffract easily
Low damping	Can be heard clearly
There is medium	Sound wave required medium to propagate

I choose Q

Because high amplitude, long wavelength, low damping and there is medium

6.2

Characteristic	Reason
Electromagnet wave	High energy / can use micro wave
High velocity	Can send signal faster

High wavelength	Can diffract easily
wide coverage	Can reach wide area

I choose Q

Because electromagnetic wave, high velocity, high wavelength, wide coverage

6.3

Characteristic	Reason
Bay	Still water // Energy of wave is spreading
High retaining wall	Withstand to the big waves.
Slope retaining wall with holes	to absorb the energy of waves // To prevent high energy of waves.
Many big rocks in water nearby the beach. of waves.	Diffraction occurs and spreading the energy

I choose Region P

Because Bay, high retaining wall, slope shape retaining wall with holes and has many big rocks in water nearby the beach.

6.4

Characteristic	Reason
High frequency	Can penetrate water
Large amplitude	Greater energy
Large percentage reflected	can detect more signals
Low sound energy absorbed	Less energy lost

I choose U

Because high frequency, large amplitude, large percentage reflected, low sound energy absorbed

7.1

Characteristic	Reason
Low density	light
High melting point	Does not melt easily
Low oxidation rate	Can last longer
High resistance	Can produce more heat

I choose S

Because low density, high melting point, low oxidation rate, high resistant

7.2

Characteristic	Reason
Thin wire	High resistance
Ceramic cartridge	Can withstand heat / fire resistant
13 A fuse	Can allow high current (more than 10 A)
Low melting point	Can melt when high current flow.

I choose R

Because Thin wire, Ceramic cartridge, 13 A fuse, Low melting point

7.3

Characteristic	Reason
Three-core	Can accommodate live, neutral and earth wire
13 A cable rating	Heating element need high current
13 A to live wire	Can cut current during short circuit
Three pin plug	Metal fitting body need earthing

I choose S

Because three-core, 13 A cable rating, 13 A to live wire and use three pin plug

7.4

Characteristic	Reason
Low resistance	Current will flow through
Low melting point	The wire will melt when excess current flows through
Low rate of oxidation	The wire will not easily rust / oxidized
Maximum current 5 A	If fuse 3A is used, the current is insufficient for the radio to function.

I choose Wire N

Because it has low resistance, low melting point, low rate of oxidation and can allow maximum current of 5 A to flow.

7.5

Characteristic	Reason
Resistance is high	To produce more heat
Melting point is low	Melt easily at low temperature
Specific heat capacity is small	Hot faster
The diameter is small	High resistance and produce more heat

I choose R

Because rintangan tinggi, takat lebur rendah, muatan haba tentu kecil dan diameter kecil

7.6

Characteristic	Reason
Large diameter	small resistance
Low density	light
Low rate of expansion	Does not increase in length
High melting point	Can withstand high heat

I choose cable Q

Because large diameter, low density, low rate of expansion and high melting point.

8.1

Characteristic	Reason
Size of the hammer is big	Surface area contact is big
Larger distance between the hammer and the gong	The force applied on the gong is greater
The number of turns of the coil is greater	The strength of the magnetism is greater
High curvature of the gong	The area of air molecule vibrate is greater

I choose Q

Because the size of the hammer is big, larger distance between the hammer and the gong, the number of turns of the coil is greater and high curvature of the gong

8.2

Characteristic	Reason
Low resistivity	To reduce heat loss in the cables
Low density	The cables will be lighter
Low cost	Cost of project will be lower
Low rate of thermal expansion	The cables will not expand under hot weather

I choose cable Q

Because low resistivity, low density, medium cost, low rate of thermal expansion

8.3

Characteristics	Reason
Low density material	Coil has smaller mass / lighter
High number of turns	Larger force acting on the coil / higher
High strength magnets	Larger force acting on the coil
More segments	Coil rotates smoothly

Motor R

Lowest density, high number of turns, high strength magnets and commutator splits into the most number of segments

9.1

Characteristics	Explanation
Use step-down transformer	To reduce the a.c. voltage
Ratio $N_p : N_s = 4000 : 200$	To reduce 240 V to 12 V
Use for diodes	To produce full wave rectification
Use capacitor	To smooth the wave

I choose circuit M because use step-down transformer, ratio $N_p : N_s = 4000 : 200$, use for diodes and use capacitor

10.1

Characteristic	Reason
emits β – particles,	can penetrate the soil and emerge from the ground
sufficiently long half-life	after a period of 2 days the activity of the source will be weak enough to not pose any danger
Use a Geiger- muller tube	Very sensitive detector/ it can be carried about from place to place
Use a ratemeter	It gives the count rate directly

R is suitable

Because emits β – particles, have sufficiently long half-life

10.2

Characteristics	Reason
Has a short half-life	can be active in a body for a short period of time
has moderate ionising power	causes minimum damage to the tissues in the body
emits gamma ray	can be detected outside the body//high penetrating power,so can be detected by the GM tube that is placed near to the head

Substance R is the most suitable with short half-life, emits gamma ray and has moderate ionising power

10.3

Characteristic	Reason
The state of matter of radioisotope is solid	Easier to handled.
Emits gamma-ray.	Penetrating power is high.
Long half-life.	Last longer.

The most suitable radioisotope is Cobalt-60.

Because the state of matter is solid, emit gamma-ray and long half-life

SCIENTIFIC INVESTIGATION

1.1

- (a) (i) Length / L
(ii) Resistance / R // Potential difference / V // Current / I
(iii) Diameter of the wire // Cross-sectional area of the wire // Type of wire
- (b) Reduce parallax error
- (c) Give a tick (✓) based on the following:

- A** – Columns L , I , V and R ✓
B – Correct units for I , V and R ✓
C – All values of I correct ✓
D – All values of I consistent to 2 d.p. ✓
E – All values of V correct ✓
F – All values of V consistent to 1 or 2 d.p. ✓
G – All values of R correct ✓
H – All values of R consistent to 2, 3 or 4 d.p. ✓

L / cm	I / A	V / V	R / Ω
20.0	0.36	0.4	1.11
30.0	0.42	0.7	1.67

40.0	0.50	1.1	2.20
50.0	0.62	1.7	2.74
60.0	0.70	2.3	3.29

Note for **G** : Accept e.c.f. from **C** and **E**

Number of \dot{u}	Marks
8 \dot{u}	5
6 - 7 \dot{u}	4
4 - 5 \dot{u}	3
2 - 3 \dot{u}	2
1 \dot{u}	1

(d) Give a tick (\dot{u}) based on the following:

A – R at the y -axis, L at the x -axis \dot{u}

B – Correct units at both axes \dot{u}

C – Uniform scale at both axes \dot{u}

D – 5 points plotted correctly $\dot{u}\dot{u}$

[Note : 3 or 4 points plotted correctly : \dot{u}]

E – Best straight line

F – Minimum size of graph 5 x 4 big squares \dot{u}
(Big square : 2 cm x 2 cm)
(From the origin to the last point)

Number of \dot{u}	Marks
7 \dot{u}	5
5-6 \dot{u}	4
3-4 \dot{u}	3
2 \dot{u}	2
1 \dot{u}	1

(e) States the correct relationship based on the straight line drawn

For a straight line with positive gradient passing through the origin,

Resistance is directly proportional to length / R directly proportional to L / $R \propto L$

For a straight line with positive gradient that does not pass through the origin,

Resistance increases linearly with length

(f) Check the voltmeter for zero error and make zero adjustment // Position of the eye such that the image of the pointer in the mirror is blocked by the pointer to avoid parallax error

1.2

(a) (i) Object distance, u

(ii) Image distance, v

u / cm	v / cm	$1/u$ (cm^{-1})	$1/v$ (cm^{-1})
34.0	14.2	0.029	0.070
30.0	15.0	0.033	0.067
26.0	16.3	0.038	0.063
20.0	20.0	0.050	0.050
16.0	26.7	0.063	0.037

(iii) Focal length

(b) Tabulate data

1. Shows a table which have u , v , $\frac{1}{u}$ and $\frac{1}{v}$

2. State the correct unit for 3. u , v , $\frac{1}{u}$ and $\frac{1}{v}$

3. All values of v are correct

4. Values of $\frac{1}{u}$ and are consistent to 3 decimal places.

5. Values of $\frac{1}{v}$ are consistent to 3 decimal places.

(c) 1. Draw the graph of $\frac{1}{v}$ against $\frac{1}{u}$

2. The responding variable, $\frac{1}{v}$ at y axis, the manipulated variable, $\frac{1}{u}$ at x axis

3. States the unit of the variable correctly

4. Both axis with the even and uniform scale

5. 5 points correctly plotted

6. A smooth best fit straight line

7. Minimum size of the graph is 10 cm x 8 cm

No of ticks \dot{v}	Marks
7	5
5,6	4
3,4	3
2	2
1	1

(d) $\frac{1}{v}$ is decreases linearly to $\frac{1}{u}$

(e) Put on the curtain to avoid excess light from outside.

The position of the eyes must be perpendicular to the reading taken to avoid parallax error.

- (ii) $\rho = 1.0286 \times 10^3 \text{ kg m}^{-3}$
 (c) $P_{\text{liquid}} = 1.043 \times 10^5$
 $P = P_{\text{liquid}} + P_{\text{atm}}$
 $= (1.043 \times 10^5 + 1.00 \times 10^5) \text{ Nm}^{-2}$
 $= 2.043 \times 10^5 \text{ Nm}^{-2}$
 (d) (i) Increases
 (ii) k is directly proportional to ρ
 (e) The position of the eye is aligned to the scale of the metre rule to avoid errors

2.3

- (a) θ is increases linearly to $\frac{1}{m}$
 (b) $\theta_0 = 27.5^\circ\text{C}$
 (c) When $\theta = 33.5$, $\frac{1}{m} = 0.6 \text{ kg}^{-1}$
 $m = 1.667 \text{ kg}$
 (d) (i) $k = \frac{33.5 - 29.3}{0.6 - 0.2}$
 $= 10.5 \text{ }^\circ\text{C kg}$
 (ii) $Q = 5.2 \times 10^3 \times 10.5$
 $= 5.46 \times 10^4 \text{ J}$
 (e) The container used to fill the liquid should be insulated to avoid heat loss to the surroundings.

2.1

- (a) 7 N
 (b) a increased
 (c) (i) Shows on the graph appropriate right triangle ($> 5 \times 4$)
 Gradient, $m = \frac{35 - 10}{9 - 1}$
 $= 3.125 \text{ N m}^{-1} \text{ s}^2 // 3.125 \text{ kg}$
 (ii) Marked on the graph
 $a = 5.5 \text{ ms}^{-2} - 6.0 \text{ ms}^{-2}$
 (iii) F increases linearly with a
 (d) 1. Make sure elastic strings are stretched at constant length.
 2. The position of the eye perpendicular to the scale of the metre rule when measuring the ticker tape to avoid errors due to parallax/systematic error

2.2

- (a) $1.00 \times 10^5 \text{ Nm}^{-2}$
 (b) (i) $k = \frac{(1.06 - 1.03)}{(0.7 - 0.35)} \times 10^5$
 $= 8.5714 \times 10^3 \text{ Nm}^{-3}$

2.4

- (a) $v = 5.0 \text{ cm}$
 (b) v is increases linearly to M
 (c) (i) $k = \frac{12.8 - 7.8}{1.6 - 0.6}$
 $= 5 \text{ cm}$
 (ii) $f = 5 \times 0.97$
 $= 4.85 \text{ cm}$
 (d) $v = 8.8 \text{ cm}$
 (e) Ensure that the object, lens and screen are placed vertically//
 The bulb filament, optical centre of the lens and the screen are at the same height and in the same line//
 Ensure that the sharpest image is formed on the screen

2.5

- (a) k decreases
 (b) (i) $\frac{1}{k} = 0.9$, $T^2 = 4.5$
 $T = 2.1213 \text{ s}$
 (ii) gradient = $\underline{3.7 - 0}$

$$0.8 - 0 \\ = 4.625 \text{ kg}$$

$$(iii) T^2 = 4\pi^2 \frac{m}{k}$$

$$\text{Gradient} = 4\pi^2 m$$

$$4.625 = 4\pi^2 m$$

$$m = 0.1172 \text{ kg}$$

(c) Unchanged

2.6

(a) (i) f is directly proportional to $\frac{1}{x}$ // f is inversely proportional to x

$$(ii) x = 2.0 \text{ m}, \frac{1}{x} = 0.5 \text{ m}$$

$$f = 380 \text{ Hz}$$

$$(iii) m = \frac{600 - 0}{0.76 - 0}$$

$$= 789.47 \text{ mHz}$$

(b) $D = fax$

v

$$(c) 2.8 = \frac{(1.2)(789.47)}{v}$$

$$v = 338.344 \text{ ms}^{-1}$$

(d) The position of the eye is aligned to the scale of the metre rule to avoid errors

The experiment is carried out outside the labrotary to avoid reflection of sound wave

2.7

(a) (i) v^2 is increases linearly to T

$$(ii) v^2 = 320 (\text{ms}^{-1})^2$$

$$v = 17.89 \text{ ms}^{-1}$$

$$(b) (i) k = \frac{660 - 380}{60 - 10}$$

$$= 5.6 \text{ m}^2 \text{s}^{-2} \text{ } ^\circ\text{C}^{-1}$$

$$(ii) c = \frac{1}{5.6}$$

k

$$= \frac{1}{5.6}$$

$$= 0.1786 \text{ s}^2 \text{ } ^\circ\text{C} \text{ m}^{-2}$$

$$(c) T = 30^\circ \text{ C}, v^2 = 540$$

$$v = 23.24 \text{ ms}^{-1}$$

(d) The position of the eye is aligned to the scale of the thermometer to avoid errors

2.8

(a) (i) R is directly proportional to $\frac{1}{d^2}$ // R is inversely proportional to d^2

$$(ii) d = 0.20 \text{ mm}, \frac{1}{d^2} = 25 \quad R = 360 \text{ } \Omega$$

$$(b) (i) m = \frac{60 - 0}{45 - 0}$$

$$= 1.3333 \text{ } \Omega \text{ mm}^2$$

$$(ii) \rho = \frac{\pi R d^2}{4l}$$

$$R = \frac{4\rho l}{\pi d^2}$$

πd^2

$$m = \frac{4\rho l}{\pi}$$

$$1.333 \text{ } \Omega \text{ mm}^2 = \frac{4\rho (1000 \text{ mm})}{\pi}$$

$$\rho = 1.0469 \times 10^{-3} \text{ } \Omega \text{ mm}$$

$$= 1.0469 \text{ } \Omega \text{ m}$$

$$(c) \rho = \frac{\pi R d^2}{4l}$$

$$1.0469 = \frac{\pi R (0.00025)^2}{4(2)}$$

$$R = 42.655 \text{ } \Omega$$

(d) The connection of the wires should be fasten to ensure the resistance in the circuit unchanged.

2.9

(a) R is directly proportional to l

$$(b) (i) m = \frac{5 - 0}{80 - 0}$$

$$= 0.0625 \text{ } \Omega \text{ cm}^{-1}$$

$$(ii) r = mA$$

$$= (0.0625 \text{ } \Omega \text{ cm}^{-1}) (1.5 \times 10^{-5} \text{ cm}^2)$$

$$= 9.375 \times 10^{-7} \text{ } \Omega \text{ cm}$$

$$(c) (i) l = 16.0 \text{ cm}, R = 1 \text{ } \Omega$$

$$(ii) \frac{1}{R'} = \frac{1}{R} + \frac{1}{R}$$

$$\frac{1}{R'} = \frac{1}{1} + \frac{1}{1}$$

$$\frac{1}{R'} = 2$$

$$R' = 0.5 \text{ } \Omega$$

- (d) The connection of the wires should be fastened to ensure the resistance in the circuit unchanged // Don't close the circuit for a long time to avoid the temperature in the circuit increasing.

2.10

- (a) (i) The potential difference decreases linearly.
 (ii) Extrapolation of the graph.
 $V = 3.5V$
- (b) 1. Shows the triangle with an acceptable/minimum size 8 cm x 8 cm
 2. Substitute correctly

$$-\frac{(1.5 - 3.5)}{(1.2 - 0.0)}$$
3. States the value of gradient and its unit
 $-1.67 \text{ VA}^{-1} // \Omega$.
- (c) Show the vertical line from $I = 0.80A$ until it touches the graph then horizontal line until it touches the V-axis.
 $V = 2.15V$
- (d) 1. $E = I(R + r)$
 $3.5 = 0.80(R + 1.67)$
 2. $R = 2.71 \Omega$

2.11

- (a) (i) R increases linearly with $\frac{1}{I}$
- (ii) When $R = 5 \Omega$, $\frac{1}{I} = 4.6$
 $I = 0.2174 A$
- (iii) R-intercept = 1.5Ω
- (iv) Gradient = $\frac{7 - 0}{6 - 1}$
 $= 1.4 \Omega A$
 $= 1.4 V$
- (b) $R = \frac{E}{I} - r$
 $R = E \left(\frac{1}{I} \right) - r$
 $E = \text{gradient of the graph}$
 $= 1.4 V$
 $r = \text{R-intercept}$
 $= 1.5 \Omega$

2.12

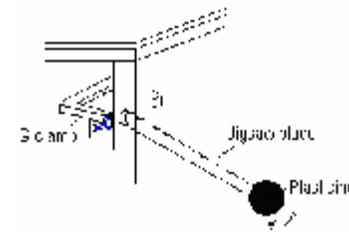
- (a) 28 m s^{-1}
 (b) 51 m s^{-1}
 (c) The acceleration decreases as time increases
 The acceleration becomes zero at the end of the motion
- (d) (i) Draws a tangent to the curve at $t = 6 \text{ s}$
 Constructs a triangle using the tangent drawn

$$= \frac{56 - 20}{10.6 - 1.0}$$

 $= 3.75 \text{ m s}^{-2}$
- (ii) 0.20×3.75
 $= 0.75 \text{ N}$

3.1

- (a) The inertia depends on the mass
 (b) As the mass increases the inertia increases
 (c) (i) To investigate the relationship between the mass and the inertia
 (ii) Manipulated variable: the mass
 Responding variable: the inertia
 Fixed variable: number of oscillation, the length of the jigsaw blade.
 (iii) Jigsaw blade, plasticine, G-clamp, stop watch, balance.
 (iv)



- (v) The mass of the plasticine is measured by a balance, $m = 30.0g$
 The jigsaw blade is clamped at one end and a plasticine ball is fixed at the other

The jigsaw blade is displaced horizontally to one side and then released so that it oscillates.
 The time for 20 oscillations, t , is taken by a stop watch. The experiment is repeated 5 times by using plasticine balls with different masses.

(vi)

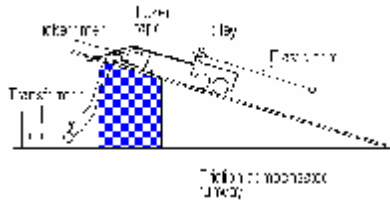
Mass/g	30	40	50	60	70	80
Time/t						

(vii) Plot the graph time, t against mass, m



3.2

- (a) The acceleration depends on the mass
- (b) When the force increased, the acceleration will be increased
- (c) (i) To investigate the relationship between the acceleration and the force.
 (ii) Manipulated variable: Force
 Responding variable: Acceleration
 Fixed variable: Mass
 (iii) A Trolley, ticker timer, ticker tape, 6 elastic cords, a wooden runway, 12 V a.c power supply.
 (iv)



- (v) Measure the mass of the trolley = m
 The ticker-timer is switched on and a trolley is pulled using a rubber band. The extension of the rubber band is ensured to be of the same length
 Acceleration of the trolley is calculated using the ticker-tape.

$$a = \frac{v - u}{t}$$

The experiment is repeated 5 times by increasing the number of the trolleys.

(vi)

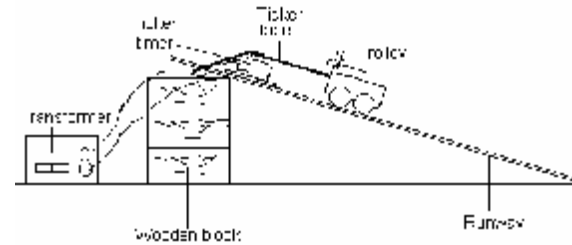
F						
m						

(vii) Plot the graph m against F



3.3

- (a) The final velocity of the girls depends on the initial height
- (b) As the initial height increases, the final velocity increases
- (c) (i) To investigate the relationship between the final velocity depends on the initial height
 (ii) Manipulated variable: The initial height
 Responding variable: The final velocity
 Fixed variable: The length of the runway
 (iii) A Trolley, ticker timer, ticker tape, wooden blocks, runway, transformer and metre ruler.
 (iv)



- (v) The initial height of the trolley by using a metre ruler, h
 The ticker-timer is switched on and a trolley is released.
 The length of the last 10 tickers on the ticker tape is measured = L

$$\text{The final velocity is calculated, } v = \frac{L}{0.02}$$

The experiment is repeated 5 times by increasing the number of the wooden blocks.

(vi)

h						
v						

(vii)

Plot the graph v against h

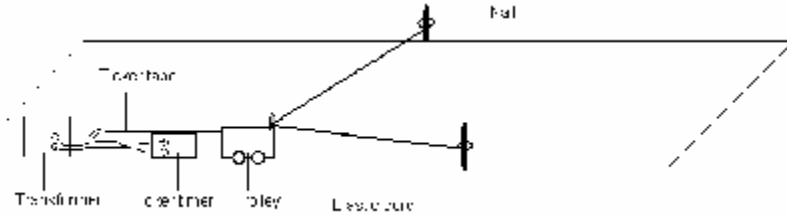


3.4

- (a) The kinetic energy depends on the elastic potential energy
- (b) As the elastic potential energy increases, the kinetic energy increases
- (c) (i) To investigate the relationship between the kinetic energy and the elastic potential energy
 (ii) Manipulated variable: The elastic potential energy
 Responding variable: The kinetic energy
 Fixed variable: The elastic cord, the mass of the trolley

(iii) A Trolley, ticker timer, ticker tape, elastic cord, runway, transformer, nails and metre ruler.

(iv)



(v) The trolley is hooked to the elastic cord and pulled to the back for a distance. The distance of the trolley moved is measured by using a metre ruler, x . The trolley is released and the distance the last 10 ticks on the ticker tape is measured, L .

The final velocity is calculated, $v = \frac{L}{0.02}$

The experiment is repeated 5 times by increasing the distance of x .

(vi) Tabulate the data

x						
v						

(vii) Plot the graph v against x

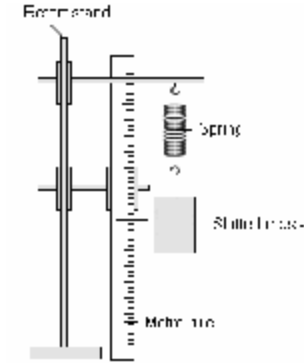


3.5

- The extension of an elastic material depends on the force applied.
- As the force increases, the extension increases
- To investigate the relationship between the force and the extension
 - Manipulated variable: The force

Responding variable: The extension

Constant variable: Spring constant, diameter of the spring
 - Spring, metre ruler, slotted mass, retort stand.
 -



- The original length of the spring is recorded, L_0
 - The mass of the slotted mass is recorded, m
 - The new length of the spring is recorded after the slotted mass is hung, L
 - The extension of the spring is calculated, $x = L - L_0$
- The experiment is repeated 5 times by increasing the number of the slotted mass.
- Tabulate the data

m						
x						

(vii) Plot the graph x against m

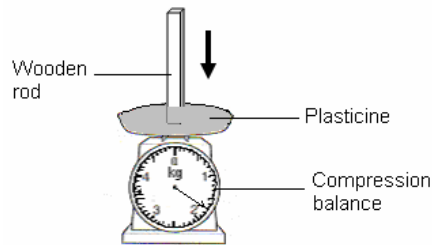


3.6

- The pressure between two solids depends on the surface area
- As the surface area increases the pressure decreases
- To investigate the relationship between the surface area and the pressure
 - Manipulated variable: The surface area

Responding variable: The pressure

Fixed variable: Force (the reading of the compression balance)
 - Compression balance, plasticine, wooden rod, meter ruler.
 -



- (v) The surface area of the wooden rod is measured by using a metre ruler, A
 The wooden rod is pressed into the plasticine until the reading of compression balance is 2 kg.
 The depth of sinking of the wooden rod in the plasticine is measured = h
 The experiment is repeated 5 times by using the wooden rods with different surface area but has same weight.

(vi) Tabulate the data

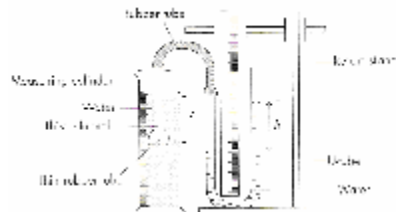
A					
h					

(vii) Plot the graph h against A



3.7

- (a) The pressure in the water depends on the depth of the water
 (b) As the depth of water increases, the pressure in the water increases.
 (c) (i) To investigate the relationship between the pressure in the water and the depth of water
 (ii) Manipulated variable: depth of water
 Responding variable: the pressure in the water.
 Fixed variable: density of the water
 (iv) Measuring cylinder, thistle funnel, rubber tube, manometer, and retort stand.



- (v) The measuring cylinder is completely filled with water.
 The thistle funnel is connected to the manometer with a rubber tube.
 The thistle funnel is lowered with the water to a depth $h = 10.0\text{m}$
 The manometer reading, p is measured.

3.8

The experiment is repeated 5 times with values of depth $y = 20.0\text{m}, 30.0\text{ cm}, 40.0, 50.0\text{ cm}$ and 560.0 cm .

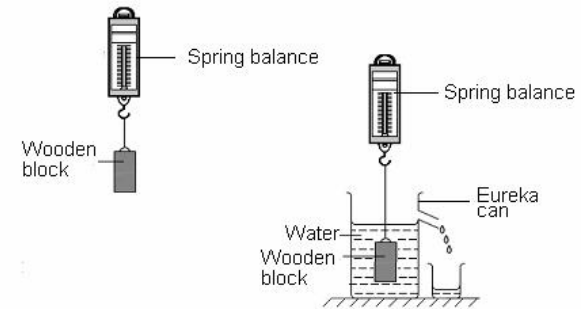
(vi) Tabulate the data:

h					
p					

(vii) Plot the graph p against h



- (a) The buoyant force depends on the weight of water displaced
 (b) As the weight of water displaced increases the buoyant force increases
 (c) (i) To investigate the relationship between the buoyant force and the weight of water displaced
 (ii) Manipulated Variable: Weight of water displaced
 Responding Variable : The buoyant force
 Constant Variable : Density of the water
 (iii) The wooden rod, spring balance, beaker, eureka can, water, balance
 (iv)

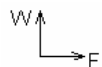


- (v) The weight of the wooden in air is recorded by using spring balance = W_1
 The wooden rod is submerged in the water partially, and the weight of the wooden rod is recorded = W_2
 The buoyant is calculated,
 $F = W_1 - W_2$
 The weight of the water in the beaker is measured by using balance, W
 The experiment is repeated 5 times by submerging the wooden rod in different height.

(vi) Tabulate the data

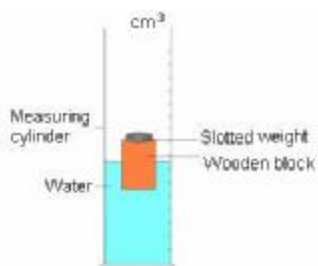
F					
W					

(vii) Plot the graph W against F



3.9

- (a) The volume of the boat in water is affected by the weight/mass of the boat
- (b) When the weight (of load) increases, the volume of liquid/water displaced increases. //When the number of slotted masses increases, the volume of liquid/water displaced increases
- (c) (i) To study the relationship between weight/number of slotted masses and the volume of liquid/water displaced
- (ii) Manipulated variable : weight, W / number of slotted masses
Responding variable: volume of liquid/water displaced, V
The fixed variable : density of liquid, ρ
- (iii) wooden block, water, beaker, measuring cylinder/ruler
- (iv)



- (v) Slotted weight of mass $m = 20$ g placed on the wooden block
Measure immerses distance of the wooden block in the water, h
Repeat the experiment 4 times with different mass of weight such as 30g, 40 g, 50 g and 60 g

(vii) Tabulate the data

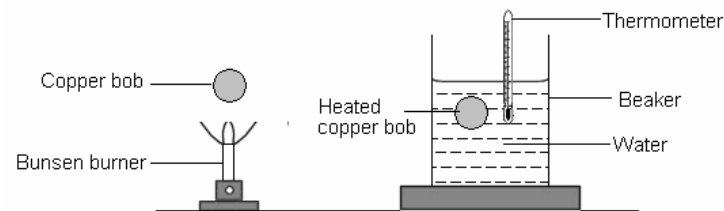
m						
h						

(vii) Plot the graph h against m



3.10

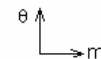
- (a) The heat depends on the mass
- (b) As the mass increases , the heat increases
- (c) (i) To investigate the relationship between the mass and the heat
- (ii) Manipulated variable: The mass
Responding variable: The heat
Fixed variable: Type of material, specific heat capacity, mass of water and initial temperature of the water, heating time
- (iii) Copper bobs, thermometer , beaker , Bunsen burner , water , beaker , forceps and balance, stop watch
- (iv)



- (v) The mass of a copper bob is measured by using a balance = m
The initial temperature of the water in the beaker is measured by using a thermometer = θ_1
The copper bob is heated by a Bunsen Burner in 5 minutes.
The heated copper bob is inserted in the beaker and the maximum temperature of the water in the beaker is recorded , θ_2
The raise of the temperature of the water is calculated , $\theta = \theta_2 - \theta_1$
The experiment is repeated 5 times by increasing the number of copper bob.
- (vi) Tabulate the data

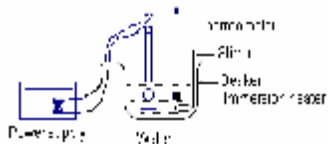
m						
θ						

(vii) Plot the graph θ against m



3.11

- (a) mass/volume/ influences to increasing/decreasing of temperature/change of temperature of water
- (b) As mass /volume (decrease)// increase as increasing of temperature /temperature change increase// decrease
- (c) (i) To study the relationship between the mass/ volume (of water) and the increasing of temperature/temperature change
- (ii) Manipulated variable : mass/volume
Responding variable : temperature change
Constant variable : density of liquid/water/time/power of water heater/initial temperature
- (iii) Water, triple balance/beaker, thermometer/ water heater/stop watch
All items must be listed or in the diagram/explanation/description later
- (iv)



- (v) The water mass of 30 g filled into the beaker
Record the initial temperature of the water , θ_1
The maximum reading on the thermometer is recorded = θ_2 after 5 minutes
The increase in temperature is calculated , $\theta = \theta_2 - \theta_1$
The experiment is repeated 5 times with the difference mass of water
- (vi) Tabulate the data

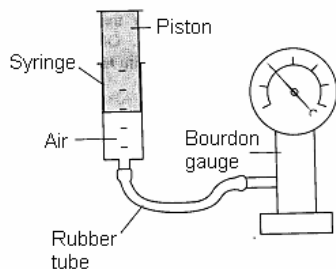
m						
θ						

- (vii) Plot the graph θ against m



3.12

- (a) Pressure depends on volume// Volume influences pressure
(b) When the volume decrease , the pressure increase
(c) (i) To investigate the relationship between volume and pressure
(ii) Manipulated : volume
Responding : pressure
Constant : mass of gas // temperature
(iii) Syringe, clip , thick rubber tube, bourdon gauge .
(iv)



- (v) The piston of the syringe is pushed in until the volume is V.
The pressure of the Bourdon gauge is recorded, P
The experiment is repeated 5 times with the difference value of V
- (vi) Tabulate the data

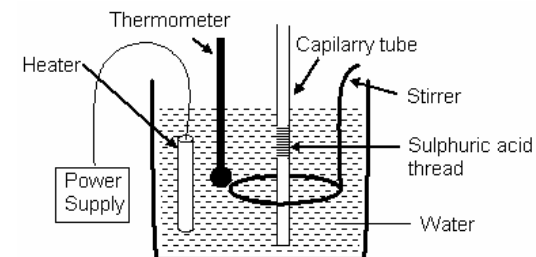
V						
P						

- (viii) Plot the graph P against V



3.13

- (a) The volume of the gas depends on the temperature
(b) The larger the temperature, the larger is the volume of a fixed mass of gas. / The volume of a gas varies directly with its temperature.
(c) (i) To investigate the relationship between the temperature and volume for a fixed mass of gas at a constant pressure
(ii) Manipulated : Gas temperature, T
Responding : Gas volume, V
Constant : Gas pressure, P or mass of gas, m
(iii) beaker, stirrer, heater, capillary tube, sulphuric acid thread, thermometer, metre rule, water, thermometer, metre rule, water,
(iv)



- (v) The apparatus is set up as shown in the diagram above..
Read thermometer when the temperature θ , reach 30°C.
Stir the water continuously, and repeat the experiment when the temperature reach 40°C, 50°C, 60°C, 70 °C and 80° C.
Measure the length, L of air trapped inside the capillary tube
Repeat the experiment when the temperature reach 40°C, 50°C, 60°C and 70 °C.

- (vi) Tabulate the data

θ						
L						

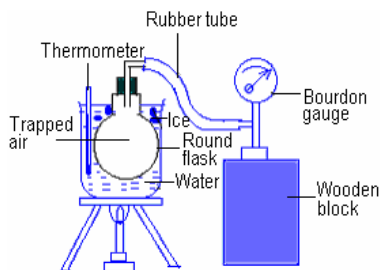
- (ix) Plot the graph L against θ



3.14

- (a) The pressure of the gas depends on the temperature
(b) When the temperature of a gas increases , its pressure increases too.
(c) (i) To investigate the relationship between the temperature and the pressure
(ii) Manipulated ; Temperature of the trapped air
Responding : Pressure
Constant : Mass and volume of trapped air

- (iii) thermometer, round flask, beaker, retort stand, Bunsen burner, tripod stand, wire gauze, ruler, Bourdon gauge, rubber tube, wooden block, water and ice.
 (iv)

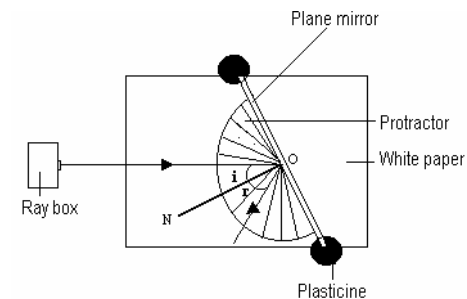
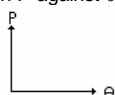


- (v) The mixture of water and ice is stirred continuously until the temperature of the bath is steady.
 By using thermometer the temperature of the trapped air is recorded, θ
 By using Bourdon Gauge the pressure of the trapped air is recorded, P
 The experiment is repeated for 5 times with different value of θ

(vi) Tabulate the data:

θ					
P					

- (vii) Plot a graph P against θ



- (v) The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable.
 A normal line ,ON is drawn on the white paper.
 A ray of light from the ray box is directed to the plane mirror.
 By using a protractor , the angle of incidence is measured = i and the angle of reflection = r
 The experiment is repeated 5 times for the other angles of incidence.

(vi) Tabulate the data:

i					
r					

- (vii) Analysis the data:
 Plot the graph r against i

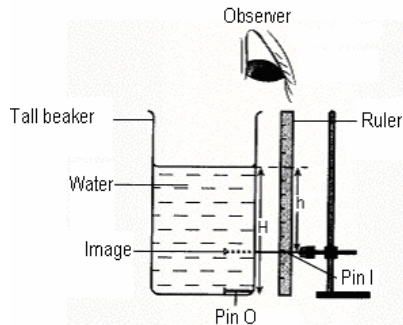


3.15

- (a) The angle of reflection depends on the angle of incidence
 (b) The angle of reflection increases as the angle of incidence increases.
 (c) (i) To investigate the relationship between the angle of incidence and the angle of reflection.
 (ii) Manipulated variable: Angle of incidence
 Responding variable: Angle of reflection
 Fixed variable: position of the plane mirror
 (iii) Ray box, plane mirror, plasticine, protractor and white paper
 (iv)

3.16

- (a) The apparent depth depends on the real depth
 (b) The apparent depth increases as the real depth increases.
 (c) (i) To investigate the relationship between apparent depth and the real depth
 (ii) Manipulated variable: real depth
 Responding variable: apparent depth
 Fixed variable: Refractive index
 (iii) Pin, ruler, water, retort stand ,tall beaker
 (iv)



- (v) A pin is placed at the base of the beaker as object O. The another pin is clamped horizontally onto the retort stand as image position indicator, I. The beaker is filled with water. By using a ruler, the real depth of the pin is measured = H. The pin O is seen vertically above the surface of the water. The position of pin I is adjusted until parallax error between the pin O and the pin I is non-existent. By using the ruler again, the position of pin I is measured as the apparent depth = h. The experiment is repeated 5 times for the other value of H.

(vi) Tabulate the data:

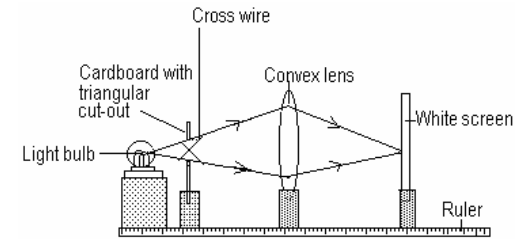
H						
h						

(vii) Plot the graph m against u



3.17

- (a) The linear magnification depends on the object distance
 (b) The greater the object distance, the smaller the linear magnification
 (c) (i) To investigate the relationship between the object distance and the linear magnification
 (ii) Manipulated variable : object distance, u
 Responding variable : linear magnification, m
 Constant variable : Focal length of the lens / type of lens
 (iii) Convex lens with holder, light bulb with power supply, screen, metre ruler and Cardboard with triangular cut-out, cross wire
 (iv)



- (v) The convex lens is placed at distance of, $u = 15$ cm from the object. The screen is adjusted until a sharp image is formed on it. The image distance, v is measured.

The linear magnification, m is calculated $m = \frac{v}{u}$ measured with a ruler.

The procedure is repeated with values of $u = 20$ cm, 25 cm, 30 cm, 35 cm and 40 cm.

(vi) Tabulate the data

u	m
15	
20	
25	
30	
35	
40	

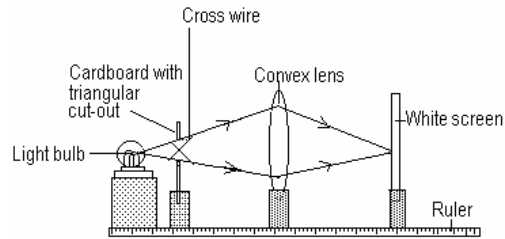
(vii) Plot the graph m against h



3.18

- (a) The linear magnification depends on the density //refractive index // focal length //power of the medium //lens
 (b) The greater the density //refractive index // focal length //power of the medium //lens, the larger the linear magnification
 (c) (i) To investigate the relationship between the object distance and the density //refractive index // focal length //power of the medium //lens
 (ii) Manipulated variable : the density //refractive index // focal length //power of the medium //lens
 Responding variable : linear magnification, m
 Constant variable : Object distance
 (iii) Convex lens with holder, light bulb with power supply, screen, metre ruler and

Cardboard with triangular cut-out , cross wire
(iv)



(v) The the density //refractive index // focal length //power of the medium //lens
Is recorded = n
The convex lens is placed at distance of, $u = 15$ cm from the object
The screen is adjusted until a sharp image is formed on it.
The image distance , v is measured.

The linear magnification , m is calculated $m = \frac{v}{u}$ measured with a ruler.

The procedure is repeated with difference the density //refractive index // focal
length //power of the medium //lens

(vi) Tabulate the data

n	m
15	
20	
25	
30	
35	
40	

(vii) Plot the graph m against n

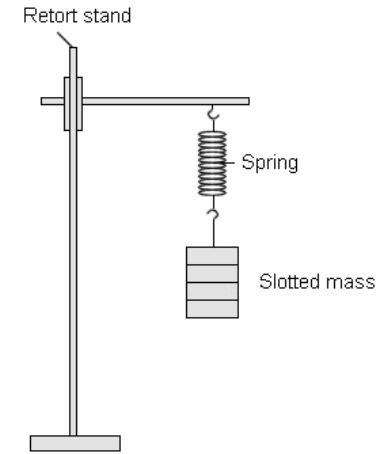


3.19

- The frequency of oscillations of a spring depends on the mass
- As the mass increases , the frequency decreases
- To investigate the relationship between the frequency and the mass
 - Manipulated variable : mass of the load

Responding variable : frequency of oscillations

Constant variable : Spring constant , diameter of the spring
 - Spring , slotted mass , retort stand ,stop watch.
 -



(v) The mass of the slotted mass is recorded = m
The slotted mass is displaced in downwards direction and released.
The time for 10 oscillations by using a stop watch = t

The frequency of oscillations is calculated , $f = \frac{10}{t}$

The experiment is repeated 5 times for the other value of m

(vi) Tabulate the data:

m						
f						

(vii) Plot the graph f against m



3.20

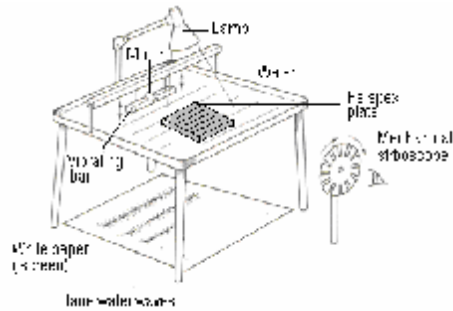
- The wavelength depends on the depth of water
- The depth of water increases as the wavelength of water waves increases.
- To investigate the relationship between the depth of water and the wavelength of water waves.

Manipulated variable: depth of water

Responding variable: wavelength

Fixed variable: frequency
 - Ripple tank , lamp , motor , wooden bar , power supply white paper , protractor ,plane reflector , perspex plate , metre rule and mechanical stroboscope.

(iv)



- (v) The depth of water on a perspex is measured by using a metre rule = d
 The power supply is switched on to produce plane waves which propagate onto the perspex plate .
 The waves are freeze by a mechanical stroboscope.
 The waves are sketched on the screen.
 The distance between 11 successive bright bands is measured by the metre rule = x
 The wavelength is calculated i.e. $\lambda = \frac{x}{10}$

The experiment is repeated 5 by increasing the number of perspex plate to change the depth the water.

(vi) Tabulate the data

d						
λ						

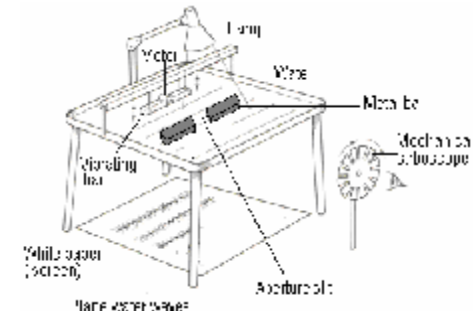
(vii) Plot the graph λ against d



3.21

- (a) The effect of bending (diffraction) depends on the size of aperture
 (b) The angle of bent increases as the size of aperture decreases
 (c) (i) To investigate the relationship between the angle of bent and the size of aperture
 (ii) Manipulated variable: size of aperture
 Responding variable: angle of bent
 Fixed variable: frequency of vibrator
 (iii) Ripple tank, lamp, motor, wooden bar, power supply, white paper, two pieces metal bar, metre rule, protractor and mechanical stroboscope.

(iv)



- (v) By using a metre rule, the width of the slit is measured = a
 The power supply is switched on to produce plane waves which propagate towards the aperture.
 The waves are freeze by a mechanical stroboscope.
 The waves are sketched on the screen.
 By using a protractor, the angle of bent = θ
 The experiment is repeated 5 times for with different widths of slit.

(vi) Tabulate the data

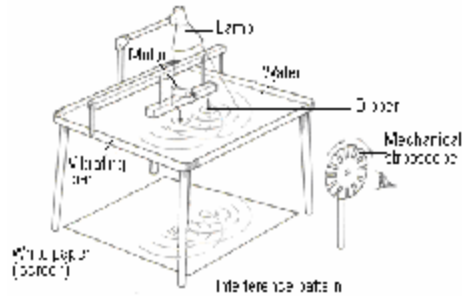
a						
θ						

(vii) Plot the graph θ against a



3.23

- (a) The distance between two consecutive antinodal lines depends on the distance between coherent sources.
 (b) The distance between two consecutive antinodal line increases as the distance between to coherent sources decreases
 (c) (i) To investigate the relationship between the distance between to coherent sources and the distance between two consecutive node lines
 (ii) Manipulated variable: the distance between to coherent sources
 Responding variable: the distance between two consecutive antinodal lines
 Fixed variable: frequency of vibrator or the wavelength
 (iii) Ripple tank, lamp, motor, wooden bar, power supply, white paper, spherical dippers, metre rule and mechanical stroboscope.
 (iv)



- (v) By using a metre rule, the distance between two dippers is measured = a
 The power supply is switched on to produce two circular waves from the dippers
 The waves are freeze by a mechanical stroboscope.
 The waves are sketched on the screen.

By using the metre rule, the distance between two consecutive antinodal lines is measured = x

The experiment is repeated 5 times for with different distances between two dippers

- (vi) Tabulate the data:

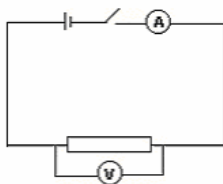
a						
x						

- (vii) Plot the graph x against a



3.24

- (a) The resistance of a metal conductor wire depends on the length of the wire.
 (b) The resistance of metal conductor increases as the length increases
 (c) (i) To investigate the relationship between the resistance and the length of a metal conductor.
 (ii) Manipulated variable: the length of the metal conductor
 Responding variable: the resistance
 Fixed variable: temperature, the cross-sectional area and type of material
 (iii) Ammeter, voltmeter, constantan wire, connection wires, dry cells, metre rule and switch.
 (iv)



- (v) The length of the conductor wire is measured by a ruler = l
 The switch is closed.
 The reading of the voltmeter, V and the ammeter, I is recorded.
 The resistance is calculated, $R = \frac{V}{I}$

The experiment is repeated 5 times for with different length of the wire

- (vi) Tabulate the data

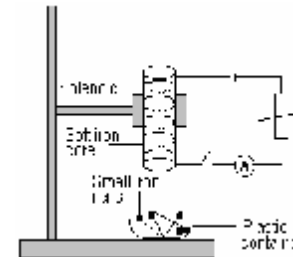
l						
R						

- (vii) Plot the graph R against l



3.25

- (a) The strength of the electromagnet depends on the magnitude of the current.
 (b) The strength of an electromagnet increases as the current increases.
 (c) (i) To investigate the relationship between the strength of an electromagnet and the current.
 (ii) Manipulated variable: the current
 Responding variable: the strength of an electromagnet
 Fixed variable: number of turns of solenoid, type of core.
 (iii) Ammeter, connection wires, rheostat, retort stand, switch, d.c. supply, soft iron core, solenoid, small iron nails and plastic container.
 (iv)



- (v) The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable.
 The switch is closed.
 The reading of the ammeter is recorded = I
 The end of the solenoid is dipped into the plastic container full of small iron nails.
 The plastic container is removed and the number of nails attached to the electromagnet is counted = N
 The experiment is repeated 5 times with different value of current by adjusting the rheostat.

- (vi) Tabulate the data

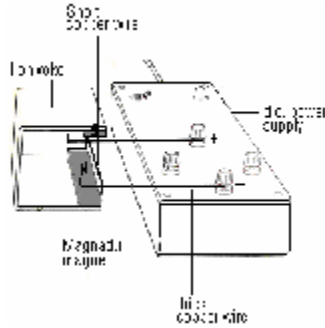
I						
N						

- (vii) Plot the graph N against I



3.26

- (a) The magnitude of the force on a current-carrying conductor in a magnetic field depends on the magnitude of the current.
- (b) The force on a current-carrying conductor in a magnetic field increases as the magnitude of the current increases.
- (c) (i) To investigate the relationship between the magnitude of the force on a current-carrying conductor in a magnetic field with the magnitude of the current.
 (ii) Manipulated variable: with the magnitude of the current.
 Responding variable: the magnitude of the force on a current-carrying conductor in a magnetic field
 Fixed variable: The strength of magnetic field and length of the current-carrying conductor.
 (iii) Magnadur magnets , U-shaped iron yoke , thick copper wire , short copper wire and d.c supply and ruler.
 (iv)



- (v) The voltage of the d.c. power supply used is recorded = V
 The d.c. power supply is switched on.
 The distance of short copper wire moves on the thick copper wire is measured by a ruler = L
 The experiment is repeated 5 times for with different voltage of the d.c. power supply.

(vi) Tabulate the data

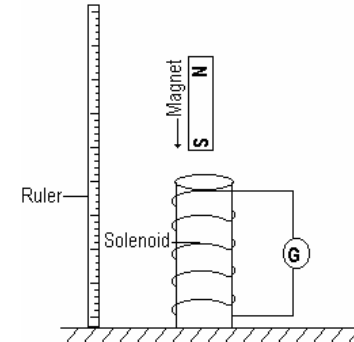
V						
L						

(vii) Plot the graph L against V



3.25

- (a) The magnitude of an induced current depends on the speed of the relative motion between conductor and magnet
- (b) The magnitude of an induced current increases as the speed of the relative motion between conductor and magnet increases.
- (c) (i) To investigate the relationship between the magnitude of an induced current and the speed of the relative motion between conductor and magnet
 (ii) Manipulated variable: the magnitude of induced current
 Responding variable: the speed of the relative motion between conductor and magnet.
 Fixed variable: number of turns of solenoid and the strength of the magnet.
 (iii) Sensitive zero-centre galvanometer, solenoid, bar magnet and ruler.
 (iv)



- (v) The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable.
 The height of the magnet above the solenoid is measured by a ruler = H
 The magnet is dropped into the solenoid and the reading of the galvanometer is recorded = I
 The experiment is repeated 5 times with different height of the magnet above the solenoid.

(vi) Tabulate the data:

H						
I						

(vii) Plot the graph I against H

