Nama : ………………………………… Tingkatan : ………………

4531/2
Fizik
Kertas 2
MEI
2007
2 ½ Jam

SEKTOR SEKOLAH BERASRAMA PENUH
BAHAGIAN SEKOLAH
KEMENTERIAN PELAJARAN MALAYSIA

PEPERIKSAAN PERTENGAHAN TAHUN 2007

FIZIK
KERTAS 2
Dua jam tiga puluh minit

**(Anda dinasihatkan untuk memperuntukkan masa 90 minit untuk Bahagian A,
30 minit untuk Bahagian B dan 30 minit untuk Bahagian C)**

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU.

1. *Kertas soalan ini mengandungi tiga bahagian* :
Bahagian A, Bahagian B *dan* **Bahagian C**
2. *Jawab* **semua** *soalan dalam* **Bahagian A, satu** *soalan daripada* **Bahagian B** dan **satu** soalan daripada **Bahagian C.**
3. *Jawapan kepada ketiga-tiga bahagian ini hendaklah diserahkan bersama-sama.*
4. *Jawapan kepada* **Bahagian A** *hendaklah ditulis dalam ruang yang disediakan dalam kertas soalan.*
5. *Jawapan kepada* **Bahagian B** *dan* **Bahagian C** *hendaklah dituliskan pada ruang jawapan yang disediakan dalam kertas soalan ini. Walau bagaimanapun kertas tulis tambahan sekiranya digunakan, perlulah diikat bersama dengan buku soalan ini. Dalam jawapan anda, persamaan, gambar rajah, jadual, graf dan cara lain yang sesuai untuk menjelaskan jawapan anda boleh digunakan.*
6. *Rajah tidak dilukis mengikut skala* **kecuali** *dinyatakan.*
7. *Markah maksimum yang diperuntukkan ditunjukkan dalam kurungan pada hujung tiap-tiap soalan atau bahagian soalan.*
8. *Penggunaan kalkulator saintifik yang* **tidak** *boleh diprogramkan dibenarkan.*

Untuk Kegunaan Pemeriksa			
Bahagian	Soalan	Markah Penuh	Markah
A	1	4	
	2	5	
	3	6	
	4	7	
	5	8	
	6	8	
	7	10	
	8	12	
Jumlah Bahagian A		60	
B	9	20	
	10	20	
C	11	20	
	12	20	
Jumlah Besar			

Kertas ini mengandungi 24 halaman bercetak

The following information mat be useful. The symbols have their usual meaning.

1. $v^2 = u^2 + 2as$

2. $a = \dfrac{v - u}{t}$

3. $s = ut + \dfrac{1}{2}at^2$

4. Momentum $= mv$

5. $F = ma$

6. Kinetic Energy $= \frac{1}{2}\,mv^2$

7. Gravitational Potential Energy $= mgh$

8. Elastic Potential Energy $= \dfrac{1}{2}$ Fx

9. $\rho = \dfrac{m}{V}$

10. Pressure in liquid, $P = h\rho g$

11. Pressure, $P = \dfrac{F}{A}$

12. Heat, $Q = mc\theta$

13. Heat, $Q = m\ell$

14. $\dfrac{PV}{T} = $ constant

15. $E = mc^2$

16. $v = \lambda f$

17. Power, $P = \dfrac{Energy}{Time}$

18. $\dfrac{1}{f} = \dfrac{1}{u} + \dfrac{1}{v}$

19. $\lambda = \dfrac{ax}{D}$

20. $n = \dfrac{\sin i}{\sin r}$

21. $n = \dfrac{\text{real depth}}{\text{apparent depth}}$

22. $n = \dfrac{1}{\sin c}$

23. $Q = I\,t$

24. $V = IR$

25. Power, $P = IV$

26. $g = 10 \text{ ms}^{-2}$

Section A

[60 marks]

Answer **all** *questions*

1. Diagram 1 shows an instrument for measuring electric current when it is not connected to any circuit.
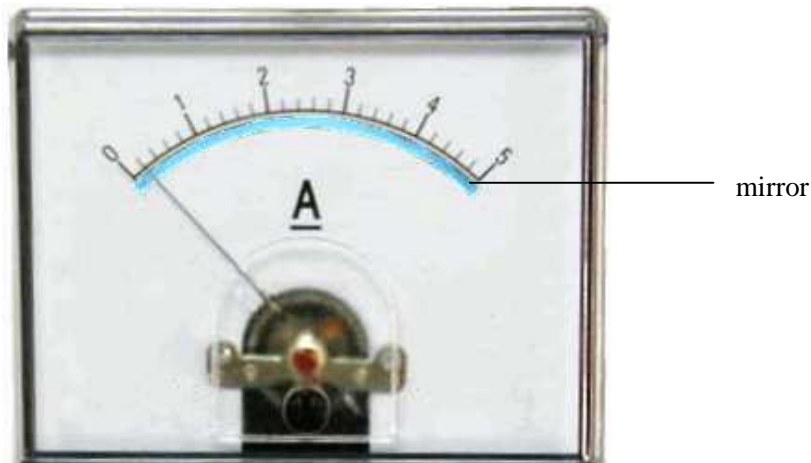

mirror

Diagram 1

(a) (i) Name the measuring instrument.

……………………………………………………………………………..
[1 *mark*]

(ii) What type of error shown by the instrument?

……………………………………………………………………………..
[1 *mark*]

(b) What is the sensitivity of the measuring instrument?

……………………………………………………………………………..
[1 *mark*]

(c) State the function of the mirror located under the scale.

...………………………………………………………………………………
[1 *mark*]

2. Diagram 2 shows the instance an aeroplane lands on a runway. The moment the aeroplane's wheels touch the runway, its *speed* is 150 km h^{-1}.
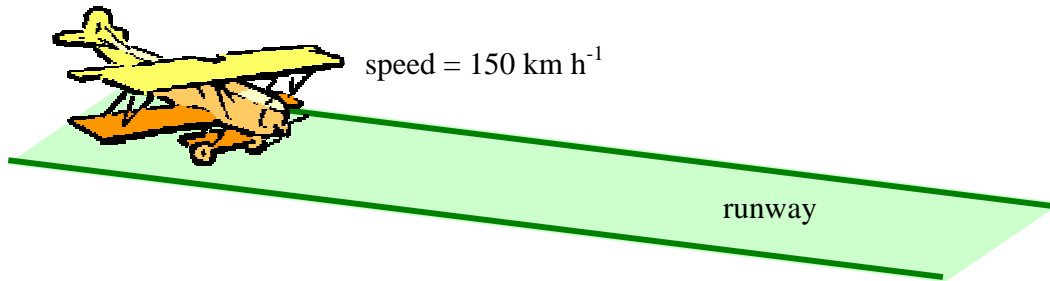
speed = 150 km h^{-1}

runway

Diagram 2

(a) What is the magnitude of the speed in SI unit.

[2 *marks*]

(b) The aeroplane takes 1.2 km to stop from the moment its wheels touched the runway. Calculate the time taken.

[2 *marks*]

(c) Explain why the aeroplane needs a long runway before it stopped?

………………………………………………………………………………

...…………………………………………………………………………..

[1 *mark*]

3.   Diagram 3.1 shows a liquid *X* of mass 250g was heated until almost its boiling
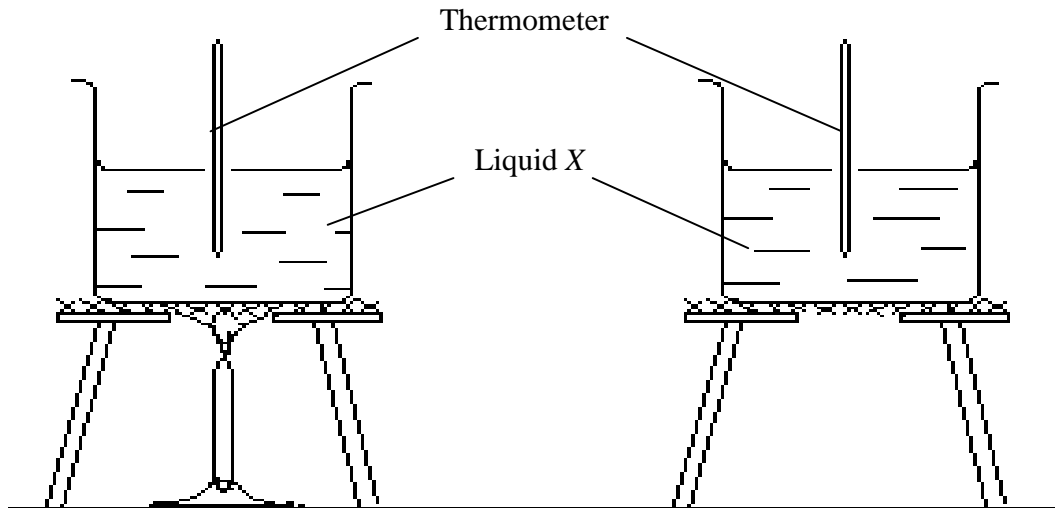   point and then left to cool down.

Thermometer

Liquid *X*

Diagram 3.1

Diagram 3.2 shows the graph of temperature against time for the cooling of the liquid.
[Specific heat capacity of liquid *X* = 4200 Jkg^{-1} °C^{-1}]

Temperature / C
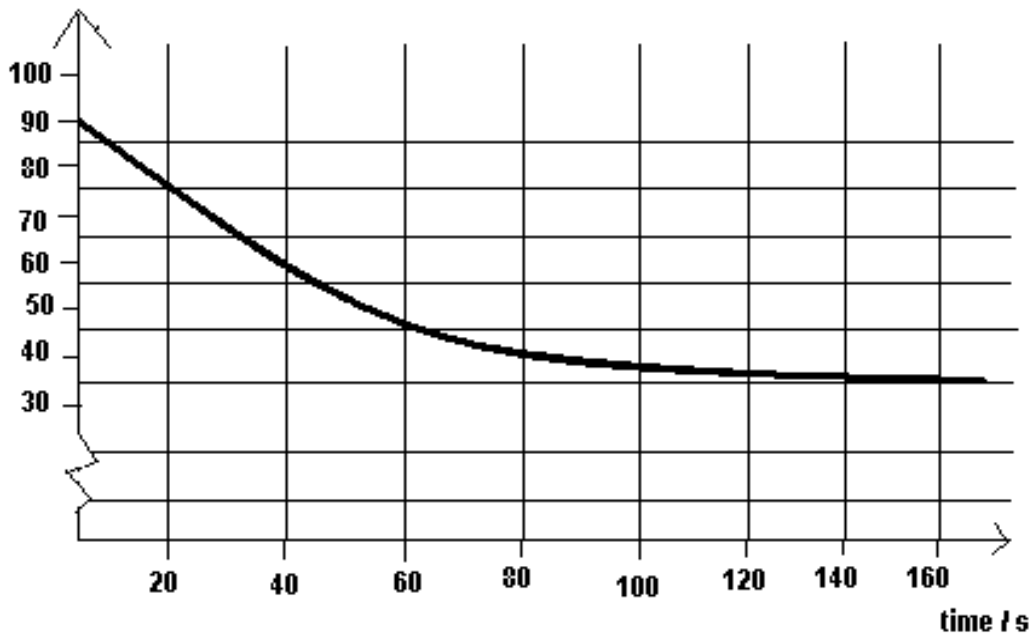
Diagram 3.2

(a)   What is meant by *thermal equilibrium*?

....

....

[1*mark*]

(b)   From the graph in Diagram 3.2,

(i)   Why is the temperature decrease with time?

....

....

[2 *marks*]

(ii)   What is the temperature of liquid X when it is in thermal
equilibrium with the surroundings.

....

[1 *mark*]

(c)   Calculate the amount of heat lost by liquid *X* before it is in thermal
equilibrium.

[2 *marks*]

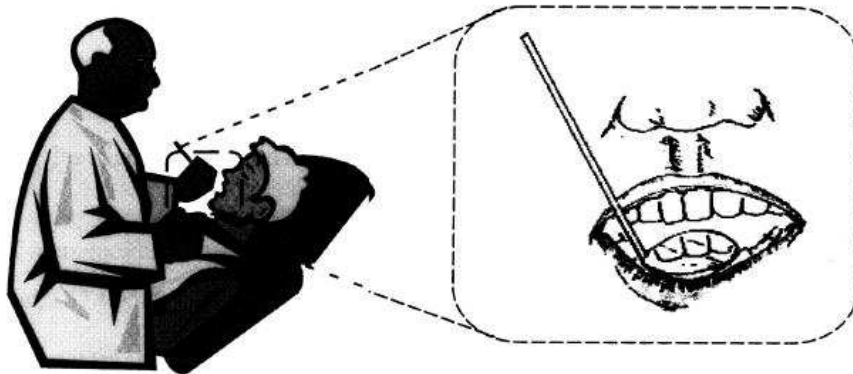4. Diagram 4 shows a dentist used a mirror to look closely at his patient's teeth.

Diagram 4

(a) State the light phenomenon that causes the image of the teeth.

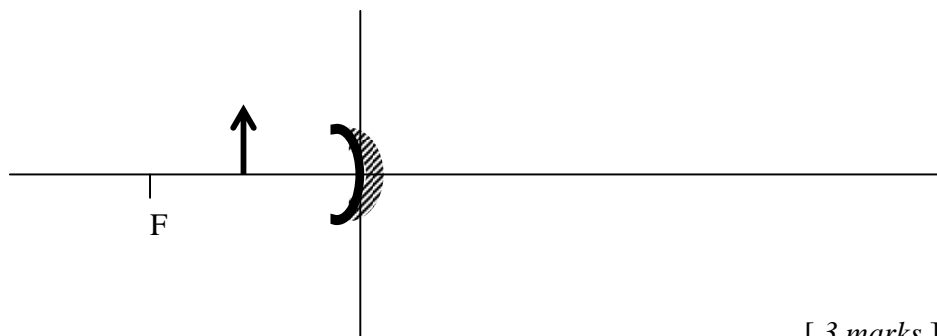……………………………………………………………………………………

[*1 mark*]

(b) Name the type of the mirror used by the dentist.

……………………………………………………………………………………..

[*1 mark*]

(c) State the characteristics of the image formed.

……………………………………………………………………………………..

……………………………………………………………………………………..

[*2 marks*]

(d) In the diagram below, the arrow represents the teeth as the object of the mirror. Complete the ray diagram by drawing the required rays to locate the position of the image.

[*3 marks*]

5.   Diagram 5.1 shows a simple mercury barometer placed at the sea level.

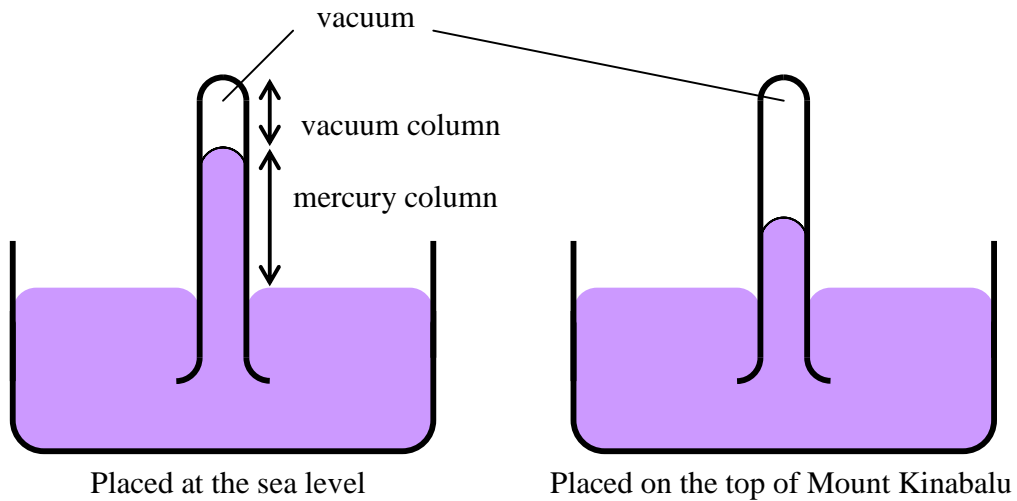Diagram 5.2 shows the height of mercury column when barometer is placed on the top of Mount Kinabalu.

Placed at the sea level   Placed on the top of Mount Kinabalu

Diagram 5.1   Diagram 5.2

(a)   Observe Diagram 5.1 and Diagram 5.2

(i)   Compare the vertical column of mercury.

…………………………………………………………………………
[*1 mark*]

(ii)   Based on the answer in 5 (a) (i), relate the altitude with the height of the vertical column of mercury.

…………………………………………………………………………
[*1 mark*]

(b)   (i)   Name the physical quantity which affect the height of the vertical column of mercury.

…………………………………………………………………………
[*1 mark*]

(ii)   What is the relationship between the physical quantity in 5 (b)(i) with the height of the vertical column of mercury.

…………………………………………………………………………
[*1 mark*]

Filled with gas

Mercury column
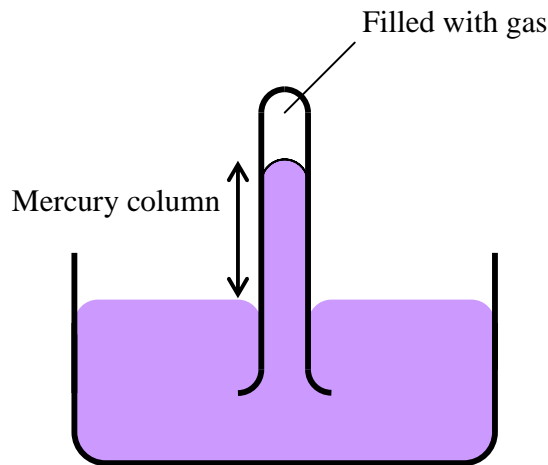
Diagram 5.3

(c)   If the gas is filled in the vacuum column, what will happen to the height of the vertical column of mercury. Give a reason.

…………………………………………………………………………
…………………………………………………………………………
…………………………………………………………………………
[*2 marks*]

(d)   Suggest **one** modification that need to be done to the barometer if the mercury is replaced with water. Explain your answer.

…………………………………………………………………………
…………………………………………………………………………
[*2 marks*]

6. Diagram 6.1 shows a ripple tank being used to investigate the interference pattern for water waves. The two dippers produce two set of circular waves which are *coherent*.
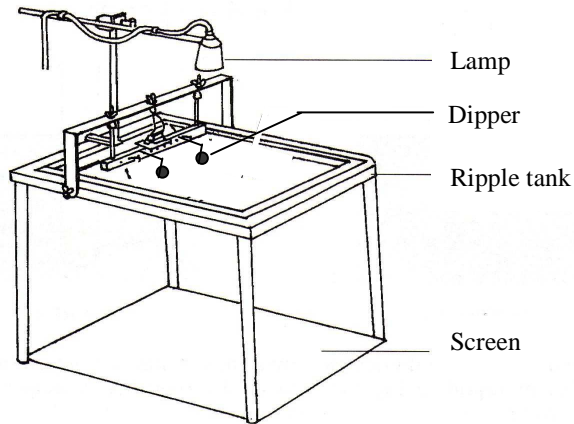

Diagram 6.1

Diagram 6.2 shows the interference pattern obtained.

The experiment is then repeated by increasing the frequency of rotation of the motor and interference pattern obtained is shown in Diagram 6.3
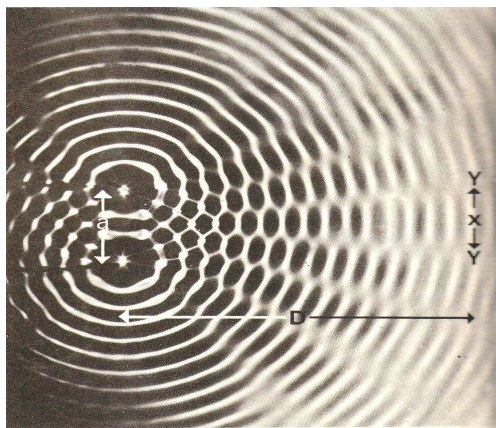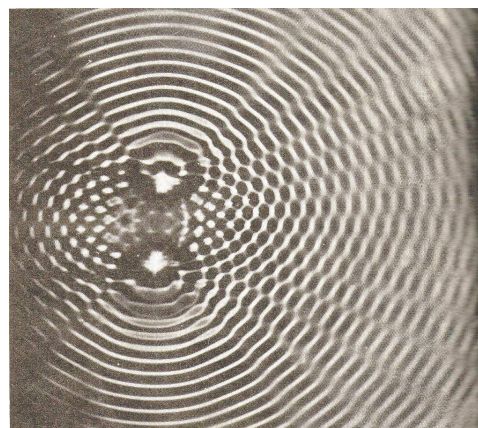

Diagram 6.2   Diagram 6.3

(a) What is meant by *coherent* ?

    ....

    ....

                                                                        [*1 mark*]

(b)   Using the interference patterns in Diagram 6.2 and Diagram 6.3, state two observations about the separations between consecutive nodal lines.

…………………………………………………………………………………

…………………………………………………………………………………

[*2 marks*]

(c)   Compare the wavelengths of the water waves in Diagram 6.2 and Diagram 6.3

…………………………………………………………………………………

…………………………………………………………………………………

[*1 mark*]

(d)   Name one constant variable for this experiment ?

…………………………………………………………………………………

[*1 mark*]

(e)   Relate the wavelengths of the water waves with the separations between consecutive nodal lines.

…………………………………………………………………………………

…………………………………………………………………………………

[*1 mark*]

(f)   If the depth of water in the ripple tank is increased, what happen to the interference pattern produced. Explain your answer.

…………………………………………………………………………………

…………………………………………………………………………………

…………………………………………………………………………………

[*2 marks*]

[Lihat sebelah

7. Diagram 7.1 shows a connection of electric appliances.
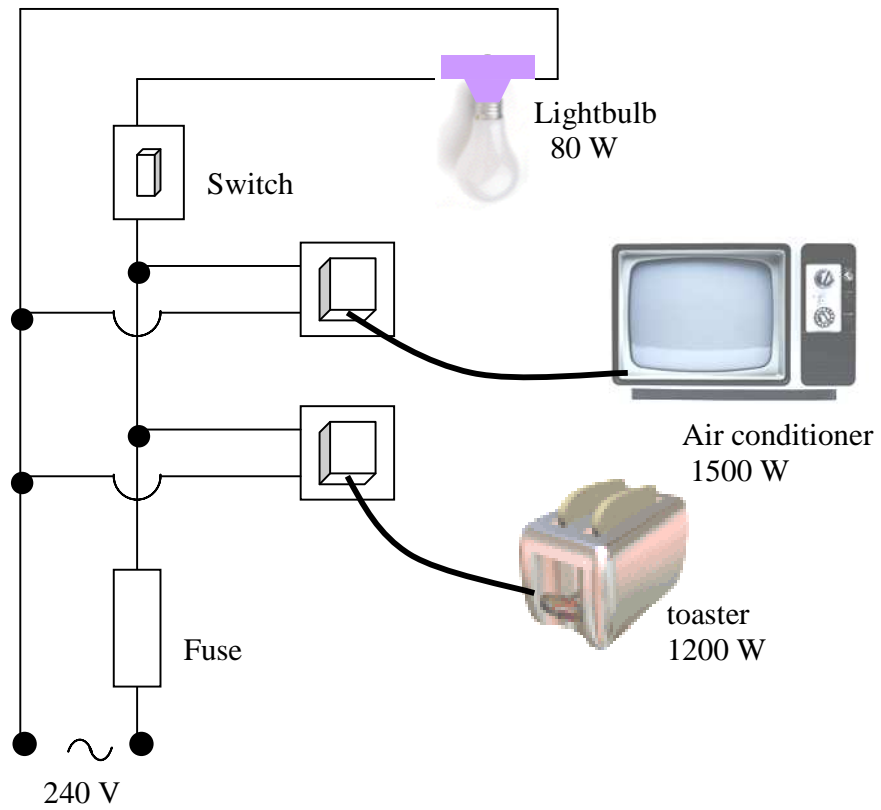

Diagram 7.1

(a) Complete the circuit in Diagram 7.2 by connecting all the electric appliances shown above.
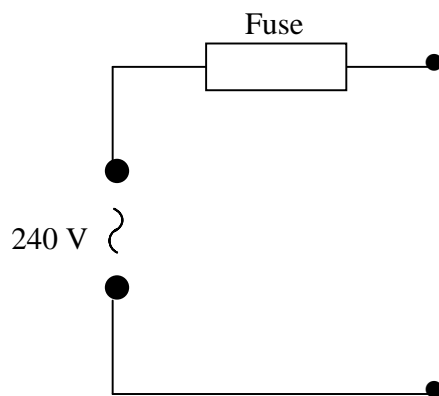

Diagram 7.2

[*2 marks*]

(b) Give the advantage of the connection of the electric appliances given in 7.2.

………………………………………………………………………………………
[*1 mark*]

(c) (i) Calculate the electric current that should be used in the electric circuit in 7.2.

[*3 marks*]

(ii) You are given 4 fuses of 13 A, 10 A, 5 A and 1 A. Choose the appropriate fuse for the circuit in 7.2.
Give a reason for your choice.

…………………………………………………………………………

…………………………………………………………………………

…………………………………………………………………………
[*2 marks*]

(d) If the air conditioner 240 V 1500 W is used for 3 hours, calculate the cost of the amount of energy consumed in that electric heater.
(1 unit, 1 kW h = RM 0.30)

[*1 mark*]

8. Diagram 8.1 and 8.2 show two identical ships which being towed into harbour by two boats A and B. Both boats exert the same force of 5000 N.
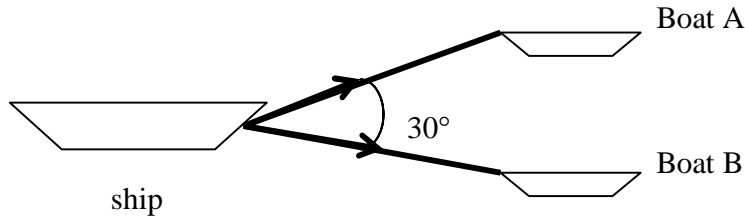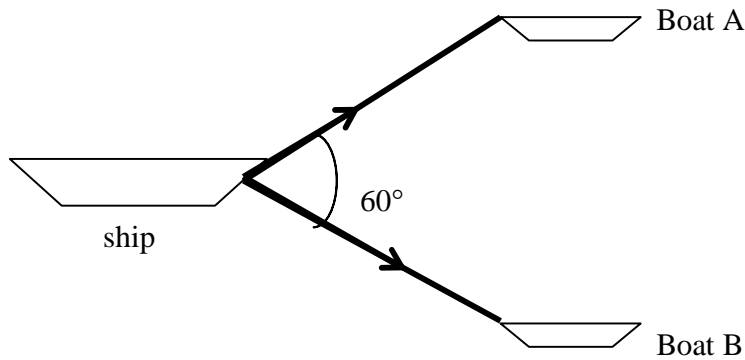

Diagram 8.1

Diagram 8.2

Diagram 8.1 shows that both boats exert the force at an angle of 15° to the path of the ship while Diagram 8.2 is at an angle of 30°.

(a) What is the meaning of resultant force?

    …………………………………………………………………………..
    [*1 mark*]

(b) With reference to Diagram 8.1 and Diagram 8.2, draw a diagram of resultant force in the space below.

Diagram of resultant force for Diagram 8.1	Diagram of resultant force for Diagram 8.2

[*2 marks*]

(c)   (i)   In the space below, draw the scale drawings of the triangles of forces to determine the values of resultant force for both Diagram 8.1 and Diagram 8.2.

(Use the scale 1 cm : 1000 N)

Resultant force for Diagram 8.1 = …………………N

Resultant force for Diagram 8.2 =……………….N

[*4 mark*s]

[Lihat sebelah

(ii) Based on your answer in 8 (c) (i), which is the most suitable method to tow the ship? Give one reason for your answer.

…...………………………………………………………………………

…………………………………………………………………………..

……………………………………………………………………………

[*2 marks*]

(d) If the mass of the ship is 1000 kg, the air and water resistance are 500 N, find the acceleration of the ship in Diagram 8.1.

[*2 marks*]

(e) What is the relationship between the angle between the two boats and the resultant force exerted by the boat.

…...………………………………………………………………………

[*1 mark*]

Section B

[20 marks]

Answer any **one** *question*

9. Diagram 9.1 shows two basketballs of the same mass being projected towards a wall. Ball A is hard while ball B is soft due to insufficient pressure.
Diagram 9.2 shows the condition of the balls when they hit the wall.
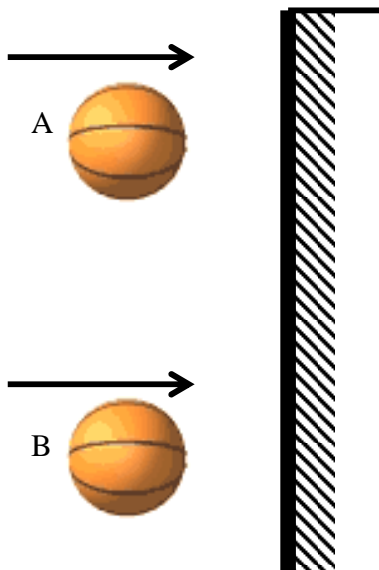It was noticed that Ball A is rebounced with a higher velocity than Ball B.
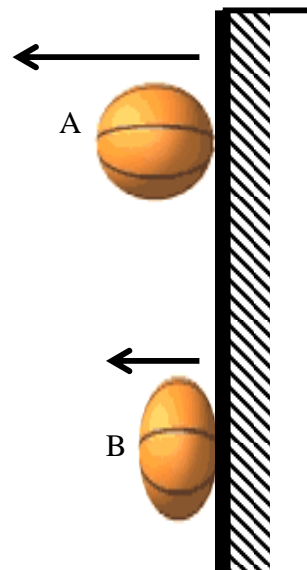
Diagram 9.1   Diagram 9.2

(a) What is the meaning of momentum?

[*1 mark*]

(b) Using Diagram 9.1 and Diagram 9.2, compare the shape of the ball when they hit the wall, the velocity after collision and the time of impact.

State the relationship between the time of impact with the
(i) impulsive force
(ii) velocity after collision

[*5 marks*]

(c)   By using the relevant physics concept, explain why a softball player moves his hand backwards while catching a fast moving ball.
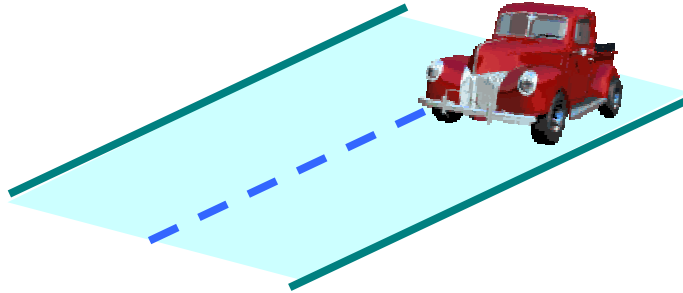
[*4 marks*]

Diagram 9.3

(d)   Driving is a necessity nowadays. To increase the safety of the driver and the passengers in a car, several safety features were installed into the car. List **five** of these features and how they can help to reduce injuries in an event of an accident.

[*10 marks*]

10. Diagram 10.1 shows a sound wave from a loudspeaker travel through balloon that filled with carbon dioxide which is denser than air.
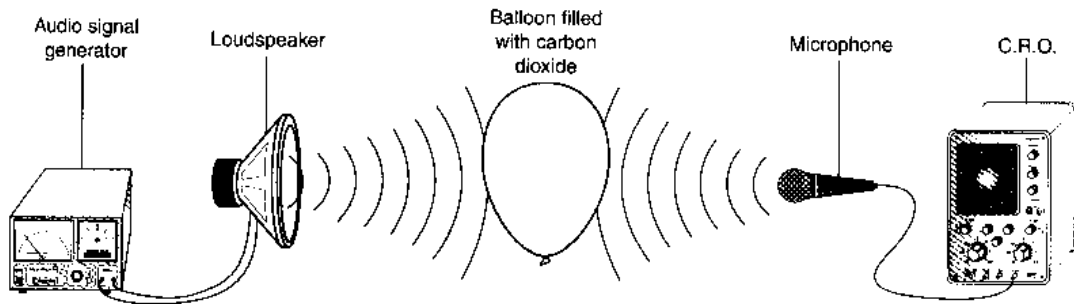

Diagram 10.1

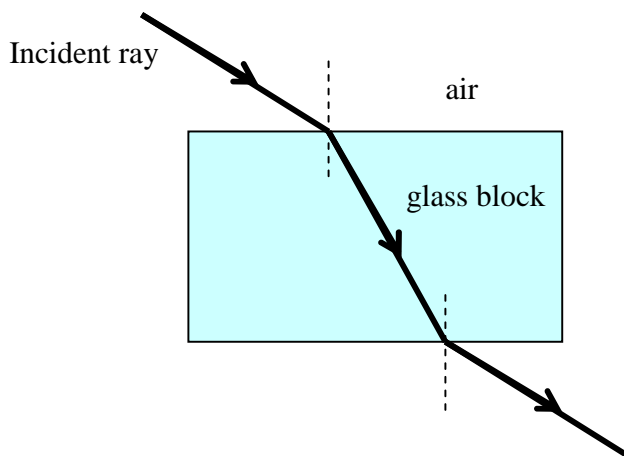Diagram 10.2 shows an incident ray passes through a glass block.

Diagram 10.2

(a) (i) What is meant by *transverse waves* and *longitudinal waves* ?
[*2 marks*]

(ii) Give **two** comparison between sound waves and light waves.
[*2 marks*]

(b) (i) With reference to Diagram 10.1 and Diagram 10.2, compare the density of the medium, the direction of the wave propagation and the speed of the wave after passing through the different medium.

Relate the density of the medium, the direction of the wave propagation and the speed of the wave after passing through the different medium to deduce a relevant physics concept.

[*5 marks*]

(ii) Name the wave phenomenon that explain the above situation.

[*1 mark*]

Diagram 10.3

c) A contractor wants to build a resort with safety features at beach area, so tourist will enjoy staying at the resort.

You are asked to give suggestion for the project based on the knowledge of the phenomenan of waves and the following considerations:

(i)   The location of the resort
(ii) Features to reduce erosion of the shore
(iii) Features to enable tourist enjoying calm water

[*10 marks*]

Section C

[20 marks]

Answer any **one** *question*

11. Encik Adli will be taking part in a four-wheel drive expedition to Taman Negara. In the expedition, he will have to drive through a hilly and unpaved area, and to cross streams.

Table 11 shows the characteristic of vehicles that can be used in the expedition,

Characteristics / Vehicles	Mass / kg	Engine Capacity (cc) / cm^3	Types of engine	Diameter of tyre / mm
P	3000	2000	Diesel	800
Q	1000	1500	Petrol	400
R	2000	2500	Diesel	600
S	1800	2000	Petrol	500
T	1500	2500	Petrol	500

Table 11

(a) What does *mass* mean ?

[*1 mark*]

(b) You are asked to investigate the characteristics of the four wheel drive that can be used in the expedition.

Based on the table as shown in Table 11;

(i) Explain the suitability of each characteristics of the vehicles in the table above

(ii) Determine the most suitable vehicle to participate in the expedition.

[*10 marks*]

Diagram 11

(c)   Adli drives a car on a straight road. He starts from rest and reaches a velocity of 5 ms^{-1} after 20 s. Then, he maintain the speed for 30 s before he stop his car in 15 s.

(i)   Sketch the velocity – time graph to represent the motion of the car.
[*5 marks*]

(ii)   Based on the graph in (c) (i), calculate the distance traveled by the car.
[*2 marks*]

(iii)   What is the acceleration of the car?
[*2 marks*]

12.   When driver is travelling in a car on a hot and sunny day, he sees a pool of water appearing on the road due to total internal reflection.

   (a)   (i)   What is meant by *critical angle* ?

   [1 mark]

   (ii)   Explain how the pool of water appearing on the road?

   [4 marks]

   b)   An engineer choosed a glass with the refractive index , n = 1.6 as a core for optical fibre that he want to produce.

   (i)   Calculate the critical angle of the glass.
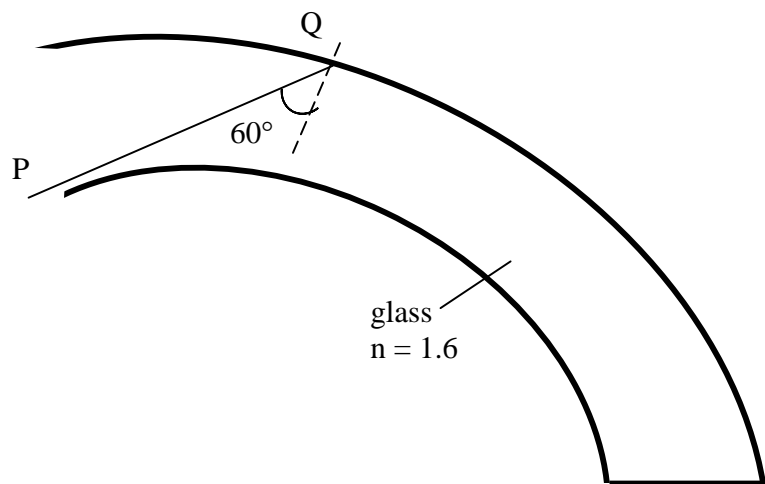
   [2 marks]

Diagram 12

   (ii)   Diagram 12 shows a part of light travel in a simple optical fibre. Complete the paths of the light ray in the diagram until it come out from the optical fibre.

   [3 marks]

c) You are asked to investigate the characteristics of the material to produce
    an optical fibre as in Diagram 12.

Type of materials	Critical angle (^{o})	Strength	Flexibelity	Diameter of fibre
P	42.86	Weak	Flexible	Thick
Q	38.40	Weak	Inflexible	Fine
R	30.85	Strong	Inflexible	Fine
S	24.41	Strong	Flexible	Fine
T	24.41	Strong	Flexible	Thick

Table 12

Based on the table above;

i) Explain the suitable characteristics of the material to produce an
    optical fibres.

ii) Decide which material is most suitable to produce an optical fibres.

[10 marks]

END OF QUESTION PAPER