

# Analysis

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[4531/3]

## Physics

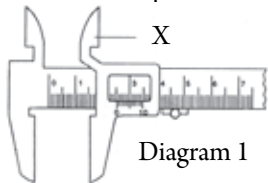
TOPICS	PAPER 1					PAPER 2															PAPER 3										
						Section A					Section B					Section C					Section A					Section B					
	06	07	08	09	10	06	07	08	09	10	06	07	08	09	10	06	07	08	09	10	06	07	08	09	10	06	07	08	09	10	
Introduction																															
to Physics	3	3	2	3	3	1	1	1					1																		
Forces and																															
Motion	7	8	9	8	7	3	3	1	1	1											1	1	1	1	1						
Forces and																															
Pressure	8	6	5	7	8				1	1	1			1	1	1											1				1
Heat	5	4	3	4	5	1			1	1	1						1	1		1		1	1					1	1		
Light	5	5	5	5	5	1	1	1	1	1	1	1	1						1		1								1		
Waves	7	6	5	7	5	1			1	1	2										1					1					
Electricity	5	5	3	4	5		2	1	1	1													1	1			1	1			
Electro-magnetism	3	3	4	5	5					1								1	1	1									1		1
Electronics	4	3	4	4	3	1	1	1			1				1				1												
Radioactivity	3	3	3	3	3				1	1		1	1			1				1											
TOTAL	40	40	40	40	40	8	8	9	8	8	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	1	2	2	2

Physics Paper 1

[4531/1]

Each question is followed by either three, four or five options. Choose the best option for each question and then blacken the correct space on the answer sheet.

- 1 Diagram 1 shows a vernier caliper.

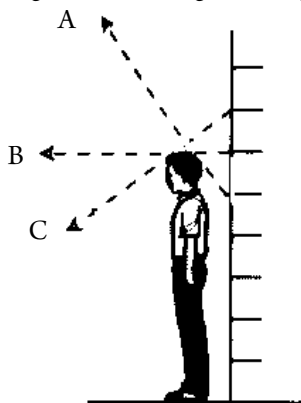


What is X.

- A Inner Caliper
- B Outer Caliper
- C Inside Jaws
- D Outside Jaws

- 2 Diagram 2 shows three positions of the observer eye to read the height of a student.

Which position gives the reading without parallax error?



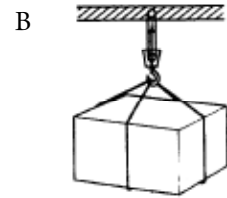
- 3 Table 1 shows the data recorded by a student to investigate the relationship between mass,  $m$  and period of oscillation,  $T$ .

Mass, $m/\text{kg}$	Time taken for 10 oscillations, $t/\text{s}$			Average $t/\text{s}$	Period, $T = \frac{t}{10}/\text{s}$
1	7.1	7.7	7.4	7.4	0.74
2	9.3	9.5	9.7	9.5	0.95
3	11.0	11.3	10.7	11.0	1.10

Which of the following statements is not true?

- A Time taken to make 10 oscillations is taken because the period is too small.
- B The accuracy of reading can be increased by reducing the zero error of the stop watch.
- C The mistake in counting the number can be reduced by taken a few readings.
- D Time taken for 10 oscillations is the manipulated variable.

- 4 Which of the following situations experiences normal reaction?



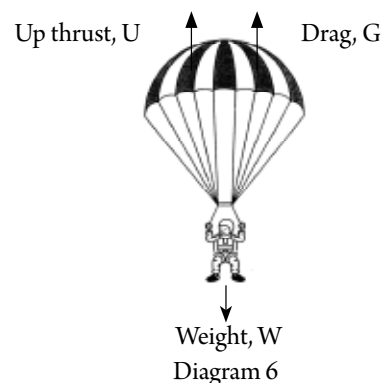
- 5 The crumple zone at the front of a vehicle is used to increase the time of impact if the vehicle involved in a collision.



The increase in the time of impact will reduce

- A Impulse
- B impulsive force
- C momentum
- D final velocity

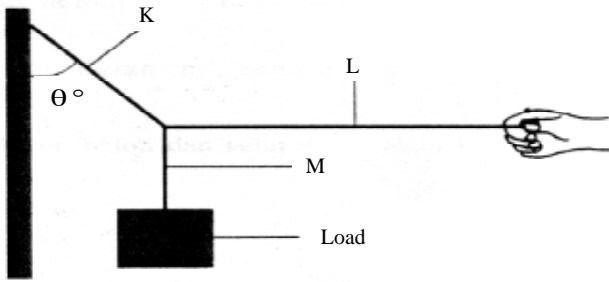
- 6 Diagram 6 shows the forces that acted on a parachute.



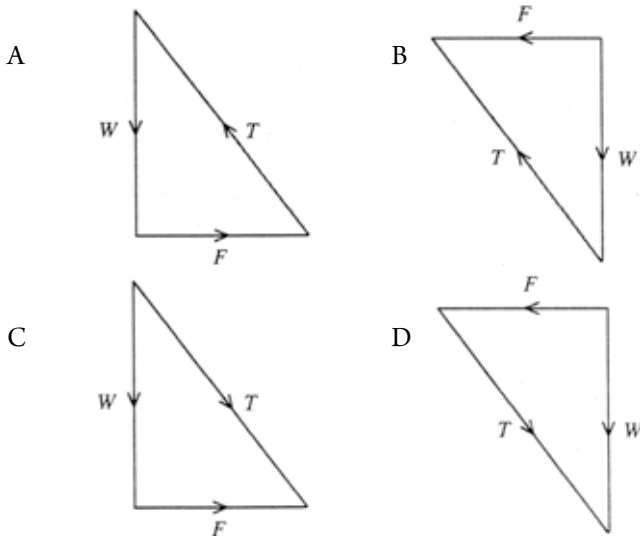
Which of the following expressions is true if the parachute falls at constant speed?

- A  $U + G > W$
- B  $U + W = G$
- C  $U + W < G$
- D  $U + G = W$

- 7 Diagram 7 shows a horizontal force,  $F$ , is applied on a load of weight,  $W$ , tied on a vertical wall by a strings  $K$  and  $M$ .

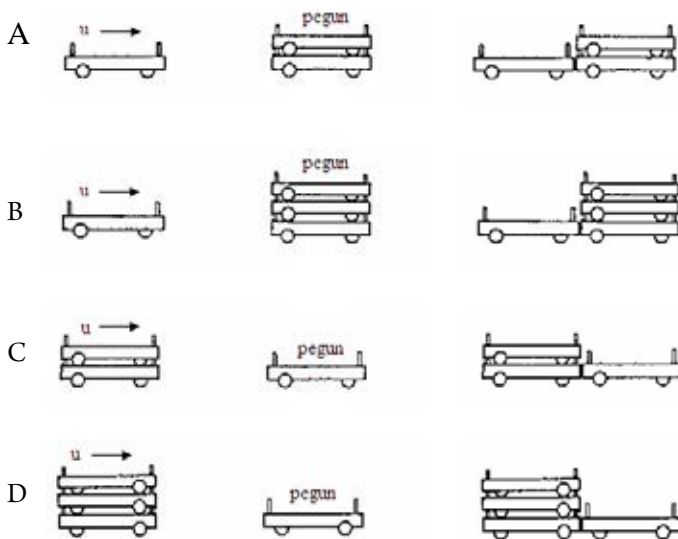


If the object is in state of equilibrium and the tension in string  $K$  is  $T$ , which triangle of forces is correct?

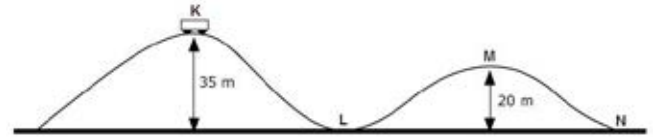


- 8 Diagram 8 shows trolleys before and after collisions. All trolleys are identical move with same initial velocity and collide with stationary trolleys.

Which trolleys move with highest common velocity after collision if the collisions are inelastic?



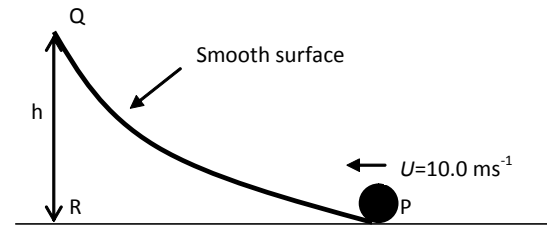
- 9 Diagram 9 shows a stationary trolley at  $K$  rolls down on a smooth curved surface.



Which of the following statement is true about the motion of the trolley?

- A Kinetic energy at  $M$  is zero  
B Velocity is increasing from  $L$  to  $M$   
C Total energy at  $K$  and  $N$  are same  
D Potential energy is increasing from  $M$  to  $N$

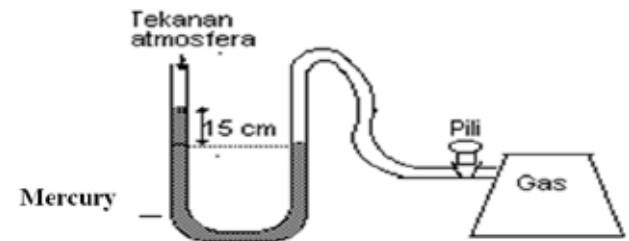
- 10 Diagram 10 shows an object is moving on an inclined smooth curved surface. The object has a velocity of  $10.0 \text{ ms}^{-1}$  at  $P$  and temporarily at rest at  $Q$ .



What is the vertical height of  $h$  from  $Q$  to  $R$ ?

- A 2.5 m  
B 5.0 m  
C 10.0 m  
D 25.0 m  
E 50.0 m

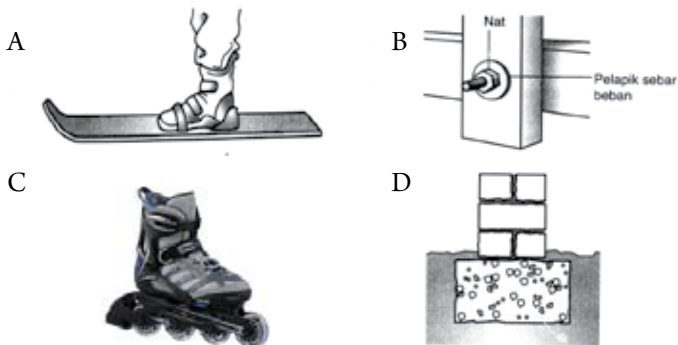
- 11 Diagram 11 shows a manometer is connected to a container of gas. Tekanan atmosfera adalah 75 cm Hg.



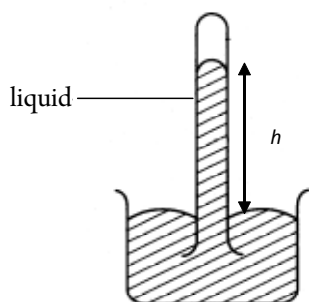
If the atmospheric pressure is 75 cm Hg, what is the pressure of gas in the container?

- A 50 cm Hg  
B 60 cm Hg  
C 75 cm Hg  
D 85 cm Hg  
E 90 cm Hg

12 Which of the following will not reduce the pressure?



13 Diagram 13 shows a simple barometer with liquid X.



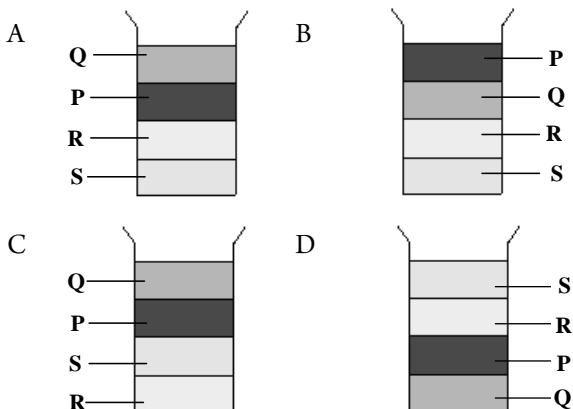
The height  $h$  influenced by the following factors except

- A volume of the liquid
- B gravitational acceleration
- C atmospheric pressure
- D density of the liquid

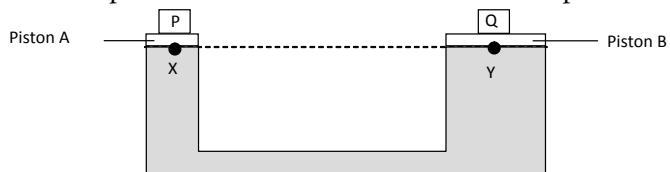
14 Table 14 shows four types of solution P, Q, R and S which do not mixed.

Solution	Density ( $\text{kg m}^{-3}$ )
P	$9.20 \times 10^2$
Q	$7.90 \times 10^2$
R	$1.27 \times 10^3$
S	$7.03 \times 10^3$

Which of the following layers of the solution is correct if they are in mixed in a beaker?



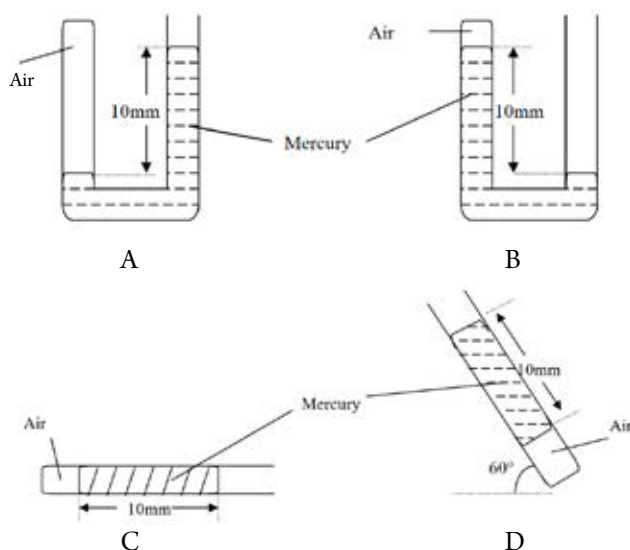
15 Diagram 15 shows a hydraulic system with the cross-sectional area of piston B is twice the cross-sectional area of piston A.



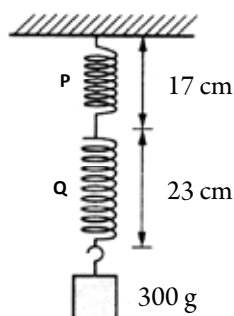
Which of the following statements is correct?

- A Pressure at X is same as atmospheric pressure
- B Pressure at X is half of pressure at Y
- C Mass of object P is half the mass of Q
- D Weight of object P is same as weight of Q

16 Which of the following situations has the highest pressure of trapped air by the mercury column?



17 Two un identical light springs, P and Q, with initial lengths 5.0 cm connected in series and hung by the load 300 g at the end of spring Q.

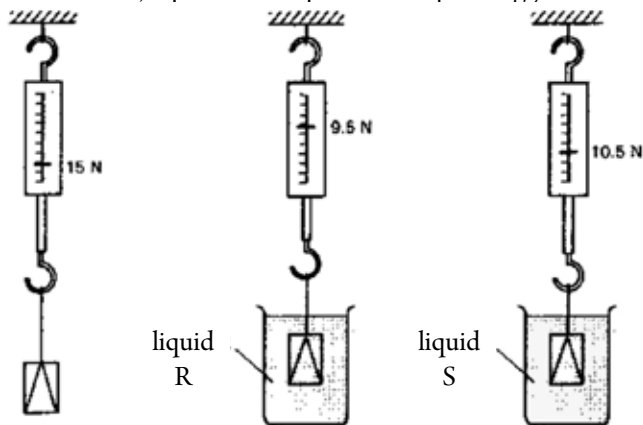


What is the total length of springs P and Q if the load 300 g is replaced by 500 g?

- A 40 cm
- B 45 cm
- C 50 cm
- D 55 cm
- E 60 cm



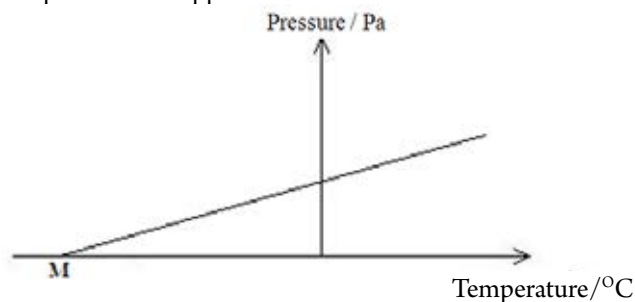
- 18 Diagram 18 shows three identical blocks hung by the spring balance in air, liquid R and liquid S correspondingly.



Which of the following statements is true about the above situations?

- A Weight of the block is lowest in liquid R
- B Volume of liquid R displacement most by the block
- C Density of liquid R is higher than the density of liquid S
- D Buoyant force experienced by the block in liquid S is highest

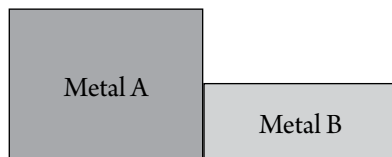
- 19 Graph shows the relationship between pressure and temperature of trapped air.



What is the value of M?

- A - 197
- B - 237
- C - 273
- D - 323

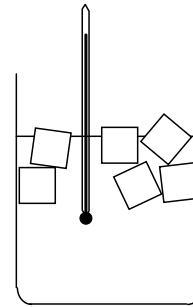
- 20 Diagram 20 shows a metal block A at temperature  $60^{\circ}\text{C}$  in contact with metal block B at temperature  $30^{\circ}\text{C}$ .



After a few minutes the metals A and B reached thermal equilibrium which means

- A the temperature of metal A is higher than B.
- B the amount of heat in metal A and B are same.
- C the rate heat flow from metal A to B and B to A are same.
- D the rate heat lost from A and B to the surrounding are same.

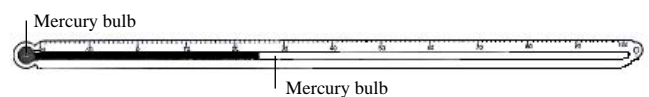
- 21 Diagram 21 shows a thermometer in a mixture of ice and water.



The temperature remains at  $0^{\circ}\text{C}$  because

- A the ice molecules which melt diffuse into water molecules.
- B ice and water reached thermal equilibrium.
- C the glass bulb of the thermometer placed near ice.
- D the heat is not used to increase the kinetic energy of water molecule.

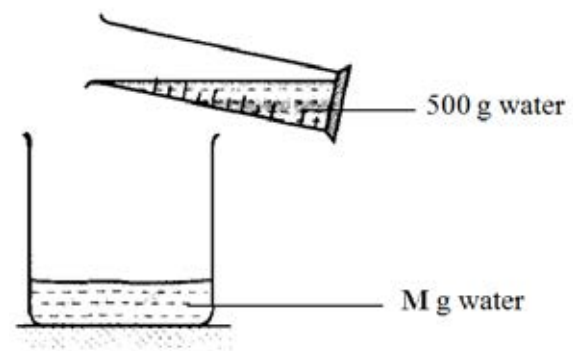
- 22 Diagram 22 shows a mercury thermometer.



Which of the following steps can be taken to increase the sensitivity of the thermometer?

- A Reduce the diameter of the capillary tube and increase the size of mercury bulb.
- B Increase the diameter of the capillary tube and reduce the size of mercury bulb.
- C Reduce the diameter of the capillary tube and reduce the size of mercury bulb.
- D Increase the diameter of the capillary tube and increase the size of mercury bulb.

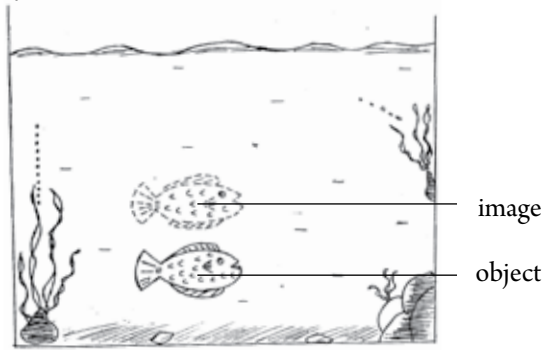
- 23 500 g of water at  $70^{\circ}\text{C}$  is poured into M g of water at  $10^{\circ}\text{C}$ . The final temperature of the mixture is  $50^{\circ}\text{C}$ .



What is the value of M?

- A 167 g
- B 250 g
- C 750 g
- D 1000 g
- E 1500 g

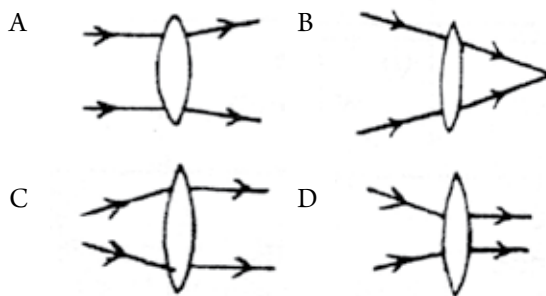
- 24 Diagram 24 shows a fish in an aquarium look closer to the surface by the observer above the water.



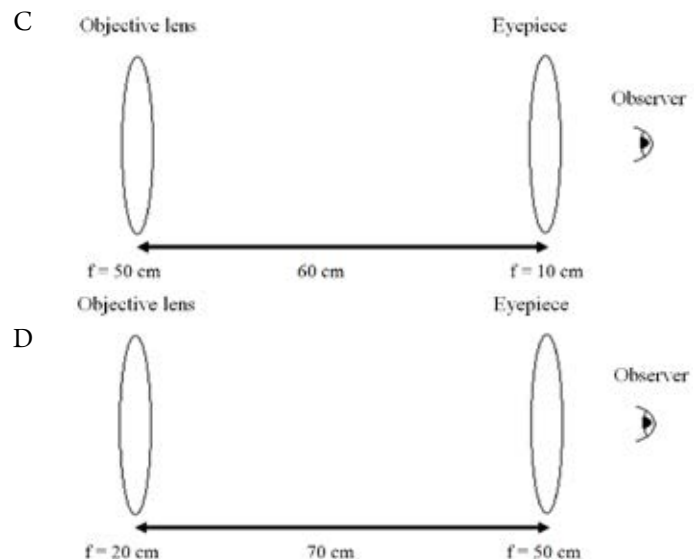
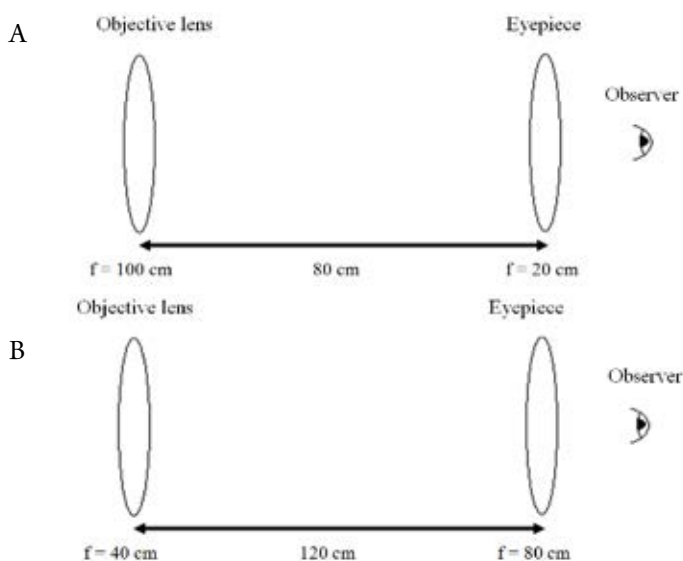
The phenomenon of light involved is

- A reflection
- B refraction
- C diffraction
- D Total internal reflection

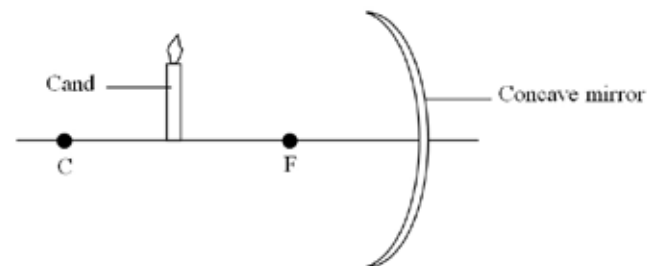
- 25 Which of the following ray diagram shows the correct path of light ray?



- 26 Which of the following arrangements of lenses produce the highest magnification of a simple astronomical telescope at normal adjustment?



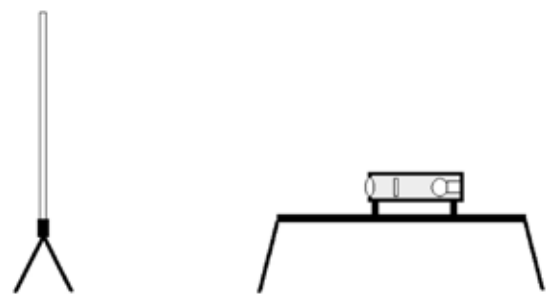
- 27 Diagram 27 shows a candle in front of a concave mirror.



The image of the candle is

- A virtual
- B upright
- C laterally inverted
- D bigger than the object

- 28 Diagram 28 shows a slide projector on a table. The distance of the screen from the lens is 2.5 m and the slide from the lens is 20 cm.



What is the focal length of the projector's lens?

- A  $\frac{250}{20} \text{ cm}$
- B  $\frac{270}{20} \text{ cm}$
- C  $\frac{500}{23} \text{ cm}$
- D  $\frac{500}{27} \text{ cm}$
- E  $\frac{500}{270} \text{ cm}$

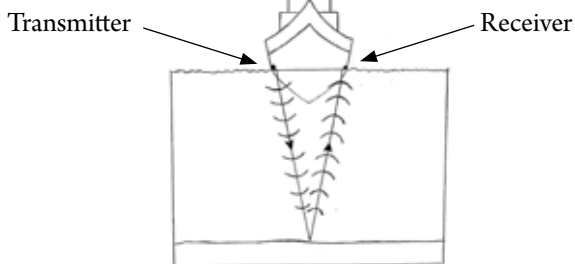
- 29 Sound from the distant object can be heard clearer at night compare during day time.



The phenomenon of waves involved is

- A refraction  
B reflection  
C diffraction  
D interference

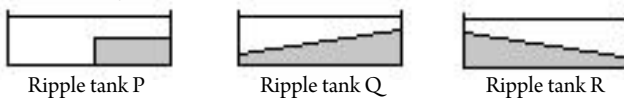
- 30 Diagram 30 shows a ship transmit an ultrasonic wave to the seabed.



If the sound waves received 2.0 s after transmitted and the speed is  $640 \text{ ms}^{-1}$ , what is the depth of the ocean?

- A 320 m  
B 640 m  
C 960 m  
D 1280 m  
E 2560 m

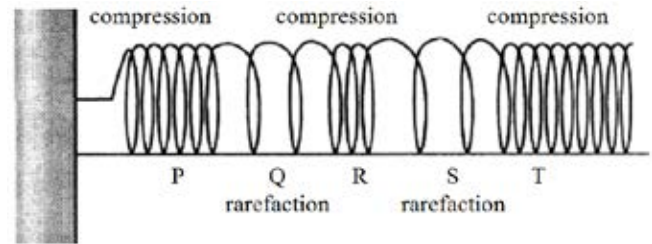
- 31 Diagram 31 shows the side view of ripple tanks P, Q and R with water and different shapes of transparent glass plates. Plane waves produced by the vibrators with the same frequencies. The patterns of wave fronts are observed on the screen using the stroboscope.



Which of the following are observed on the screens from ripple tanks P, Q and R?

- A   
B   
C   
D

- 32 Diagram 32 shows a stretched slinky spring on a horizontal plane with one end attached to a vertical wall. A pulse of waves given on the other end of the spring produced a series of compression and rarefaction regions.



The wavelength can be measure from

- A P to R  
B P to S  
C P to Q  
D P to T

- 33 Diagram 33 shows the spectrum of electromagnetic waves.

Radio waves	Microwaves	Ultra-violet	Visible light
Infra red	X-ray	Gamma ray	

Which of the following statement is true?

- A All electromagnetic waves can be deflected by magnetic field.  
B All electromagnetic waves can be deflected by electric field.  
C All electromagnetic waves are transverse waves.  
D All electromagnetic waves travelled with the same speed in glass.

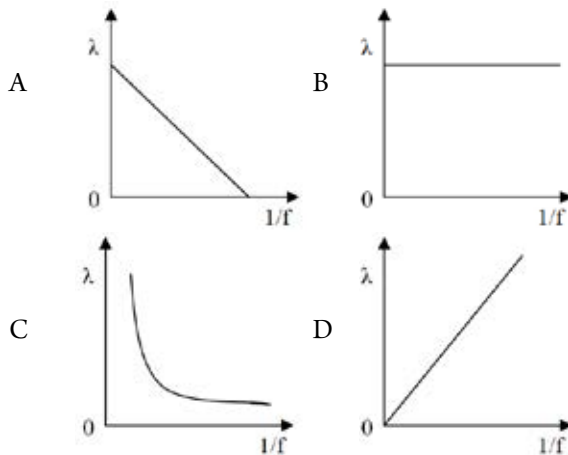
- 34 Diagram 34 shows an interference pattern of light waves in Young's double slits experiment.



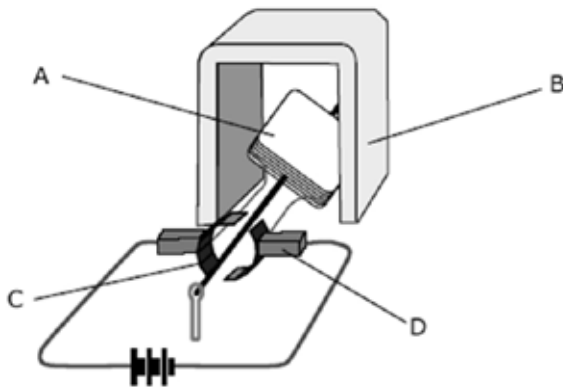
Which of the following will caused the distance between two consecutive fringes increases?

- A Reduce the distance between light source and the double slits.  
B Reduce the distance between double slits and the screen.  
C Reduce the distance between two slits of double slits.  
D Increase the distance between two slits of double slits.

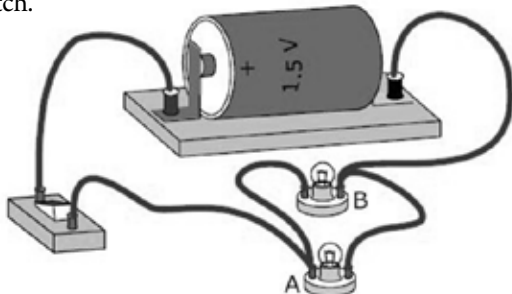
35 Which of the following graph represents the correct relationship between wavelength,  $\lambda$ , and frequency,  $f$ ?



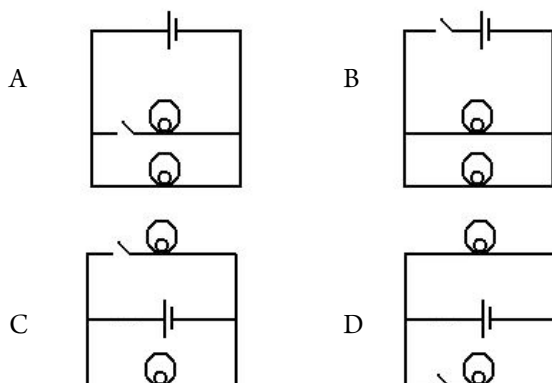
36 Diagram 36 shows the structure of electric motor. Which of the following labels represents permanent magnet?



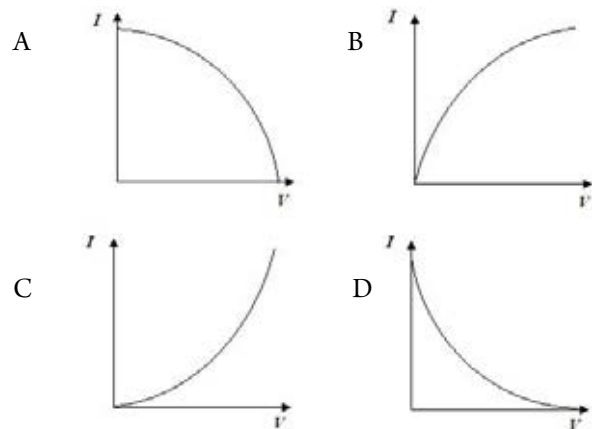
37 Diagram 37 shows a dry cell is connected to two bulbs and a switch.



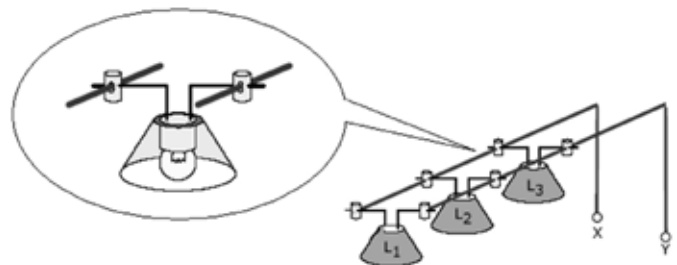
Which of the following circuits represents the above connection?



38 Which of the following graphs represents the change of potential difference across a resistor which increases its resistance when current flow increases?



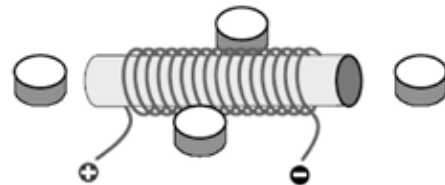
39 Diagram 39 shows the connection of three identical bulbs  $L_1$ ,  $L_2$  and  $L_3$  labeled 12V, 30W.



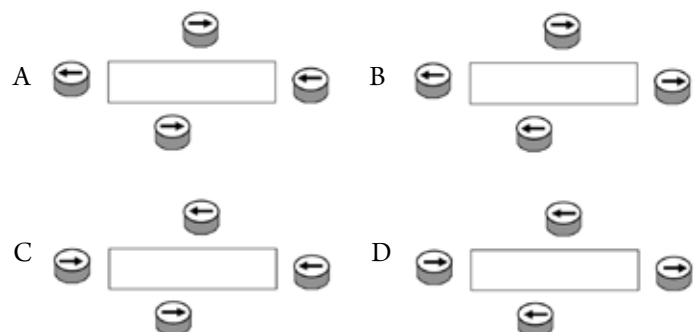
What is the value of current from X if the potential difference across XY is 12 V?

- A 0.4 A
- B 2.5 A
- C 7.5 A
- D 12 A
- E 36 A

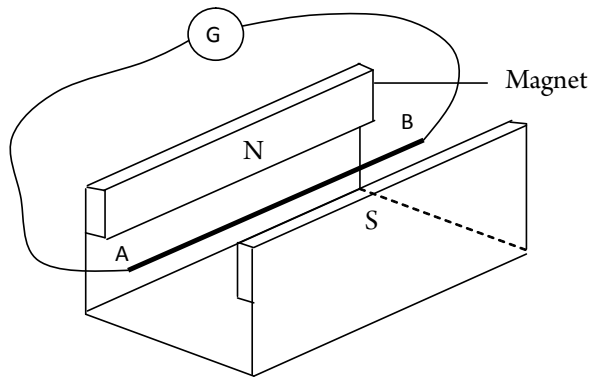
40 Diagram 40 shows four plotting compasses placed close to a solenoid around an iron core.



Which of the following shows the correct direction of the needle of the compasses?



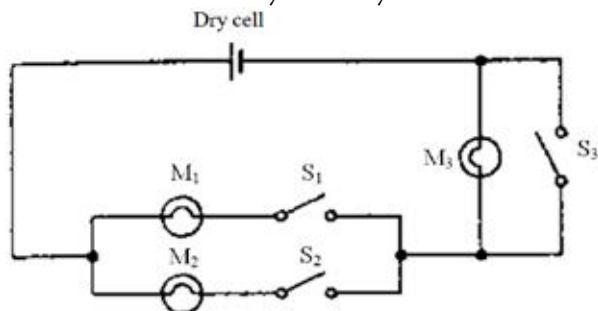
- 41 Diagram 41 shows a conducting wire connected to a galvanometer in between two magnet.



What will happen when the wire move upwards?

- A Induced current flow in wire from B to A.  
 B The wire will be magnetise.  
 C The needle of galvanometer will not deflect.  
 D The needle of galvanometer deflect and then back to initial position.

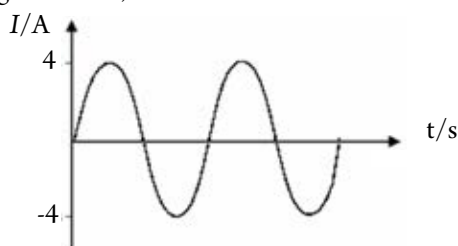
- 42 Diagram 42 shows three identical bulbs connected to a dry cell and a switch. The bulb lights up with normal brightness if it is connected individually to the dry cell.



Which of the following shows the condition of the bulbs when the switches S1, S2 and S3 are closed?

- |   | Bulb $M_1$ | Bulb $M_2$ | Bulb $M_3$ |
|---|------------|------------|------------|
| A | Dimmed     | Dimmed     | Normal     |
| B | Dimmed     | Dimmed     | Fuse       |
| C | Normal     | Normal     | Fuse       |
| D | Normal     | Normal     | Dimmed     |

- 43 Graph 43 shows variation of alternating current flows through a resistor,  $5\Omega$ .



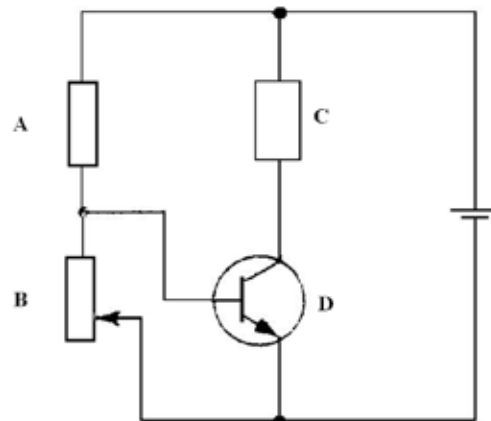
What is the value of power dissipated as heat in the resistor?

- |        |         |
|--------|---------|
| A 20 W | D 80 W  |
| B 40 W | E 100 W |
| C 50 W |         |

- 44 Which of the following pairs are correct?

	Symbol	Electronic Device
A		Diode
B		Dry cell
C		PNP Transistor
D		Variable Capacitor

- 45 Diagram 45 shows a circuit of fire alarm. Which component works as a sensor of heat?



- 46 Diagram 46 shows the truth table for a combination of a few logic gates.

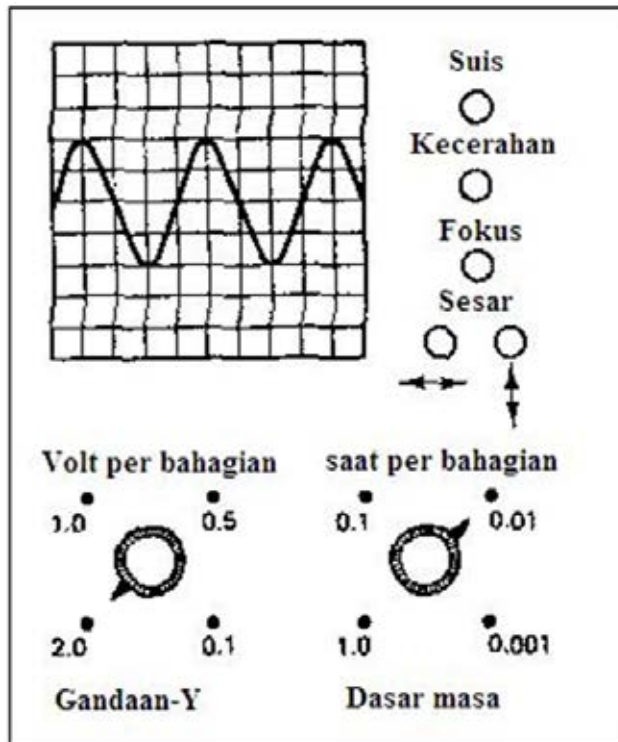
Input		Output
A	B	X
0	0	1
0	1	1
1	0	1
1	1	0

Which of the following combination of logic gates give the above output X?

- A
- B
- C
- D



- 47 Diagram 47 shows the shape of the signal displayed on the screen when Y-input of a cathode-ray-oscilloscope is connected to a dynamo of a bicycle.

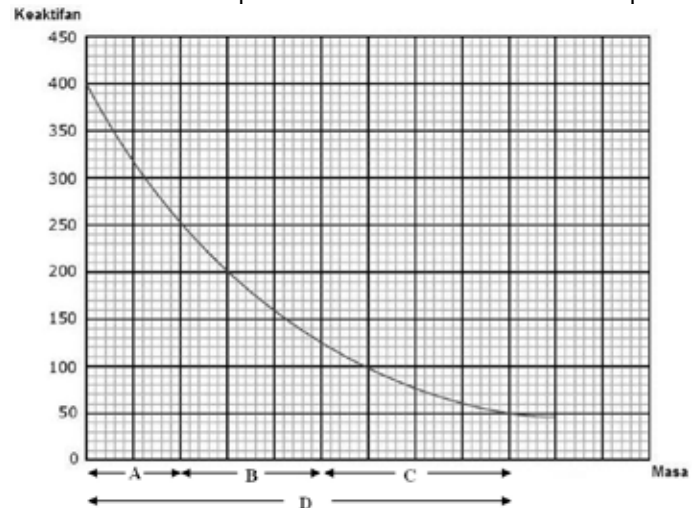


Which of the following statements is correct?

- A The peak voltage is 8.0 V
- B The frequency is 25 Hz
- C A light spot produced when time-base is off
- D The amplitude of the signal reduced when Y-multiplier change to 1.0V / division

- 48 Graph 48 shows the radioactive decay of an isotope.

Which sections represents the half-life of the radioisotope?



- 49 The equation below represents the radioactive decay of X with the emission of alpha particle and daughter nucleus Y.



Which of the following is true about nucleus Y?

- A Y has 2 protons less than X.
  - B Y has 4 neutrons less than X.
  - C Y has 4 protons less than X.
  - D Y has 2 electrons less than X.
- 50 The initial activity of  $^{214}_{83}\text{Bi}$  is 32 counts per second. After 60 minutes the activity drops to 4 counts per second.
- What is the half-life of  $^{214}_{83}\text{Bi}$ ?
- A 10 minutes
  - B 15 minutes
  - C 20 minutes
  - D 30 minutes
  - E 40 minutes

END OF QUESTIONS PAPER



Physics Paper 2

[4531/2]

Section A

[60 marks]

Answer all questions in this section.

- 1 Figure 1 shows a spring on a smooth horizontal surface being compressed by a steel ball toward a wall.

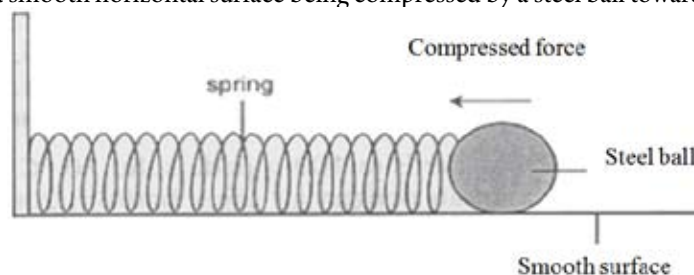


Figure 1

- (a) (i) State the type of energy stored in the compressed spring.  
 \_\_\_\_\_ [1 mark]
- (ii) State the relationship between the compressed force and the energy stored in the spring.  
 \_\_\_\_\_ [1 mark]
- (b) The compressed force is released and the ball move with certain velocity.  
 State the changes to magnitude of the velocity if
- (i) the stiffer spring is used (the ball released from the same point)  
 \_\_\_\_\_ [1 mark]
- (ii) the ball with bigger mass is used  
 \_\_\_\_\_ [1 mark]

- 2 Figure 2 shows a plane wave of water wave propagates towards two plane barriers.

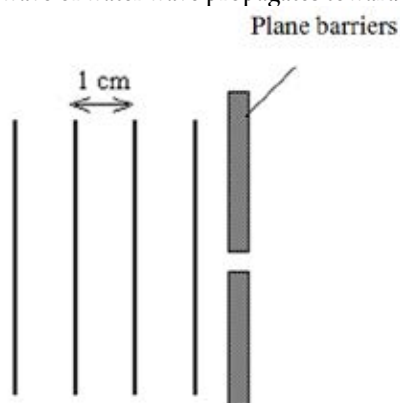


Figure 2

- (a) Draw the pattern of the wave that passed through the opening.  
 \_\_\_\_\_ [2 marks]
- (b) Name the phenomenon of wave occur in (a).  
 \_\_\_\_\_ [1 mark]

- (c) If the velocity of the wave before the opening is 4 cm s<sup>-1</sup>, calculate its frequency after the opening.

[2 marks]

- 3 Figure 3.1 shows the component of a cathode-ray-oscilloscope.

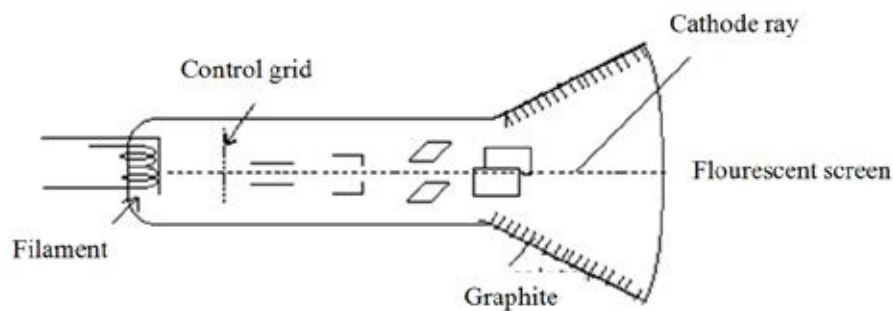


FIGURE 3.1

- (a) What is the meaning of *cathode ray*?

[1 mark]

- (b) State the function of the filament in the cathode-ray-oscilloscope.

[1 mark]

- (c) If the potential difference between anode and cathode is 5 kV, calculate the speed of the cathode ray.

[Mass of an electron,  $m_e = 9 \times 10^{-31}$  kg]

[Charge of one electron,  $e = 1.6 \times 10^{-19}$  C]

[3 marks]

- (d) State one advantage of using the cathode-ray-oscilloscope instead of the voltmeter to measure the potential difference.

[1 mark]

4. Figure 4.1 shows a virtual image of flower as seen through a magnifying glass.



Figure 4.1

- (a) (i) What is the meaning of virtual image. [1 mark]  
 \_\_\_\_\_
- (ii) State the phenomena of light involved in the formation of the image. [1 mark]  
 \_\_\_\_\_
- (b) (i) Draw the ray diagram to show the formation of image in Figure 4.2 below. [2 marks]

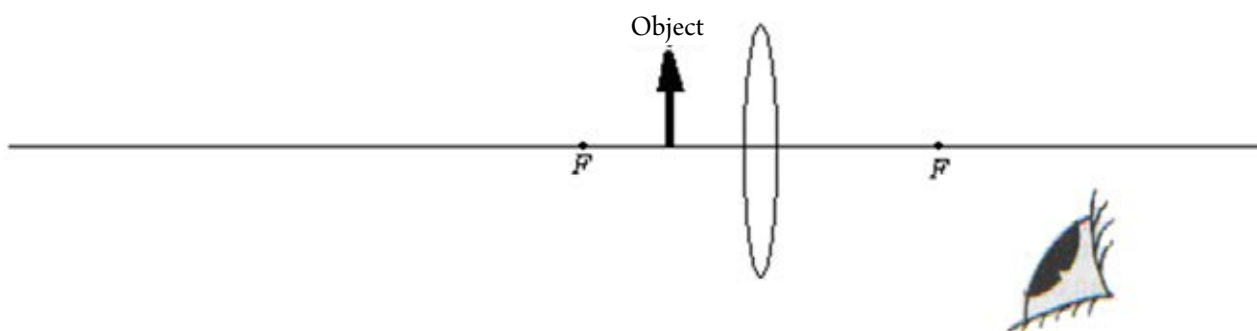


FIGURE 4.2

- (ii) State one characteristic of the image other than virtual image. [1 mark]  
 \_\_\_\_\_
- (c) Calculate the image distance,  $v$ , if the object distance and focal lens are 10 cm and 20 cm respectively.

[2 marks]

- 5 Two identical cylinders filled with gas of the same mass are compressed by 2 kg loads. The cylinder in Figure 5.1 is maintained at room temperature and the cylinder in Figure 5.2 is heated up to a certain temperature.

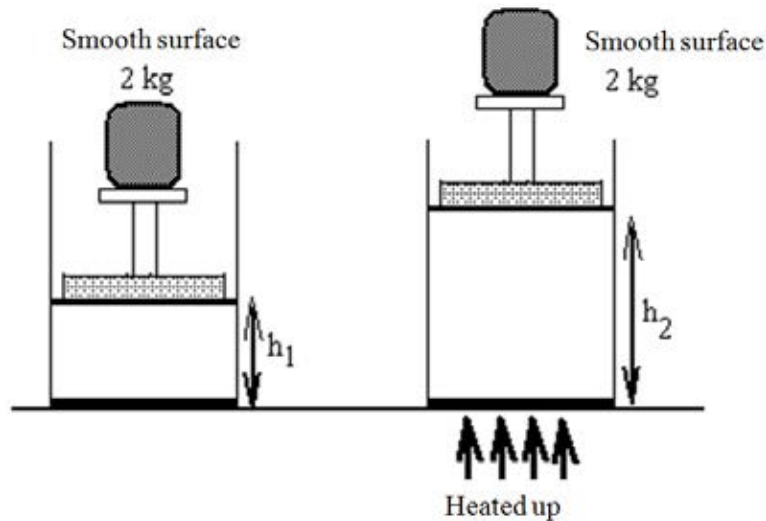


FIGURE 5.1

FIGURE 5.2

- (a) Using Figure 5.1 and Figure 5.2, compare  
 (i)  $h_1$  and  $h_2$

(ii) the temperature of gas in cylinders in Figure 5.1 and Figure 5.2

[2 marks]

- (b) State the relationship between temperature and height of piston in the cylinder.  
 Explain your answer.

[3 marks]

- (c) Name the gas law involved.

[1 mark]

- (d) What will happen to height of the piston,  $h_1$ , in Figure 5.1 if the mass of the load is reduced?  
 Give one reason for your answer.

[2 marks]

- 6 Figure 6.1 and Figure 6.2 show the graphs of radioactive decay of radioisotopes P and Q.

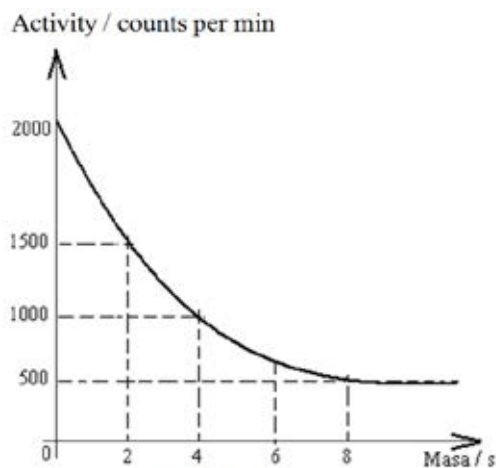


FIGURE 6.1

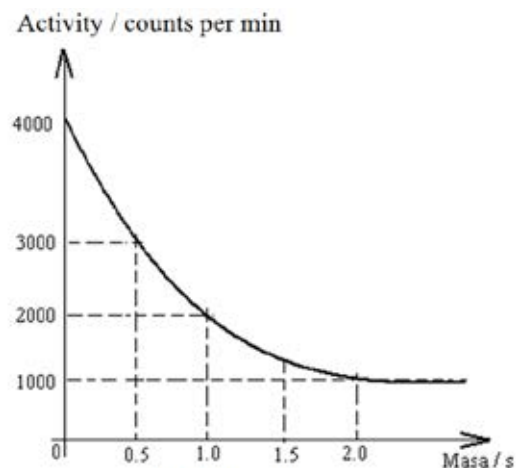


FIGURE 6.2

- (a) What is the meaning of radioisotope?

---



---

[1 mark]

- (b) Using Diagram 6.1 and Diagram 6.2, state two observations for the activity radioactives P and Q.

---



---

[2 marks]

- (c) What is the time taken for the activity of the substances P and Q to reduce to half of their initial activity.

---



---

[2 marks]

- (d) State the relationship between the activity to be halved and its time interval in (c).  
Name that time interval.

---



---

[2 marks]

- (e) What is the activity of the substance Q after 3 s?

---

[1 mark]

- 7 Diagram 7.1 shows a hydraulic pump used to lift up a car in a workshop.

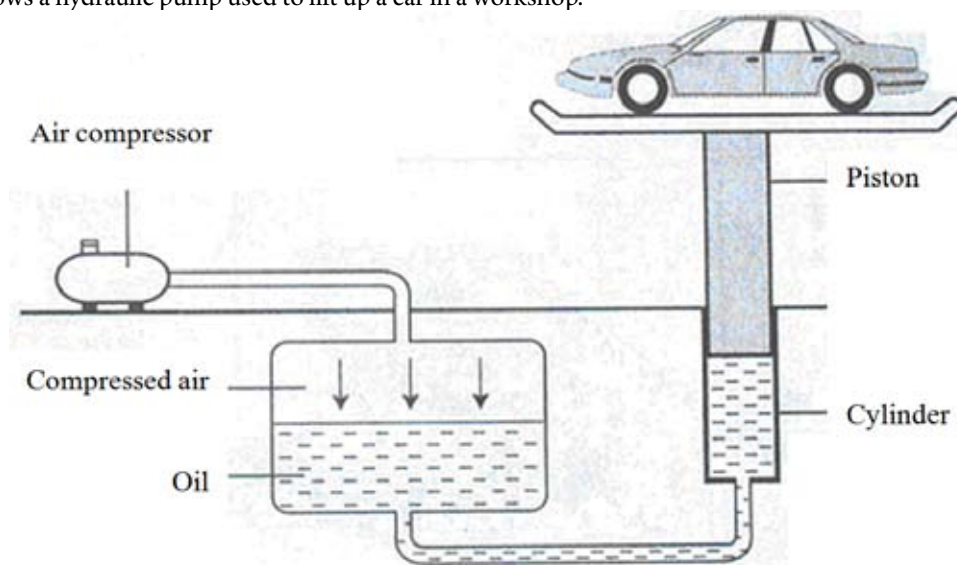


FIGURE 7.1

- (a) (i) Name the physics' principle used in hydraulic pump.

---

[1 mark]

- (ii) Name one important characteristic of the fluid used.

---

[1 mark]

- (b) The pressure of compressed air on the surface of fluid is  $5000 \text{ N m}^{-2}$  and cross sectional area of the piston is  $2 \text{ m}^2$ .

- (i) What is the pressure of fluid in the cylinder?

---

[1 mark]

(ii) Calculate the maximum mass that can be lifted by the piston.

[3 marks]

(iii) What is the effect to the position of the piston if the car is replaced by a lorry with bigger mass?

[1 mark]

(c) What are the changes could be done to the piston and the cylinder so that the heavier load can be lifted.

[2 marks]

(d) Name another application that uses physics' principle in (a)(i).

[1 mark]

- 8 Diagram 8.1 shows a transistor circuit used to detect the temperature of liquid. The bulb will lights up the base voltage  $V_B$  at least 2 V.

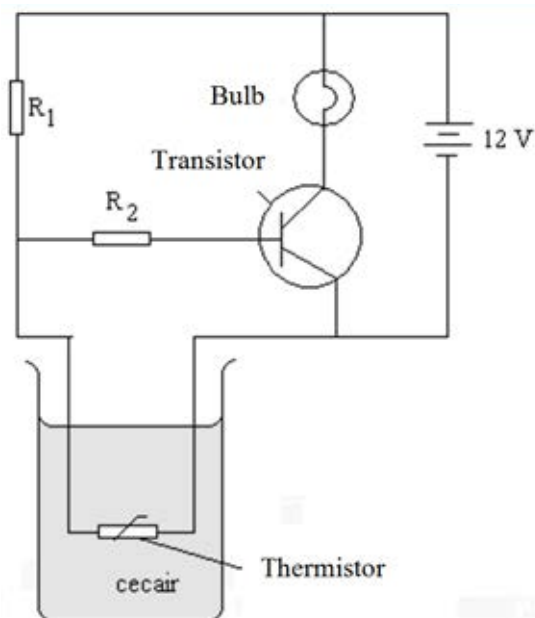


FIGURE 8.1

- (a) In Figure 8.1 above, complete the symbol of the transistor which is suitable for the circuit to function. Name the type of the transistor.

[2 marks]



(b) If the bulb lights up

(i) what is maximum voltage across resistance  $R_1$ ?

[1 mark]

(ii) calculate the resistance of the thermistor when the voltage across  $R_1$  is maximum.

[2 marks]

(c) A student trying to make changes to the circuit in Figure 8.1 by exchanging the position the resistor  $R_1$  and thermistor. The bulb lights up when the resistance of thermistor is  $3500\ \Omega$  at boiling point of the liquid. Table 8.1 shows three resistors S, T and U to change with resistor  $R_1$ .

Resistor	Resistance / $\Omega$
S	400
T	550
U	800

Table 8.1

(i) Calculate the base voltage  $V_B$  for each of the above resistors.

[4 marks]

(ii) Using your answer in (c)(i), suggest the most suitable resistor to be used.  
 Give one reason for your answer.

[2 marks]

(iii) Why the bulb lights up?

[1 mark]

Section B  
 [ 20 marks ]

Answer any one question from this section.

- 9 Figure 9.1 shows temperature against energy graph for heated solid oxygen.  
 Figure 9.2 shows temperature against energy graph for ice heated with heating equipment.

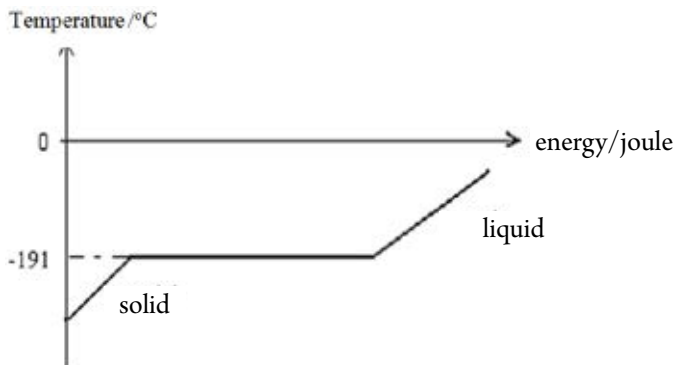


FIGURE 9.1

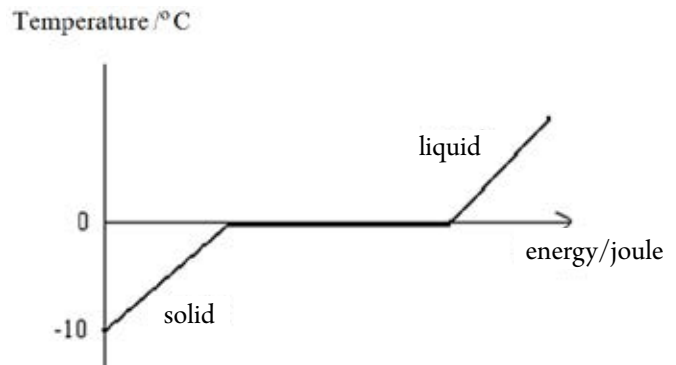


FIGURE 9.2

- What is meaning of temperature? [1 mark]
- Using Diagram 1.1 and Diagram 1.2, compare the change in temperature with heating energy for oxygen and ice. State the relationship between heat energy supplied by the heater and the temperature at melting point. [5 marks]
- Explain the methode to cool down a cup of coffee faster. [4 marks]
- Diagram 1.3 shows a box with a cover to be used as a refrigerator.

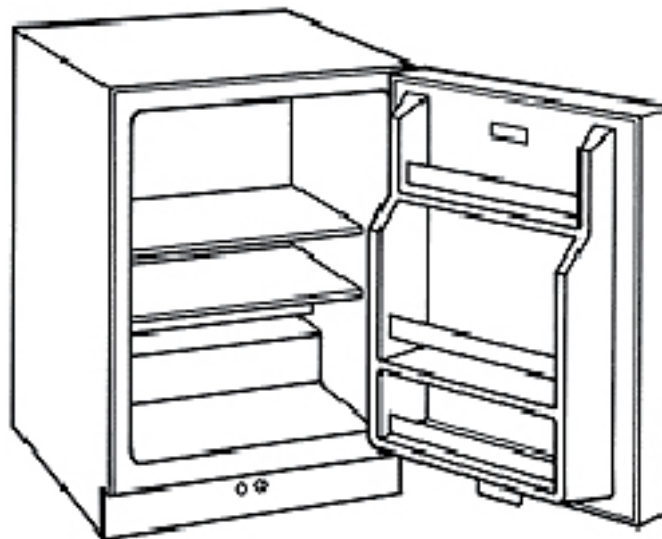


FIGURE 1.3

Using concepts of physics, explain how the box can be modified to be a refrigerator.  
 Your explanation should be discussed in the following aspects;

- The shape and the material of the pipe for the flow of the refrigerant or cooling liquid.
- The type of cooling liquid used
- Safety features.
- The position of cooling compartment.

[10 marks]

10. Figure 10.1 (a) shows a pendulum made from a conducting wire, swinging between two magnets.

The pendulum displaced at a lower level.

Figure 10.1 (b) shows the identical pendulum system is displaced at a higher level.

Figure 10.2 (a) and Figure 10.2 (b) show a simple generator and its anchor spin between two magnets with different speed

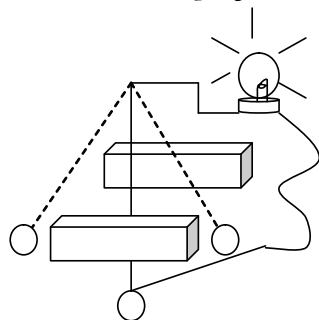


FIGURE 10.1(a)

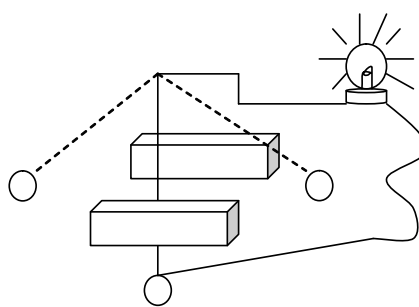


FIGURE 10.1 (b)

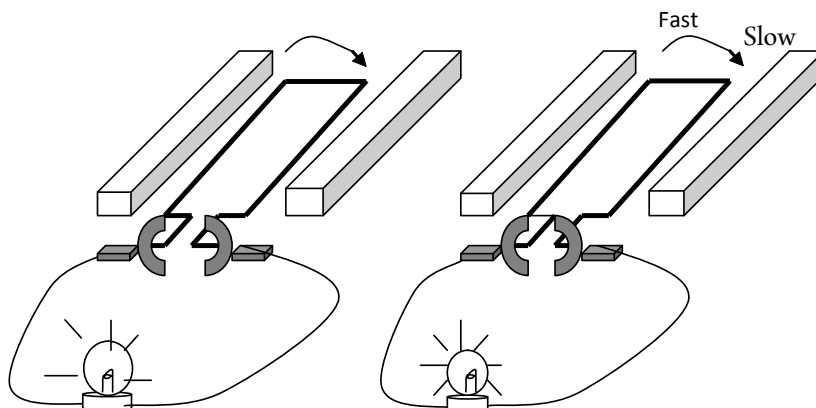


FIGURE 10.2 (a)

FIGURE 10.2 (b)

- (a) What is meant by electromagnet induced? [1 mark]
- (b) Using figure 9.1 and 9.2 compare the brightness of bulbs with their relative movements of the anchor and level of pendulum being displaced.  
 Relate the speed of the anchor and the level displaced of a pendulum, magnetic field, hence deduce a relevant physics concept. [5 marks]
- (c) (i) Name the type of current flows through the bulb in figure 9.1.  
 (ii) Sketch the graph of an output current deduced from the oscillation of the simple pendulum.  
 On the same graph, sketch and label the graph of an output current if the speed of the oscillation of the simple pendulum increased. [4 marks]
- (d) Using the labelled diagram, suggest how to modify the generator above into alternating current generator which has high efficiency. [10 marks]

Section C  
 [ 20 marks ]

Answer any one question from this section

- 11 (a) Endoscope is an instrument used by doctor to observe the internal injury of a patient. Endoscope is made from optical fibre as shown in Diagram 11.1. The light from the internal organ transmitted through the optical fibre by multiple total internal reflections until it reached the video camera.

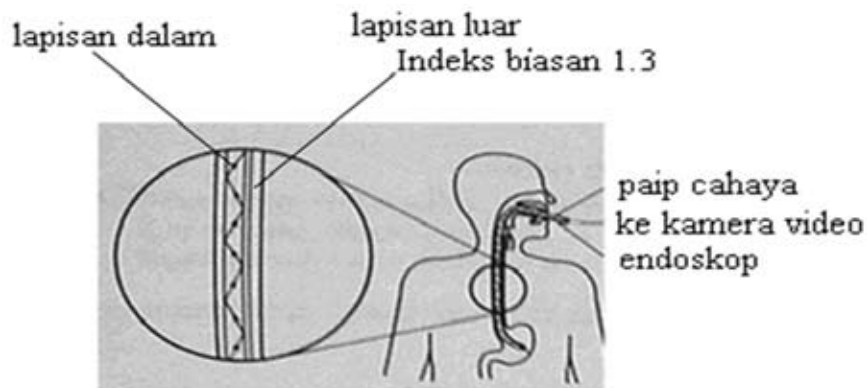


Diagram 11.1

Table 11.1 shows the characteristics of glass to be used as the optical fibre.

Characteristic/Material	Refractive Index	Stiffness	Strength	Critical angle, c/ o
V	1.3	Low	Moderate	50.3
W	2.4	Low	High	24.6
X	2.5	High	High	23.6
Y	1.8	Moderate	Moderate	33.8
Z	1.7	Low	High	36.0

- (i) What is the meaning of total internal reflection? [1 mark]
- (ii) You are asked to study the characteristics of the materials in Table 11.1 to be used as the optical fibre in endoscope. Explain the suitability each characteristic in Table 11.1 and choose the most suitable material. Give reasons for your choice. [10 marks]
- (b) When a ray of light propagates from air to a diamond, the diamond looks sparkling. Refractive index of diamond is 2.43.
- (i) Calculate the critical angle of the diamond. [2 marks]
- (ii) Explain how the diamond look sparkling after light ray enters through its surface. [3 marks]
- (iii) What changes to the sparkling of the diamond when it is immersed in a beaker of water. Give reason for your answer. [2 marks]
- (iv) Can a piece of glass give the same sparkling effect when it is cut similar to the diamond. Explain your answer. [2 marks]

- 12 Diagram 12.1 shows a fuse used in electrical appliances. The fuse is used to prevent the appliance from spoilt when excess current flow.

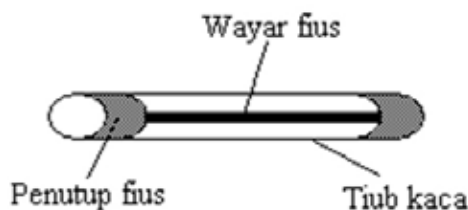


Diagram 12.1

Table 12.1 shows the characteristics of metal used as the wire in fuse.

Metal	Resistance / $\Omega$	Melting point / $^{\circ}\text{C}$	Specific heat capacity / $\text{Jkg}^{-1} \text{ } ^{\circ}\text{C}^{-1}$	Diameter
P	0.03	700	900	Big
Q	0.97	1200	500	Small
R	0.22	327	128	Small
S	0.18	1083	387	Big

- (a) (i) What is meant by electric current? [ 1 mark]
- (ii) Explain how fuse works. [2 marks]
- (iii) You are asked to study the characteristics of the metal in Table 12.1 to be used as wire in fuse. Explain the suitability of the characteristics in Table 12.1 and choose the most suitable wire. Give reasons for your choice. [10 marks]
- (b) An electric iron labelled 1000 W, 240 V is used for 2 hours. Calculate
- (i) The amount of electrical energy used.
- (ii) The current flow in the electric iron and hence suggest the suitable fuse. [5 marks]
- (c) The wire to the electrical appliances consists of three wires; Live, Neutral and Earth wires. To which wire the fuse is connected and explain your answer. [2 marks]

END OF QUESTIONS PAPER

Physics Paper 3

[4531/3]

Section A  
[28 marks]  
Answer all questions

- 1 A student carry out an experiment to investigate the relationship between the length of constantan wire,  $l$  and the resistance,  $R$ . The arrangement of the apparatus are as shown in Figure 1.1.

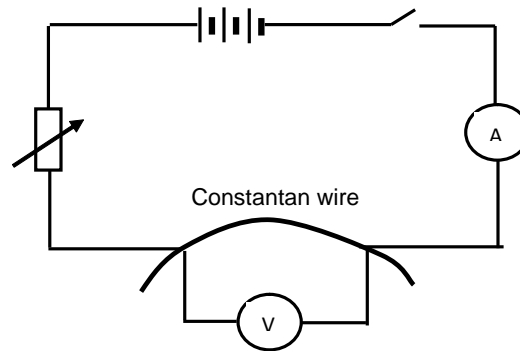


Figure 1.1

Using the constantan wire of length,  $l = 20.0$  cm, the switch is closed and the rheostat is adjusted so that the reading of the ammeter,  $I = 0.5$  A. The reading of the voltmeter is as shown in Figure 1.2.

The steps above are repeated using lengths,  $l = 40.0$  cm,  $60.0$  cm,  $80.0$  cm and  $100.0$  cm. Their corresponding readings of voltmeter are as shown in Figures 1.3, 1.4, 1.5 and 1.6.

The resistance of the constantan wires are calculated using the formula;  $R = \frac{V}{I} \Omega$

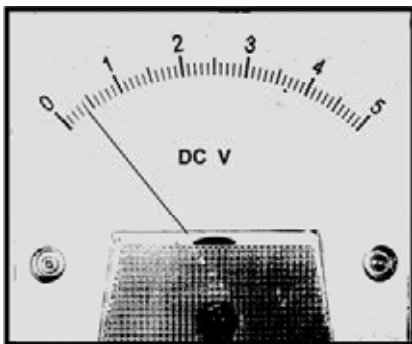


FIGURE 1.2 ( $l = 20.0$  cm)

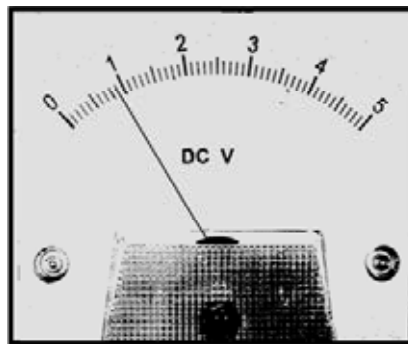


FIGURE 1.3 ( $l = 40.0$  cm)

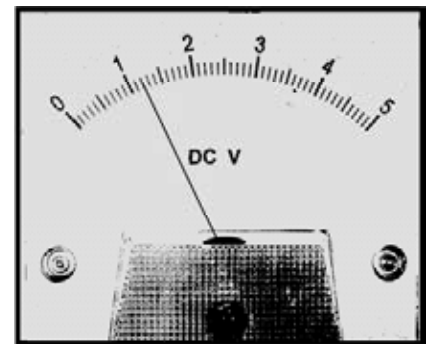


FIGURE 1.4 ( $l = 60.0$  cm)

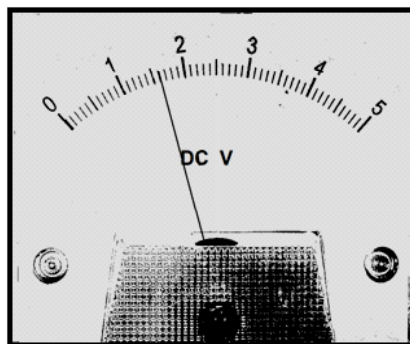


FIGURE 1.5 ( $l = 80.0$  cm)

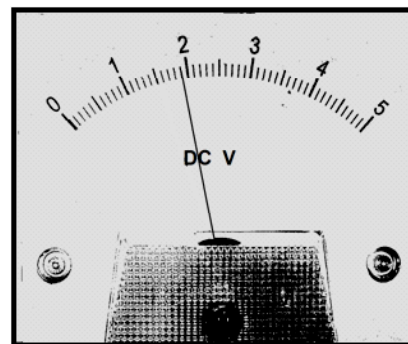


FIGURE 1.6 ( $l = 100.0$  cm)



(a) From the informations mentioned, state;

(i) manipulated variable,

---

[1 mark]

(ii) responding variable,

---

[1 mark]

(iii) fixed variable.

---

[1 mark]

(b) On the Figures 1.2, 1.3, 1.4, 1.5 and 1.6, write the readings of the voltmeter in the space provided when the length,  $l$  are 20.0 cm, 40.0 cm, 60.0 cm, 80.0 cm and 100.0 cm respectively.

Tabulate the data for  $l$ ,  $V$  and  $R$  in the space below.

[7 marks]

(c) Plot the graph of  $R$  against  $l$  on the next page.

[5 marks]

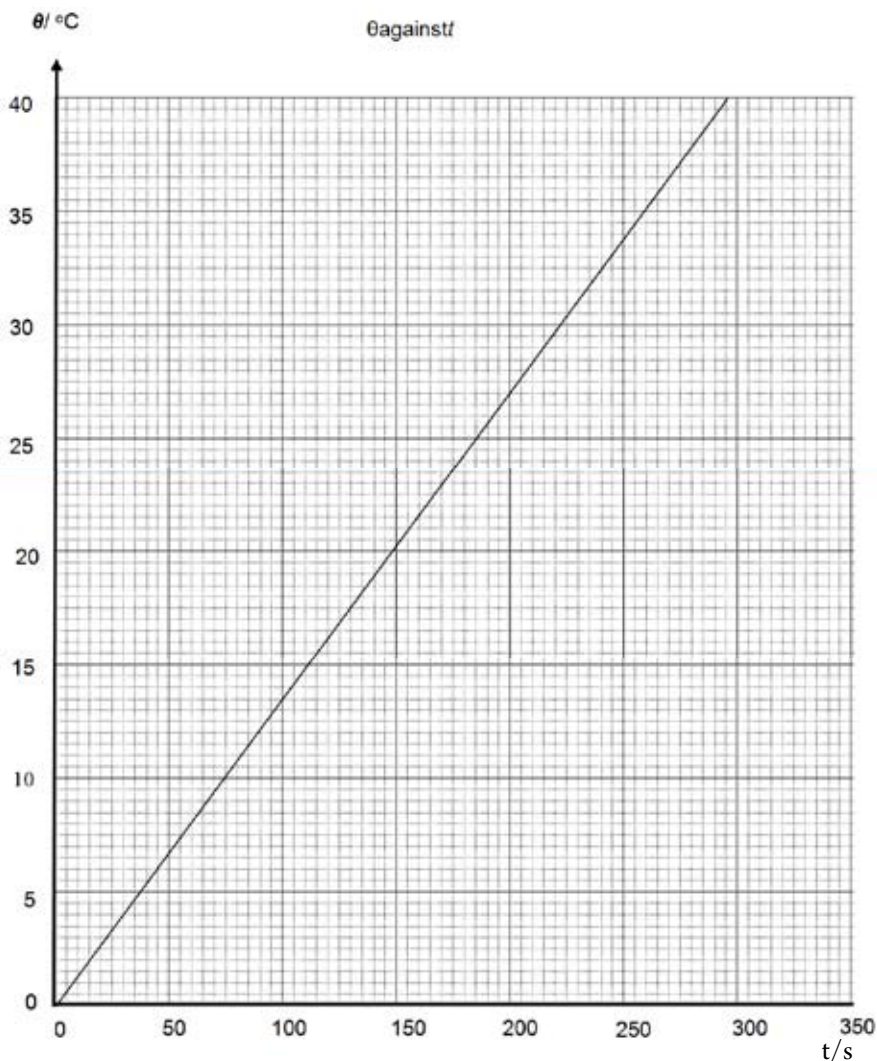
(d) Using the graph in (c), state the relationship between  $R$  and  $l$ .

---

[1 mark]

[illegible]

2. A student carry out an experiment to investigate the relationship between rise in temperature,  $\theta$  and time,  $t$  for a copper block of mass 5 kg. A heater of electrical power of 25 W is used to heat up the copper block from initial temperature  $30^{\circ}\text{C}$ . The student record the rise in temperature in 300 seconds. A graph of  $\theta$  against  $t$ , plotted is as shown in Figure 2.1



- (a) Based on the graph in Figure 2.1,

- (i) state the relationship between  $\theta$  and  $t$

[ 1mark]

- (ii) determine the rise in temperature of the copper block,  $\theta$ , in 120 seconds.

Show in the graph how you determine the rise in temperature.

[ 2 marks]

- (iii) determine the time taken to heat up the copper block from  $30^{\circ}\text{C}$  to  $65^{\circ}\text{C}$

[ 2 marks]

- (iv) Calculate the gradient of the graph.

[ 3marks]

- (b) Using your answer in (a) (iv) and the equation  $\theta = \frac{Pt}{mc}$ , calculate the specific heat capacity, of the copper block.

[ 3 marks]

- (c) State one precaution in this experiment.

[ 1mark ]



## Section B

[12 marks]

Answer any one question from this section.

3. Figure 3.1 shows an electromagnet of a crane connected to a power supply to lift up scrapped iron in iron mill. Figure 3.2 shows the same crane where the electromagnet is connected to higher power supply.

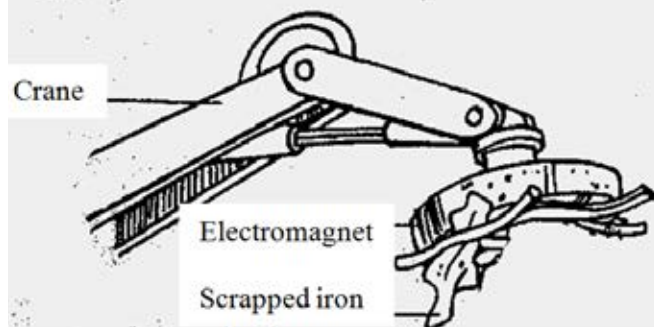


FIGURE 3.1

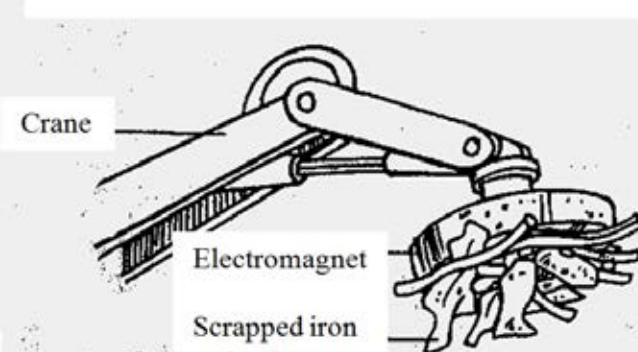


FIGURE 3.2

Based 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 soft iron core, insulated copper wire and other apparatus, describe an experiment framework to investigate the hypothesis stated in 3(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. [10 marks]

4. Figure 4.1 shows a swing with a baby oscillates vertically. It is observed that the swing oscillate 'slower' if the mass of the baby is bigger.

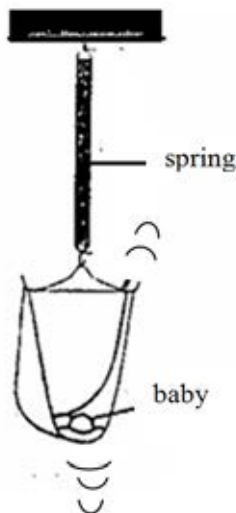


FIGURE 4.1

Based 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 helical spring, slotted weight and other apparatus, describe an experiment framework to investigate the hypothesis stated in 3(b).

In your description, state clearly the following;

- (viii) Aim of the experiment.
- (ix) Variables in the experiment.
- (x) List of apparatus and materials.
- (xi) Arrangement of the apparatus.
- (xii) The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable.
- (xiii) The way you would tabulate the data.
- (xiv) The way you would analyse the data. [10 marks]

END OF QUESTIONS PAPER

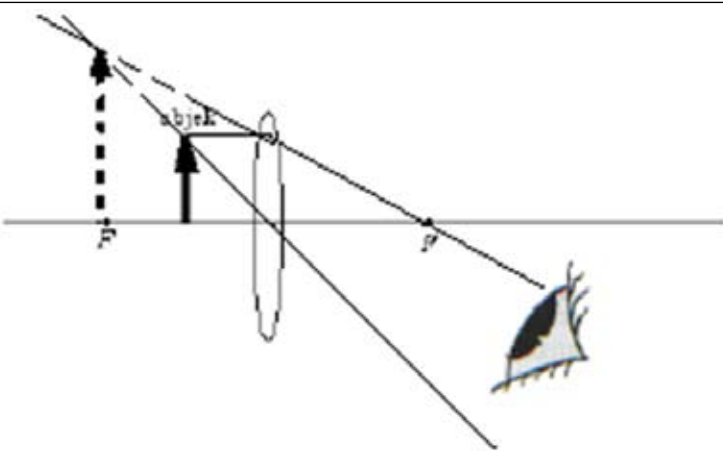


# Jawapan Physics

Physics Paper 1

No	Ans	No	Ans	No	Ans	No	Ans	No	Ans
1	C	11	E	21	B	31	B	41	A
2	B	12	C	22	A	32	A	42	C
3	D	13	A	23	B	33	C	43	B
4	C	14	D	24	B	34	C	44	B
5	B	15	C	25	C	35	C	45	B
6	D	16	A	26	C	36	B	46	D
7	A	17	E	27	D	37	B	47	B
8	D	18	C	28	D	38	B	48	B
9	C	19	C	29	A	39	B	49	A
10	B	20	C	30	B	40	D	50	C

Physics Paper 2

No	Mark	Answer
Question 1		
(a)(i)	1	Elastic potential energy
(ii)	1	Directly proportional
(b)(i)	1	Increases
	1	Decreases
Question 2		
(a)	1	[semi circle shape]
	1	[same $\lambda$ ]
(b)	1	Diffraction
(c)	1	$(4 \text{ cm s}^{-1}) / 1 \text{ cm}$
	1	4 Hz
Question 3		
(a)	1	Beam of electrons with high kinetic energy
(b)	1	To emit electrons by thermionic emission
(c)	1	Velocity = $\sqrt{\frac{2 \times 1.6 \times 10^{-19} \times 5000}{9 \times 10^{-31}}}$
	1	$r = 1.78 \times 10^{21} \text{ m s}^{-1}$
(d)	1	More sensitive
Question 4		
(a)(i)	1	Image that cannot be formed on a screen
(ii)	1	Refraction
(b)(i)	2	
(ii)	1	Magnify or upright
(c)	2	$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$ $\frac{1}{20} = \frac{1}{v} + \frac{1}{10}$ $v = -20 \text{ cm}$
Question 5		
(a)(i)	1	$h_2 > h_1$
(ii)	1	Temperature in 5.1 smaller
(b)	1	As temperature increases, height increases
	1	When temperature increases, distance between molecules increases
	1	Distance between molecules increases with volume
(c)	1	Charles' law
(d)	1	$h_1$ increases
	1	When force or pressure decreases, volume increases

Question 6		
(a)	1	Isotope with unstable nucleus
(b)	1	The activity decreases with time
	1	The rate of decay of Q is higher
(c)	1	$P = 4.0 \text{ s}$
	1	$Q = 1.0 \text{ s}$
(d)	1	The activity reduced by halved in a specific interval of time
	1	Half-life
(e)	1	$4000 \rightarrow 2000 \rightarrow 1000 \rightarrow 500$ or 500 counts per minute
Question 7		
(a) (i)	1	Pascal's principle
(ii)	1	Incompressible
(b) (i)	1	$5000 \text{ N m}^{-2}$
(ii)	1	$F = 5000 \times 2$
	1	$= 10,000 \text{ N}$
	1	$m = 1000 \text{ kg}$
(iii)	1	height of piston decreases
(c)	1	Increase the cross-sectional area
	1	Increase the thickness of the wall
(d)	1	Hydraulic jack
Question 8		
(a)		[right direction of arrow at emitter]
		Pnp
(b) (i)		10 V
(ii)	1	$2 = \frac{R_1(12)}{1000 + R_1}$
	1	$R = 200$
(c) (i)		Resistor S
	1	$V_B = \frac{400(12)}{400+3500}$
	1	$= 1.23 \text{ V}$
	1	Resistor T, $V_B = 1.63 \text{ V}$
	1	Resistor U, $V_B = 2.23 \text{ V}$
(ii)	1	Resistor T
	1	The base voltage more than 2 V
(iii)	1	Collector current flows

Bahagian	Mark	Answer Scheme
Question 9		
(a)	1	The degree of hotness
(b)	1	In solid state, temperature increases if energy increases
	2	In liquid state, temperature increases if energy increases
	3	Temperature unchange during melting
	4	Energy is used to break the bond between the molecule in solid
	5	The energy used is called latent heat of fusion
(c)	1	Add in ice cubes
	2	Stir the coffee
	3	Ice absorb heat from coffee
	4	The rate of heat absorption is bigger if the different in temperature between ice and liquid is bigger
(d)	1	Pipe in a shape of coil wrapped around the freezer
	2	Increase the area will increase the rate of heat absorption
	3	Pipe is made from low specific heat capacity
	4	Good conductor of heat
	5	Freon
	6	Can easily evaporate at low temperature and pressure
	7	The box is wrapped with the insulator
	8	Reduce the flow of heat from surrounding into the box
	9	Equipped with the thermostat
	10	Temperature inside can be controlled
Question 10		
(a)	1	Production of current when a conductor wire cut the magnetic flux
(b)	1	The pendulum bob is released at higher level in Figure 10.1 (b)
	2	The bulb lights up brighter in Figure 10.1 (b)
	3	As the height released increases, the speed of wire cut the magnetic field increases
	4	As brightness increases, induced current increases
	5	As speed increases, induced current increases
(c)	1	Induced current
	2	Current against time is labelled with sinusoidal shape
	3	Second signal has higher amplitude
	4	Second signal has smaller period
(d)	1	Curved shape permanent magnet
	2	Magnetic field is uniform around the coil
	3	Replace commutator with slip ring
	4	Current flow in the bulb in two direction
	5	Increase the number of coil
	6	More current produced
	7	The coil wound on the soft iron core
	8	Increase the intensity of magnetic field
	9	Laminated soft iron core is used
	10	To reduce eddy current

Bahagian	Mark	Answer Scheme
Question 11		
(a)(i)	1	Phenomenon of light which reflect light in denser medium when the angle of incidence is bigger than the critical angle c.
(ii)	1	High refractive index
	1	Medium is denser
	1	Stiffness is low
	1	Can easily bent
	1	Strength is high
	1	Optical fibre will not break
	1	Small critical angle
	1	Total internal reflection is more likely to take place
	1	W
	1	High refractive index, Stiffness is low, Strength is high, Small critical angle
(b)(i)	1	Correct substitution, $n = 1 / (\sin c)$ , $c = \sin^{-1} 2.43$
	1	$c = 24.3^\circ$
(ii)	1	Refraction occur when light enters diamond
	1	Total internal reflection occur several times in the diamond
	1	Refraction occur at different angle
	1	Different colours emitted
(iii)	1	Less sparkling
	1	Critical angle increases
(iv)	1	No
	1	Bigger critical angle

Bahagian	Mark	Answer Scheme
Question 12		
(a)(i)	1	Rate of charge flow
(ii)	1	If current flow is high, temperature increases
	1	Wire will melt
(iii)	1	High resistance
	1	Large heat energy produced
	1	Low melting point
	1	Wire easily melt when melting point is reached
	1	Low specific heat capacity
	1	Temperature rise easily
	1	Small diameter
	1	High resistance
	1	R
	1	High resistance, Low melting point, Low specific heat capacity and Small diameter
(b)(i)	1	Correct substitution, $E = Pt = 1000 \times 2 \times 60$
	1	$E = 120\,000\text{ J}$
(ii)	1	$E = VIt$
	1	$I = 120\,000 / (240 \times 120)$
	1	$= 4.17\text{ A}$
(c)	1	Live wire
	1	Current flow in the electric appliance through live wire

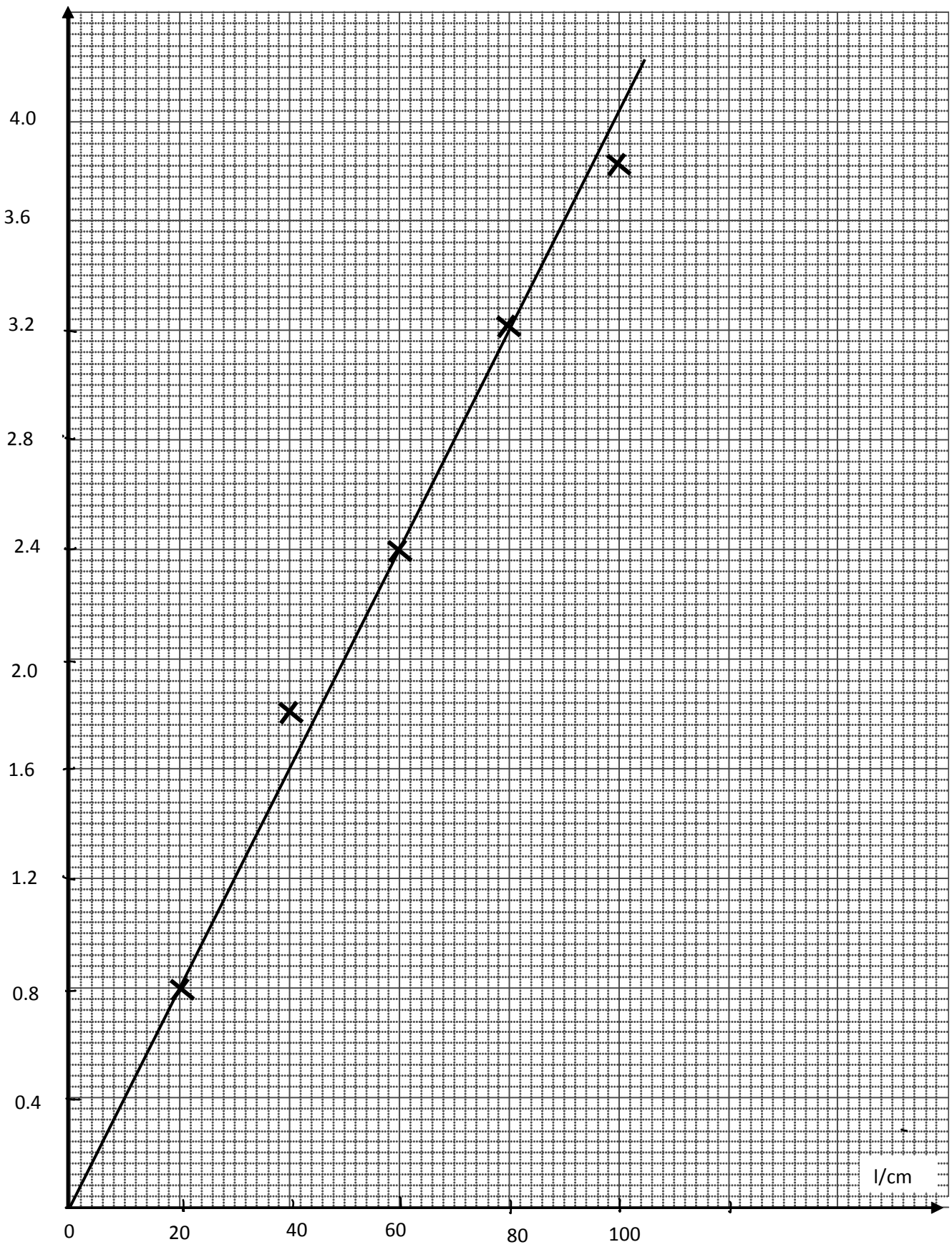
Physics Paper 3

Bahagian	Mark	Answer Scheme																		
Question 1																				
(a)(i)	1	Length of wire																		
(ii)	1	Resistance																		
(iii)	1	Thickness of wire																		
(b)	7	1. Show columns of $l$ , $V$ and $R$																		
		2. Correct units of $l$ , $V$ and $R$ .																		
		3. At least 2 readings of $V$ correct																		
		4. All readings of $V$ correct																		
		5. Readings of $l$ and $V$ consistent to 1 d.p.																		
		6. Correct calculation of $R$ .																		
		7. Values of $R$ consistent to 1 d.p																		
		<table><tr><td><math>l</math> / cm</td><td><math>V</math> / volt</td><td><math>R</math> / <math>\Omega</math></td></tr><tr><td>20.0</td><td>0.4</td><td>0.8</td></tr><tr><td>40.0</td><td>0.9</td><td>1.8</td></tr><tr><td>60.0</td><td>1.2</td><td>2.4</td></tr><tr><td>80.0</td><td>1.6</td><td>3.2</td></tr><tr><td>100.0</td><td>1.9</td><td>3.8</td></tr></table>			$l$ / cm	$V$ / volt	$R$ / $\Omega$	20.0	0.4	0.8	40.0	0.9	1.8	60.0	1.2	2.4	80.0	1.6	3.2	100.0
$l$ / cm	$V$ / volt	$R$ / $\Omega$																		
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60.0	1.2	2.4																		
80.0	1.6	3.2																		
100.0	1.9	3.8																		
(c)	5	Draw $R$ against $l$																		
		A. $R$ on Y axis and $l$ on X axis																		
		B. Both axes have correct units																		
		C. Both axes has uniform and not odd scale																		
		D. 5 points plot correctly																		
		E. 3 points plot correctly																		
		F. Best fit line (min 3 points)																		
		G. Minimum size 5x4 box of 2x2cm																		
<table><tr><td>No. correct</td><td>Score</td></tr><tr><td>7</td><td>5</td></tr><tr><td>5-6</td><td>4</td></tr><tr><td>3-4</td><td>3</td></tr><tr><td>2</td><td>2</td></tr><tr><td>1</td><td>1</td></tr></table>			No. correct	Score	7	5	5-6	4	3-4	3	2	2	1	1						
No. correct	Score																			
7	5																			
5-6	4																			
3-4	3																			
2	2																			
1	1																			
(d)	1	$R$ is directly proportional to $l$																		
Total	16																			



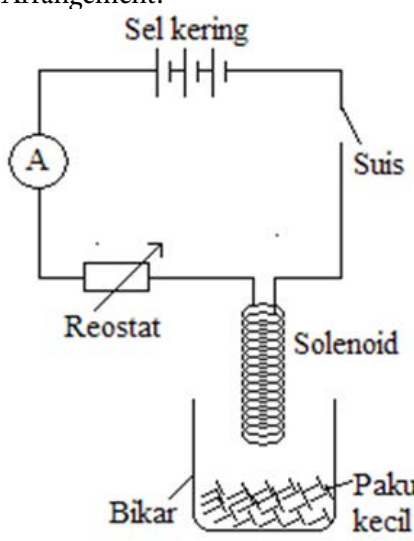
R/Ω

R against l

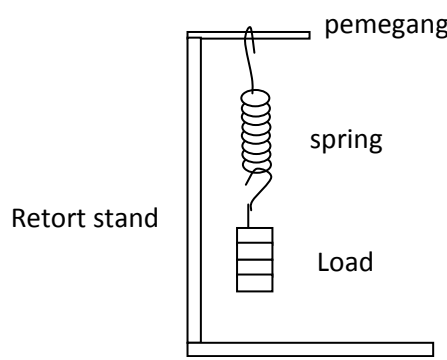


l/cm

Bahagian	Mark	Answer Scheme
Question 2		
(a)(i)	1	Directly proportional
(ii)	1	Show on the graph
	1	16 °C
(iii)	1	$\theta = 35\text{ }^{\circ}\text{C}$ / Show on the graph
	1	$t = 260\text{ s}$
(iv)	3	1. Draw a triangle on the graph 2. Substitute the values 3. Answer with correct unit $0.1346\text{ }^{\circ}\text{C s}^{-1}$
(b)	3	1. Rearrange the formula $\frac{\theta}{t} = \frac{P}{mc}$ 2. Substitute the values $c = \frac{25}{0.1346(0.5)}$ 3. Answer with correct unit $371.47\text{ J kg}^{-1}\text{ }^{\circ}\text{C}^{-1}$
(c)	1	Container wrapped with insulator to prevent heat lost to the surrounding
Total	16	

Bahagian	Mark	Answer Scheme
Question 3		
	1	Inference: The strength of electromagnet depends on current flow.
	1	Hipotesis : As current increases, the strength of electromagnet increases.
	1	Aim: To investigate the relationship between current and the strength of electromagnet.
	1	Variable : Manipulated: Current
		Responding: Number of pin attracted to the soft iron
	1	Fixed: Number of turns of coil
	1	Apparatus: Solenoid, ammeter, pins, rheostat, dry cell, beaker, switch and connecting wires
	1	Arrangement: 
	1	Procedure:
	1	1. Switch on the circuit and adjust rheostat so that the current flow, $I = 0.2\text{ A}$
	1	2. Count the number of pins, $N$ attracted to the soft iron.
	1	3. Repeat with current = $0.3\text{ A}$ $0.4\text{ A}$ , $0.5\text{ A}$ and $0.6\text{ A}$

		Result:												
	1	<table><tr><td>I / A</td><td>N</td></tr><tr><td>0.2</td><td></td></tr><tr><td>0.3</td><td></td></tr><tr><td>0.4</td><td></td></tr><tr><td>0.5</td><td></td></tr><tr><td>0.6</td><td></td></tr></table>	I / A	N	0.2		0.3		0.4		0.5		0.6	
I / A	N													
0.2														
0.3														
0.4														
0.5														
0.6														
	1	Analisis: Plot N against I graph												

Bahagian	Mark	Answer Scheme						
Question 4								
		Inference: Period of oscillation depends on mass of load						
	1	Hipotesis: As mass increases, period increases.						
	1	Aim: To investigate the relationship between mass and period						
	1	Variables: MV – mass RV – period FV – spring constant						
	1	Apparatus: Beam balance, load, spring, retort stand, stop watch						
	1	Arrangement: <div></div>						
	1	Procedure: 1. A load of mass, $m = 50$ hung on the spring. 1. 2. Pull the load and release. Time taken to make 10 oscillation is recorded and the period is determined 1. 3. Repeat with mass, $m = 100$ g, 150 g 200 g and 250 g.						
	1	Result: <table><tr><th>m/g</th><th>T/s</th></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>	m/g	T/s				
m/g	T/s							
	1	Analysis: Plot T against m graph						