PHYSICS

Format of Physics Paper
SPM Level

ITEM	PAPER 1 (4531/1)	PAPER 2 (4531/2)	PAPER 3 (4531/3)
Type of Instrument	Objective Test	Subjective Test	Subjective Test (Written practical test)
Type of Items	Multiple Choice Questions (MCQ) (Each item has three, four choices of answers)	Subjective Items • Structured Item • Restricted Response Items and Extended Response Item	• Structured Item • Extended Response Item
Number of Questions	50 (Answer all)	12 Questions **Section A** 8 questions (Answer **all**) **Section B** 2 questions (Answer **one** only) **Section C** 2 questions (Answer **one** only)	4 Questions **Section A** 2 questions (Answer **all**) **Section B** 2 questions (Answer **one** only)
Total Marks	50 Marks	100 Marks **Section A –** 60 Marks **Section B –** 20 Marks **Section C -** 20 Marks	40 Marks **Section A –** 28 Marks **Section B –** 12 Marks
Duration of Test	1 Hour 15 Minutes	2 Hour 30 Minutes	1 Hour 30 Minutes
Context Coverage	Covers All Learning Areas from Form 4 and Form 5	Covers All Learning Areas from Form 4 and Form 5	Covers All Learning Areas from Form 4 and Form 5
Construct Requirements	Knowledge: 25% - 30% Understanding: 35% - 45% Application Skills: 30% - 35%	Knowledge: 10% - 15% Understanding: 15% - 20% Application Skills: 20% - 32% Problem Solving: 20% - 25% Conceptualising: 15% - 20% Decision Making: 15% - 20%	Problem Solving:100%
Difficulty Levels Low - L Moderate - M High - H	L : 5 M: 3 H : 2	L : 4 M: 3 H : 3	L : 5 M: 3 H : 2

Analysis of Physics Paper
SPM Level

TOPICS	PAPER 1			PAPER 2			PAPER 3		
	YEAR			YEAR			YEAR		
	2004	2005	2006	2004	2005	2006	2004	2005	2006
Introduction to Physic	7	2	3	1	1	2	1	1	1
Forces and Motion	9	2	7	7	2	7	1	0	1
Forces and Pressure	7	2	9	2	2	2	0	0	0
Heat	6	5	4	2	1	1	0	2	0
Light	1	5	5	1	1	1	0	0	0
Waves	3	7	7	1	1	1	1	0	0
Electric and electromagnetic	9	8	9	1	3	1	1	1	2
Electraonics	3	4	3	1	1	1	0	0	0
Radioactivity	5	3	3	1	1	1	0	0	0

CONTOH KERTAS SOALAN PHYSICS

PAPER 1 **ONE HOUR FIFTEEN MINUTES**

*Each question is followed by either **three, four** or **five** options.*
*Choose the best option for each question. **Answer all questions.***

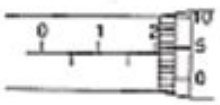
1. Which of the following is not an SI base quantity?

   A. Mass
   B. Weight
   C. Length
   D. Time

2. Which of the following lists of physical quantities consists only of vectors?

   A. time, mass, velocity
   B. mass, velocity, acceleration
   C. force, acceleration, volume
   D. velocity, acceleration, force.

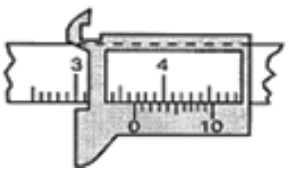
3. The diagram below shows the scale of a micrometer screw gauge.



   What is the reading shown?

   A. 2.04 mm
   B. 2.05 mm
   C. 2.06 mm
   D. 2.40 mm
   E. 2.60 mm

4. The diagram below shows the measurement of the diameter of a ball bearing using a pair of vernier callipers.



   What is the diameter of the ball bearing?

   A. 3.47 cm
   B. 3.51 cm
   C. 3.67 cm
   D. 3.70 cm
   E. 4.57 cm

5. The density of lead is 11.3 g cm^{-3} at room temperature.

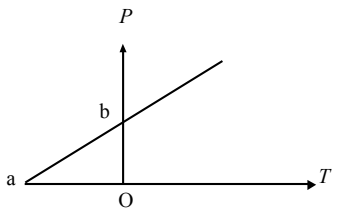
   What is its value in SI unit?

   A. 1.13 x 10^{-5} kg m^{-3}
   B. 1.13 x 10^{-3} kg m^{-3}
   C. 0.0113 kg m^{-3}
   D. 1.13 x 10^{4} kg m^{-3}
   E. 1.13 x 10^{7} kg m^{-3}

6. In which of the following sets are the prefixes arranged in ascending order?

   A. nano, mega, milli, kilo
   B. mega, kilo, nano, milli
   C. nano, milli, kilo, mega
   D. kilo, milli, mega, nano

7. The graph below shows the relationship between *P* and *T*.



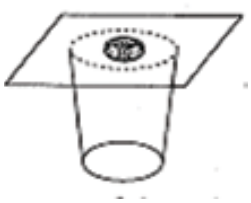
   The equation of the graph is

   A. P = b/a T + a
   B. P = b/a T + b
   C. P = -b/a T + a
   D. P = -b/a T + b

8. A student needs to measure the internal diameter of a test tube as accurately as possible. Which instrument should be used?

   A. Metre ruler
   B. Measuring tape
   C. Vernier callipers
   D. Micrometer screw gauge

9. A coin is put on a card and placed on top of a glass, as shown in the diagram below. When the card is flicked away with the finger, the coin drops neatly into the glass. Which property of the coin makes this possible?



   A. Thickness
   B. Volume
   C. Inertia
   D. Density

10. The momentum of the bullet fired from a gun is large because of

    A. its mass
    B. its velocity
    C. its mass as well as its velocity

11. All of the following are ways of reducing the impulsive force except

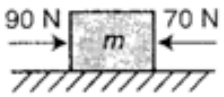
A. jumping off a table, a boy bends his knees when he reaches the ground
B. polystyrene or cardboard is used when packing fragile items.
C. cars are designed in the shape of an aerofoil as a safety feature.
D. thick piece of mattress is used in the high jump event.

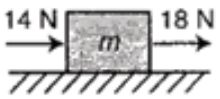
12. The diagram below shows a cat shaking its body from head to tail to shed the water when it gets wet.

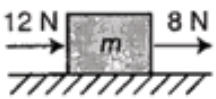
The cat shakes water from its coat using

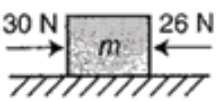
A. the concept of inertia.
B. the concept of equilibrium of forces.
C. the principle of conservation on energy.
D. the principle of conservation of momentum.

13. Which system of forces below gives mass m the greatest acceleration?

A. 

C. 

B. 

D. 

14. Figure (a) shows two smooth spheres A and B, of masses 4 kg and 2 kg, are travelling towards each other along the same horizontal line with speeds of 6 m s^{-1} and 1 m s^{-1} respectively.

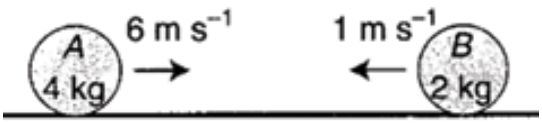


Figure (a)

After the collision, the direction of motion B has been reversed and it is travelling at a speed of 5 m s^{-1} as shown in Figure (b).

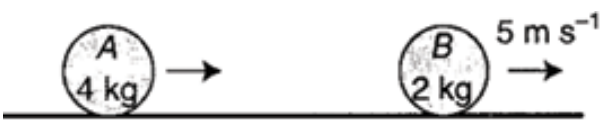


Figure (b)

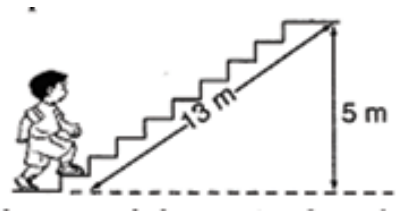
What is the speed of A and after the collision?

A. 3.0 m s^{-1}
B. 3.7 m s^{-1}
C. 4.0 m s^{-1}
D. 4.3 m s^{-1}
E. 6.0 m s^{-1}

15. A rock on the Moon is brought to the Earth where the gravitational field is stronger. On the Earth, the rock will have the same

A. inertia and mass
B. inertia and weight
C. mass and weight
D. weight and acceleration

16. The diagram below shows a boy weighing 600 N takes 4 s to run up the stairs



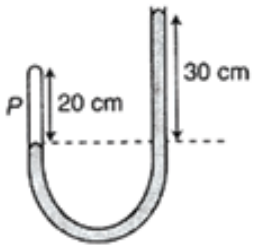
How much potential energy does he gain, in J?

A. 2 400
B. 3 000
C. 7 200
D. 7 800
E. 12 000

17. In which of the following examples is the greatest pressure exerted ?

A. A hippopotamus standing on the ground
B. A bar is gold resting on a table
C. A knife cutting a piece of cheesecake
D. A tractor with its four large wheels on the road.

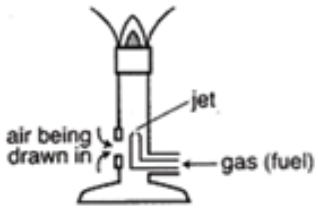
18. The diagram below shows a J-tube which contains mercury with air trapped at Part P.



If the atmospheric pressure is 76 cm Hg, find the pressure of the trapped air.

A. 20 cm Hg
B. 30 cm Hg
C. 46 cm Hg
D. 96 cm Hg
E. 106 cm Hg

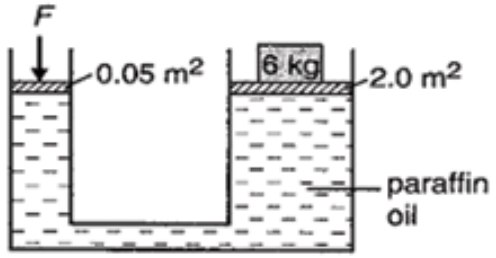
19. The diagram below shows a Bunsen burner.



Which principle is used in the working of a Bunsen burner?

A. Archimedes' principle
B. Bernoulli's principle
C. Pascal's principle

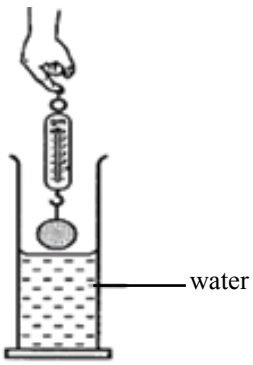
20. The diagram below shows a hydraulic jack used to raise a block of 6 kg.



The cross-sectional areas of smaller piston and larger piston are 0.05 m^2 and 2.0 m^2 respectively. What is the force, *F*, acting on the smaller piston?

A. 0.15 N
B. 1.50 N
C. 15.00 N
D. 150.00 N .
E. 1 500.00 N

21. The diagram below shows a load hanging from a spring balance.



The load is then lowered into cylinder gradually until it is totally submerged. Which statement about the reading on the spring balance is correct?

A. Increases.
B. Remains the same.
C. Decreases until it becomes zero.
D. Decreases until it reaches a fixed value.

22. Which of the following does not show a way of reducing the pressure?

A.

C.

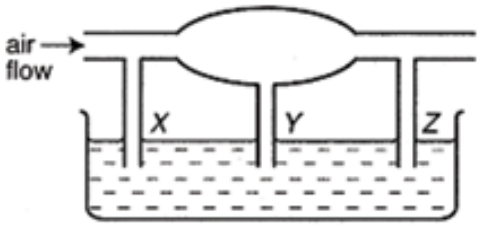
B.

D.

23. After achieving thermal equilibrium, two objects will

A. have the same mass and energy.
B. have the same temperature and rate of heat transfer.
C. have the same chemical and physical properties.

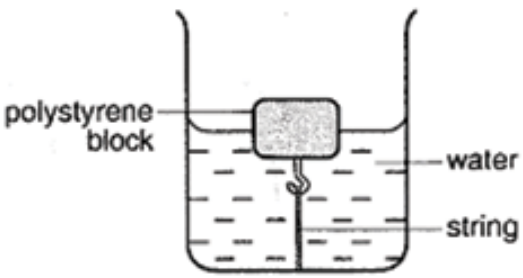
24. The diagram shows air flowing through a horizontal tube with varying cross-sectional area.



Based on Bernoulli's principle, which tube has the highest water column ?

A. X
B. Y
C. Z

25. The diagram shows a polystyrene block tied to the base of a container by a string.

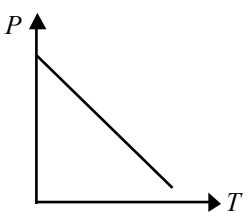


When more water is poured into the container, the tension in the string will

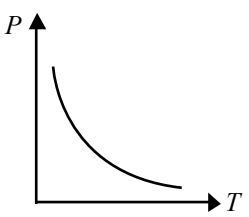
A. decrease
B. increase
C. remain the same

26. Which of the following graphs shows the relationship between the gas pressure, P, and the absolute temperature, T, for a fixed mass of gas at constant volume ?

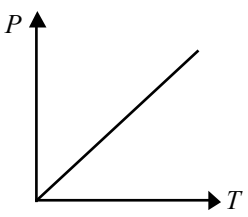
A.



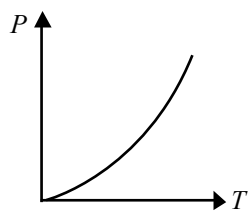
C.



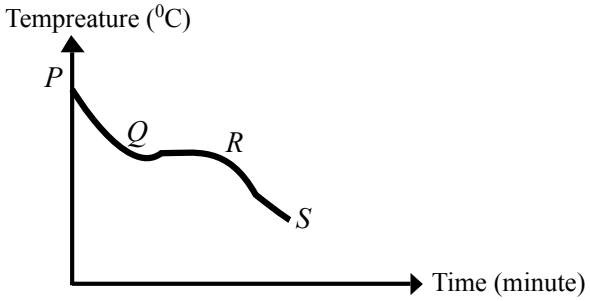
B.



D.



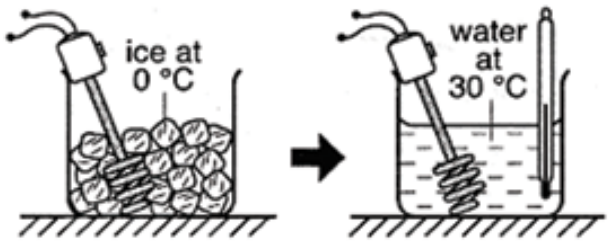
27. The graph shows the cooling curve of benzoic acid from liquid to solid.



At which stage does benzoic acid exists as a solid as well as a liquid

A. P
B. PQ
C. QR
D. RS

28. The diagram below shows a heater being used to convert 100 g of ice at 0 ºC to water at 30 ºC



How much heat is required to be supplied ?
[Specific heat capacity of water = 4.2 J g-1 ºC-1,
Specific latent heat of fusion of ice = 334 J g-1]

A. 12.6 kJ
B. 33.4 kJ
C. 46.0 kJ
D. 1 000 kJ
E. 1 010 kJ

29. Gas pressure in a container is due to the

A. momentum of the gas particles
B. change in the momentum of the gas particles
C. rate of change in the momentum of the gas particles
D. rate of change in the momentum of the gas particles per unit area

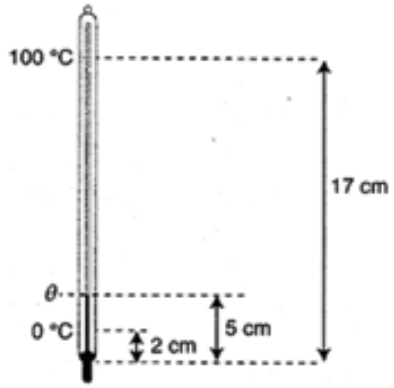
30. After a long journey, the temperature in a car's tyres increased from 30 ºC to 60 ºC because

A. the pressure in the tyres is doubled
B. the air molecules in the tyres expanded
C. the number of air molecules in the tyres increased
D. the air molecules in the tyres are moving more rapidly

31. Which type of wave is longitudinal?

A. Radio wave
B. Light wave
C. Sound wave
D. Water wave

32. The diagram shows a mercury thermometer.



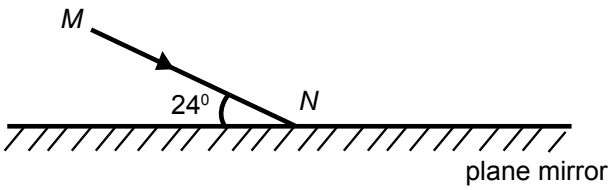
The reading of the thermometer, θ, is

A. 20 ºC D
B. 25 ºC E
C. 30 ºC
D. 33 1/3 ºC
E. 50 ºC

33. Using water as an example, latent heat is absorbed when

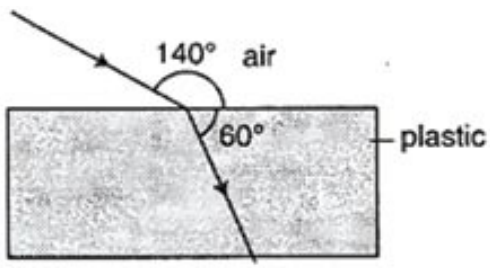
A. warm water is left to cool to room temperature
B. water is frozen into ice in the freezer
C. water is vaporised to steam during boiling
D. steam is condensed to water when it comes into contact with a cool surface.

34. The diagram shows a light ray MN striking the surface of a plane mirror at an angle of 24º.
What is the total angle between the incident and reflected ray?



A. 24 º
B. 42 º
C. 66 º
D. 132 º
E. 156 º

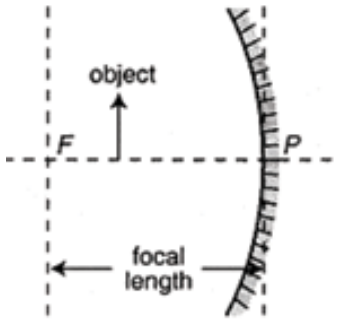
35. The diagram shows a ray of light moving from air to plastic.



What is the refractive index of the plastic?

A. 0.74
B. 0.65
C. 1.00
D. 1.35
E. 1.53

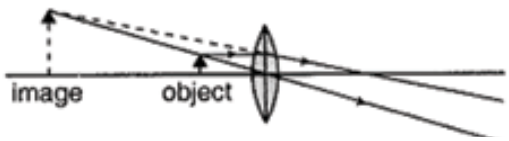
36. The diagram shows an object placed in front of a concave mirror.



If the distance of the object from the mirror is less than the focal length, what are the characteristics of the image?

A. Virtual, upright and diminished.
B. Virtual, upright and magnified.
C. Real, inverted and diminished
D. Real, inverted and magnified.

37. The diagram shows a converging lens producing an upright, virtual image.



Which optical instrument uses this arrangement?

A. A camera
B. A projector
C. A magnifying glass
D. A photocopier

38. Which of the following phenomena is not related to the principle of total internal reflection?

A. Formation of mirage.
B. Formation of rainbow.
C. Sky appears blue at noon.
D. Light propagates along optical fibres

39. The refractive index, n , of a medium can be determined by all the following methods, **except**

A. $\frac{\text{real depth}}{\text{apparent depth}}$

B. $\frac{\text{speed of light in air}}{\text{speed of light in the medium}}$

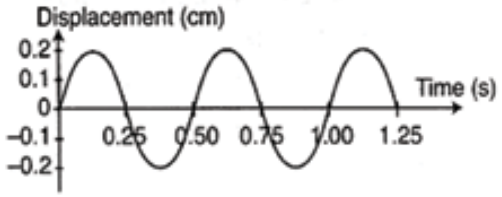
C. $\frac{\text{frequency of light in air}}{\text{frequency of light in the medium}}$

D. $\frac{\text{wavelength of light in air}}{\text{wavelength of light in the medium}}$

40. Which of the following lens has a power of -20D?

A. Converging lens with a focal length of 0.05 cm.
B. Converging lens with a focal length of 5 cm.
C. Diverging lens with a focal length of 0.05 cm.
D. Diverging lens with a focal length of 5 cm.

41. The diagram shows how displacement varies with time as a wave passes a fixed time.

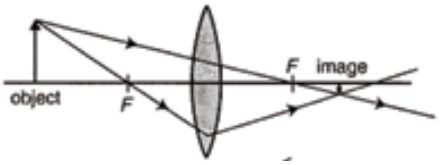


What is the wave frequency, in hertz?

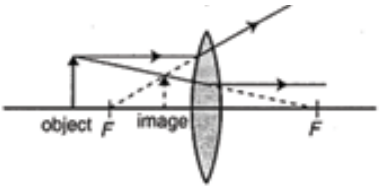
A. 0.2
B. 0.25
C. 0.5
D. 1.0
E. 2.0

42. A few students end up with different ray diagrams as shown below. The converging lens has its principal focus at F. Which drawing shows the **correct** path of the light rays?

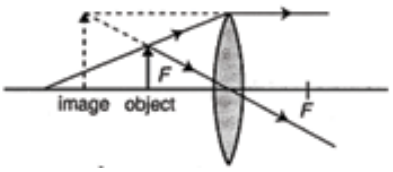
A.



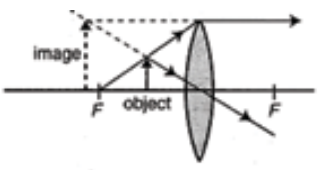
B.



C.



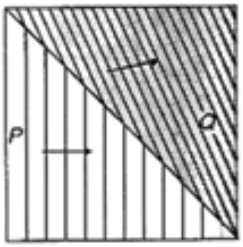
D.



43. When a system oscillating at its natural frequency is slowed down by damping, its frequency will

A increase.
B. decrease.
C. remain the same.

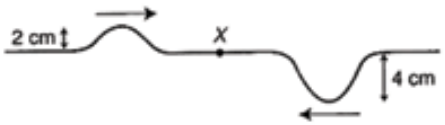
44. The diagram shows water waves travelling from section P to section Q in a ripple tank.



Which statement is **correct**?

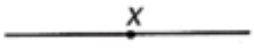
A. The frequency is higher in section P.
B. The waves move faster in section Q.
C. The water is deeper in section P.
D. The amplitude is longer in section Q.

45. The diagram shows a string with two wave pulses on it, one traveling in each direction.



Which diagram below shows the instance when the two pulses arrive at X?

A.

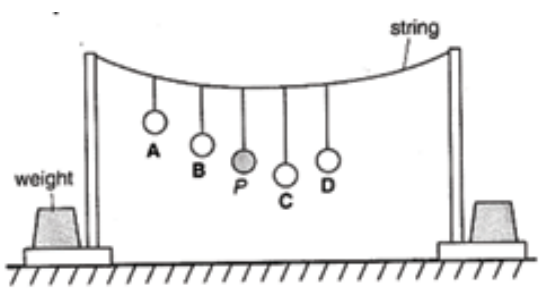


B.

C.

D.

46.

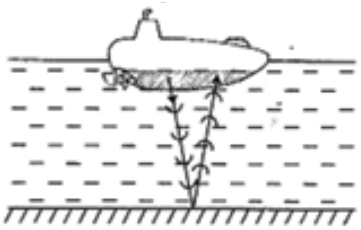


The diagram shows an experiment set-up to study resonance in an oscillating system. When pendulum P is oscillating, which pendulum, **A** , **B** , **C** or **D** will oscillate with the largest amplitude?

47. Which of the following statements about electromagnetic wave is not correct?

A. All electromagnetic waves are transverse waves.
B. All electromagnetic waves travel at the same speed in a vacuum.
C. All electromagnetic waves are affected by the magnetic field.
D. Electromagnetic waves may have different wavelengths.

48. In the diagram, a marine survey ship emits an ultrasonic wave straight to the seabed.



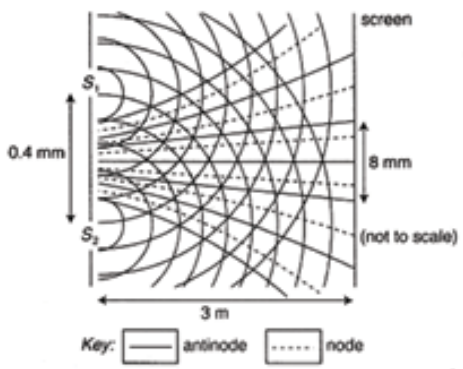
It receives an echo 2.0 s later. The speed of sound in sea water in 720 m s^{-1}. How deep is the sea at this position?

A. 360 m
B. 720 m
C. 1 080 m
D. 1 440 m
E. 2 880 m

49. A radio station broadcasts at a frequency of 15 MHz. The speed of sound in the air is 330 m s^{-1} and the speed of radio wave is 3.0×10^8 m s^{-1}. What is the wavelength of the waves broadcasted by the station?

A. 2.2×10^{-5} m
B. 20 m
C. 22 m
D. 4.95×10^{8} m
E. 4.50×10^{15} m

50. The diagram shows the wave pattern formed by waves from two coherent sources, S_1 and S_2.



The distance between the two coherent sources S_1 and S_2 is 0.4 mm, and the screen is 3 m away from the sources. The distance between two particular bright fringes is 8 mm. Given that a monochromatic yellow light is used as the coherent sources, what is the wavelength of the yellow light?

A. 1.20×10^{-7} m
B. 1.60×10^{-7} m
C. 3.00×10^{-7} m
D. 4.8×10^{-7} m
E. 5.33×10^{-7} m

Section A(60 marks)
Instructions: Answer all questions in this section

1. Figure 1.1 shows a measuring device which is used in an electric circuit.

Figure 1.1

(a) What is the physical quantity measured by the device in Figure 1.1?

…….. [1 mark]

(b) What is the reading shown by the device?

…….. [1 mark]

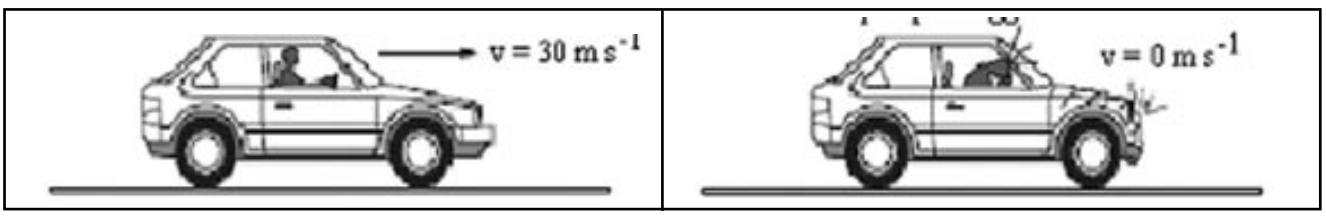
(c) For measurement in an electric circuit, state the type of connection that is used.

…… [1 mark]

(d) What is the function of the mirror in the device?

…… [1 mark]

2. A crash dummy is placed in a 1000 kg car as shown in Fig. 2.1. The impulsive force on the dummy during a collision is determined. The duration of the collision is 0.2 s.



Before collision After collision

Figure 2.1

(a) Name the physics concept that causes the dummy to jerk forward during the collision.

…… [1 mark]

(b) Calculate the impulsive force on the crash dummy.

[2 marks]

(c) When the car is equipped with air bags, the impulsive force on the dummy decreases.
(i) Explain why the impulsive force decreases.

……. [1 mark]

(ii) State one other method to reduce the impulsive force.

……. [1 mark]

3. Figure 3.1 shows water waves moving towards an obstacle P in a pond. The distance between 6 crest is 2m.

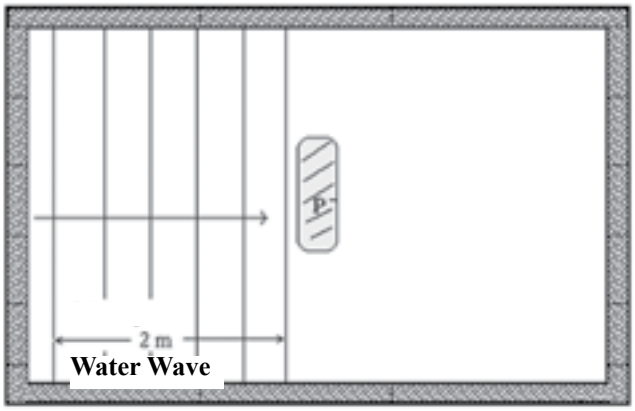


Figure 3.1

(a) (i) In figure 3.1 draw the water wave fronts of the waves after passing the obstacle. [1 mark]

(ii) Name the phenomenon after the waves passes the obstacle.

……. [1 mark]

(b) Explain what happens to the amplitude of the wave after it passes the obstacle ?

……..

……..……
[2 marks]

(c) The frequency of the water wave is 5Hz. Calculate the velocity of the wave.

[2 marks]

4. Figure 4.1 shows the output of a transformer which is connected to four diodes labelled as J, K, L and M to produce full-wave rectification. The diodes are connected to a cathode-ray oscilloscope which is parallel to the resistance, R. The time-based oscilloscope's control is switched on.

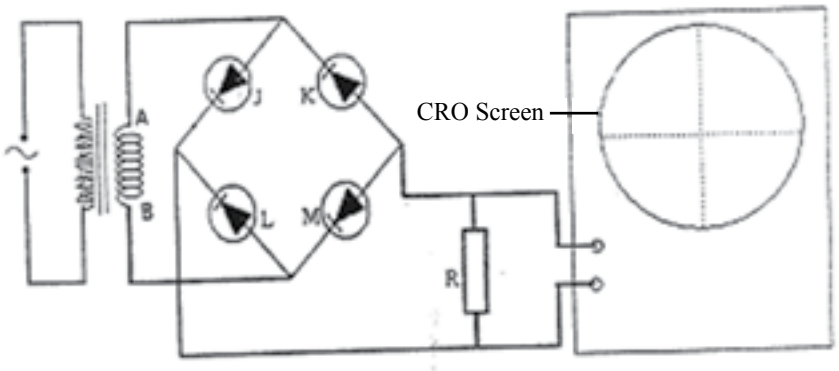


Figure 4.1

(a) What is the meaning of rectification?

.....

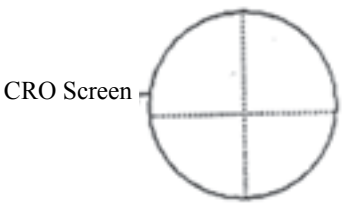
[1 mark]

(b) In figure 4.1 draw

i) the trace that would appear on the screen of the cathode-ray oscilloscope.

ii) the direction of the current that passes the resistance, R , if the terminal A transformer is positive. [2 marks]

(c) i) A capacitor is connected parallel to the resistant. Draw the trace that would appear on the screen of the cathode-ray oscilloscope.



[1 mark]

ii) Explain how the trace in c(i) is obtained.

.....

[1 mark]

d) The output voltage of the transformer is 240 a.c. Calculate the maximum voltage for the above a.c.

[2 marks]

5. Fiqure 5.1 and 5.2 shows parallel rays hitting the surface of concave mirror X and concave mirror Y.

Concave mirror X

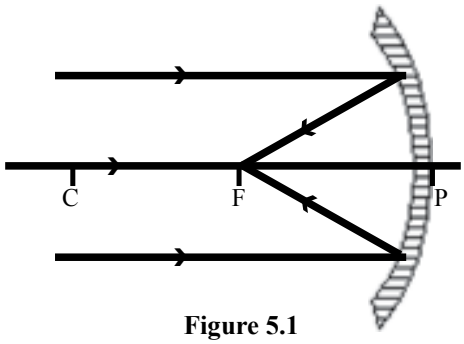


Figure 5.1

Concave mirror Y

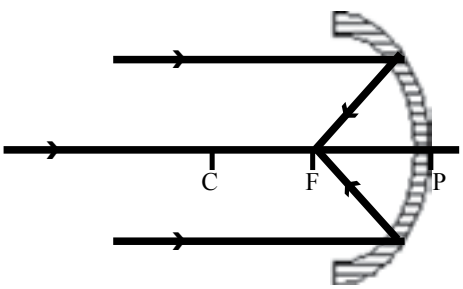


Figure 5.2

CP is the centre of curvature and F is the focal point of both mirrors.

(a) Based on figure 5.1 and 5.2 find one similarity

(i) the light ray after hitting the surface of both mirrors.

……

[1 mark]

(ii) the position of the focal point. F with the centre of curvature CP of both mirrors.

……

[1 mark]

(b) Compare

(i) the curvature of concave mirror X and concave mirror Y

……

[1 mark]

(ii)the focal length of concave mirror X and concave mirror Y

……

[1 mark]

(c) Based on your answer in (b) state the relationship between the curvature and the focal length of these mirrors.

……

[1 mark]

(d) If a light source is positioned at the focal point F of concave mirror Y, what is the effect on the reflected rays?

……

[1 mark]

(e) Name one instrument which uses the application mentioned in (d). Explain your answer.

……

……

……

[2 marks]

6. Figure 6.1 shows the arrangement of an apparatus for the experiment to study the penetration of radioactive rays from sources A and B.

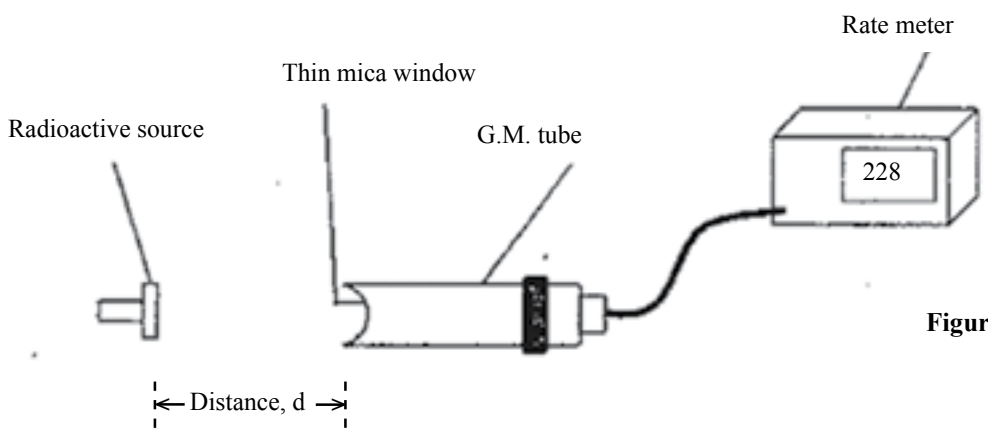


Figure 6.1

Figure 6.2 shows the graph of a rate meter reading against distance from source A.

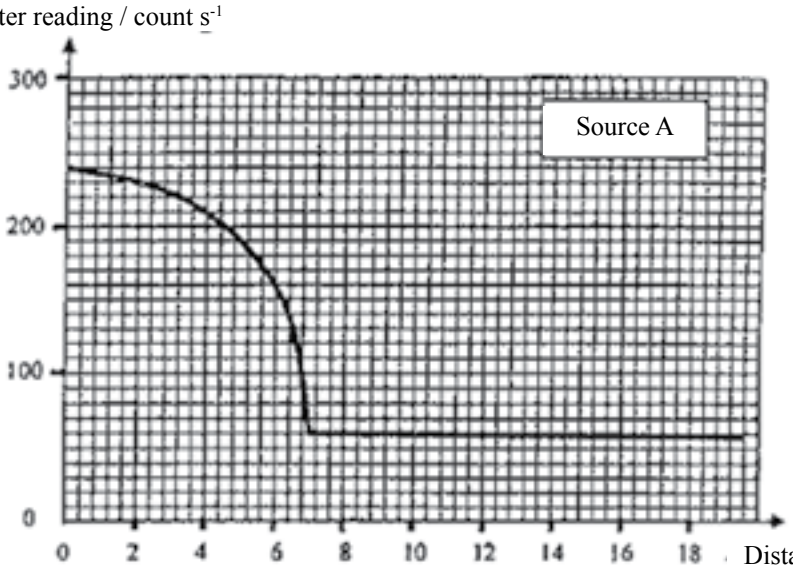


Figure 6.2

Figure 6.3 shows the graph of a rate meter reading against distance from source B.

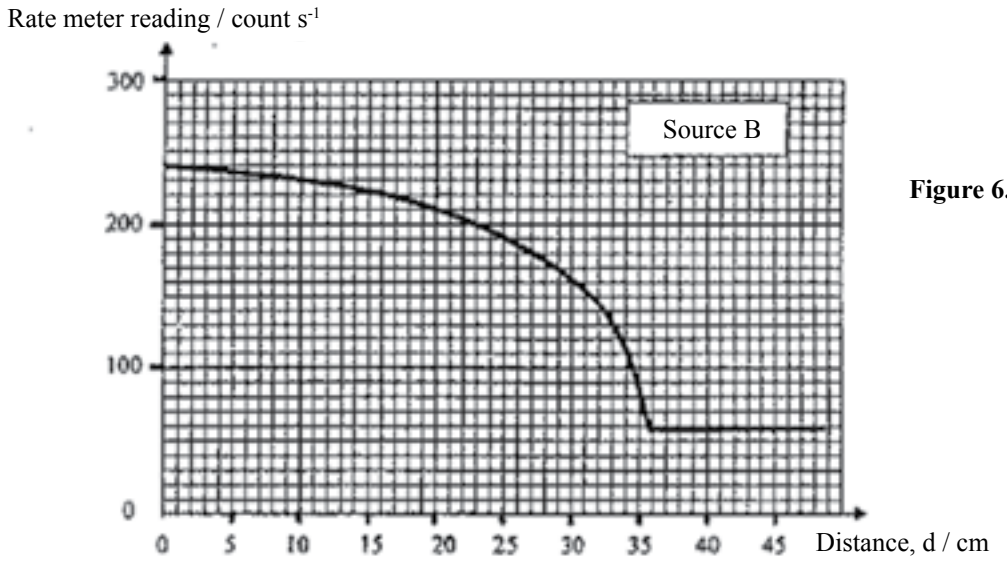


Figure 6.3

(a) Why is the mica window of the Geiger Muller tube built as thin as possible?

……

[1 mark]

(b) Using figure 6.2 and 6.3,

(i) compare the changes of the rate meter reading against the distance from source A and B.

……

……

[3 marks]

(ii) compare the final rate meter reading of both sources.

……

[1 mark]

(iii) name the final reading of the rate meter.

……

[1 mark]

7. (c) State the type of radioactive ray emitted by source A. Explain your answer.

……

……

[2 marks]

Figure 7.1 shows the state of similar springs before and after a load is put on it.

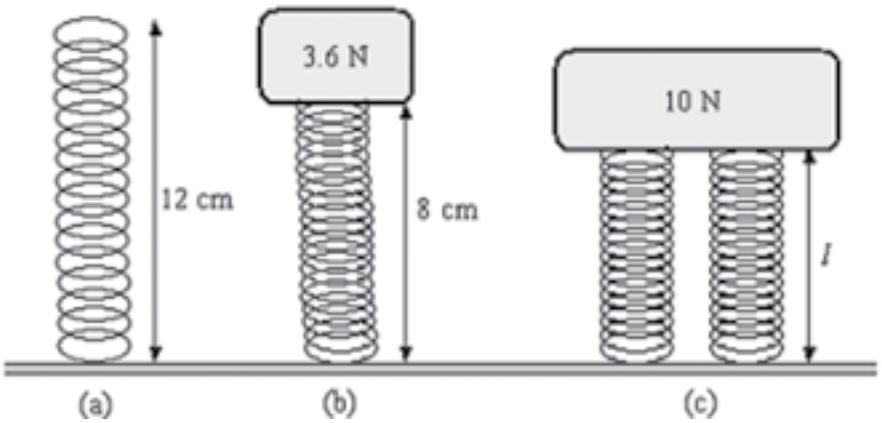


Figure 7.1

a) (i) Name the energy restored when the spring has compressed.

……

[1 mark]

(ii) What is the length of the spring in figure 7.1 (b) if the 3.6 N load is removed.

……

[1 mark]

(iii) Find the spring constant, k

[2marks]

{iv) Find the length of l in figure 7.1 (c)

[2 marks]

(b) Figure 7.2 shows the arrangement of the spring in a compression balance.

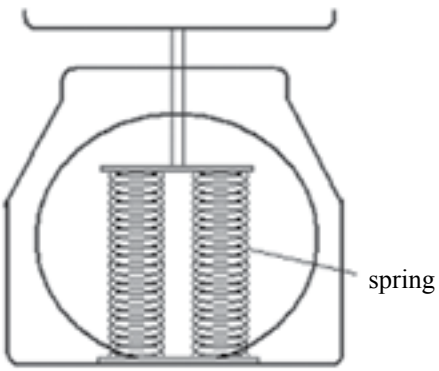


Figure 7.2

(i) State the relationship between the compression of spring and the load in the compression balance.

……

[1 mark]

(ii) What would happen to the spring when a heavy load is placed on the compressed balance and the reading exceeds the weight scale?

.....

[1 mark]

(iii) Suggest two modifications that has to be made so that the balance can measure a much bigger load.

.....

.....

[2 marks]

8. Figure 8.1 shows the method used to detect water pipe leakage. Radioisotope material added into the water. Then a Geiger Muller tube which is joined to rate meter is moved to the earth's surface through the pipeways.

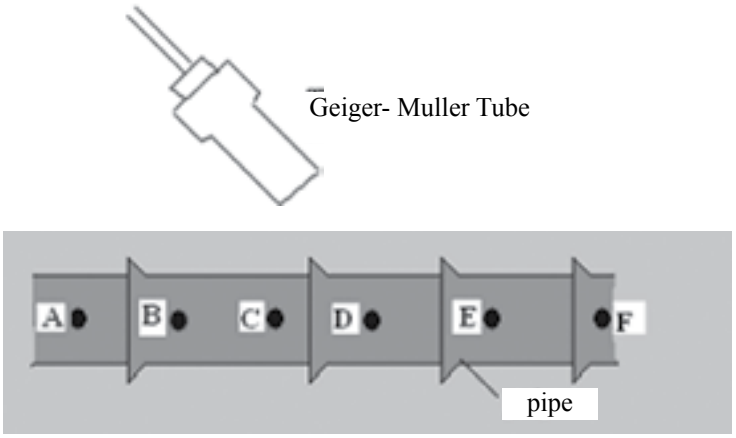


Table 8.1 shows the readings of the Geiger Muller Counter at various positions

Geiger Muller Tube Position	A	B	C	D	E	F
Count rate / minutes	300	295	284	372	290	216

(a) What is meant by 'radioisotope'?

.....

[1 mark]

(b) Based on figure 8.1 state which part of the pipe is leaking. State your reasons.

.....

.....

[2 marks]

(c) Table 8.2 shows the time taken by the radioisotopes to reduce to 12.5 % of the original activeness and the rays that are produced.

Radioisotope	Time taken to reduce to 12.5%	Rays produced
Natrium-24	45 hours	Betha
Cobalt-60	15.9 years	Gamma
Radium-226	4860 years	Alfa

Based on table 8.2

(i) Write the equation for Radium-226($^{226}_{88}Ra$) if it decomposes into Radon-222($^{222}_{86}Rn$)

[2 marks]

(ii) Determine the lifespan for each radioisotope.

[4 marks]

(d) Using your answer in c (iii), suggest a suitable radioisotope which is suitable to find out leakages in pipes. Give two reasons for your answer.

……

……

……

[3 marks]

Section B (20 marks)

*Instructions : Answer any **one** question from this section.*

9. (a) Figure 9.1 shows the position of the ping-pong ball before the water tap is turned on. Figure 9.2 shows the position of the ping-pong ball after the water tap is turned on. P_1, P_2, and P_4 are atmospheric pressure , while P_3 is air pressure.

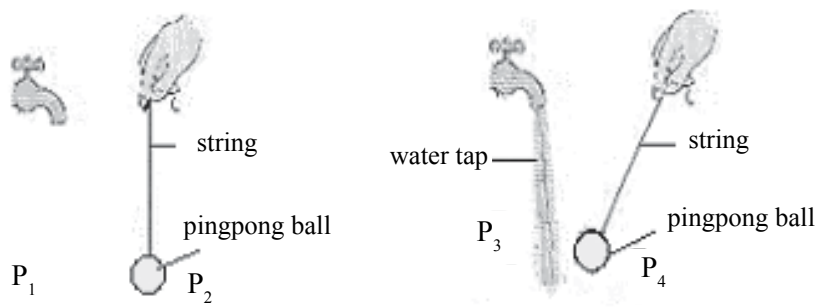


Figure 9.1

(i) What does atmospheric pressure mean?

[1 mark]

(ii) Compare the position of the ping-pong ball in figure 9.1 and figure 9.2. Then compare the pressure of P_1 and P_2, and P_3 and P_4.

Describe the relationship between pressure water flow from the water-tap and the position the ping-ping ball to deduce an appropriate physics concept.

[5 marks]

(iii) Name the physics principle that explains the situation above.

[1 mark]

(b) An aeroplane can fly by using the wings in the form of an aerofoil

(i) Explain how an aeroplane is lifted to the air when it moves with great speed on the runaway.

[3 marks]

(c) Figure 9.3 shows an insecticide sprayer.

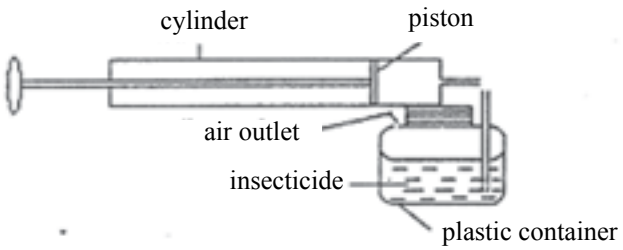


Figure 9.3

Using the appropriate physics concepts to explain how the insecticide-sprayer can be modified to become a car paint sprayer. In your explanation justify the:

i) ways to have continuous flow of the spray.
ii) velocity of the spray.
iii) durability and mobility
iv) sufficient volume of the paint.

[10 marks]

10. Diagram 10.1 shows a fishing boat sending ultrasonic waves to the sea bed. Diagram 10.2 shows a student shouting loudly in a cave.

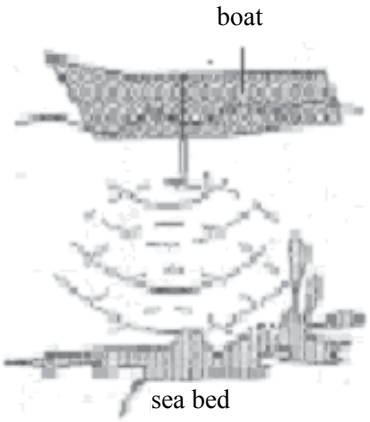


Diagram 10.1

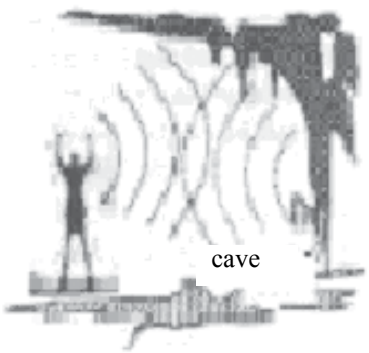


Diagram 10.2

a) What is the meaning of the word wavelength?

[1 mark]

(b) Based on diagram 10.1 and 10.2 compare the surface of the sea bed and the surface of the cave, wavelength and the direction of the waves before and after hitting the sea bed and the surface of the cave. Name the incident that occurred.

[5 marks]

(c) Diagram 10.3 shows a wave moving from a deep end to a shallow end that has a convex shape.

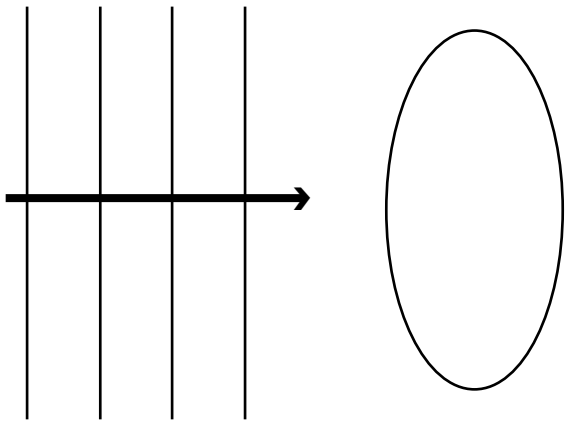


Diagram 10.3

Explain what happens to the wave when it moves in the shallow end and after it leave the shallow end. You can use a diagram to explain your answer. [4 marks]

(d) A fishing village in a cape consists of wooden houses and attap roofs. During the monsoon season the houses are damaged by strong winds and erosion of the beach. Using your knowledge and physics concepts, give suggestions and explanation on how that they can avoid such damages from occurring in the future.

You explanation should include the following aspects:
(i) the design and structure of the house.
(ii) the location of the house that is going to be built. [10 marks]

Section C [20 marks]
Instructions: Answer all questions in this Section

11. You are asked to conduct an experiment on solar energy for the Friends of the Environment Club. You are given the task of designing a solar heater to heat water in a container. You are required to choose one of the four solar heaters P, Q, R and S shown in Figure 11.1

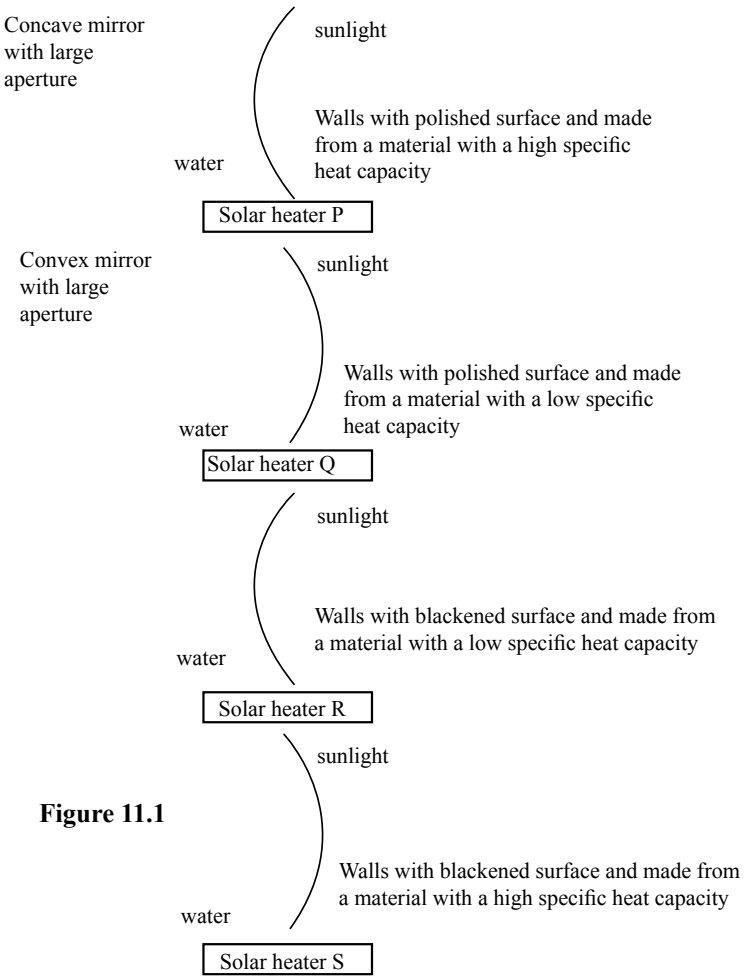


Figure 11.1

(a) State the energy changes that take place in the solar heater. [1 mark]

(b) Based on Fig. 11.1,
(i) explain the properties of a solar heater which can which can quickly heat water.
(ii) determine the most suitable solar heater to quickly heat water and give your reason. [10 marks]

(c) State the advantages of using solar energy over fossil fuels in Malaysia. [4 marks]

(d) A 2.0 kg metal tin contains 1.5 kg water at a temperature of 28^0C. The temperature of the tin and the water increases to 34^0C after being heated for 10 minutes with a 0.08 kW, 240 V heater.
[Specific heat capacity of water = 4200 J kg^{-1} $^0C^{-1}$].

Calculate:
(i) the quantity of heat received by the water,
(ii) the specific heat capacity of the metal. [5 marks]

12. A network system of cables is used to transmit electricity from the power station to the users. Figure 12.1 shows models of network cables for P, Q, R and S.

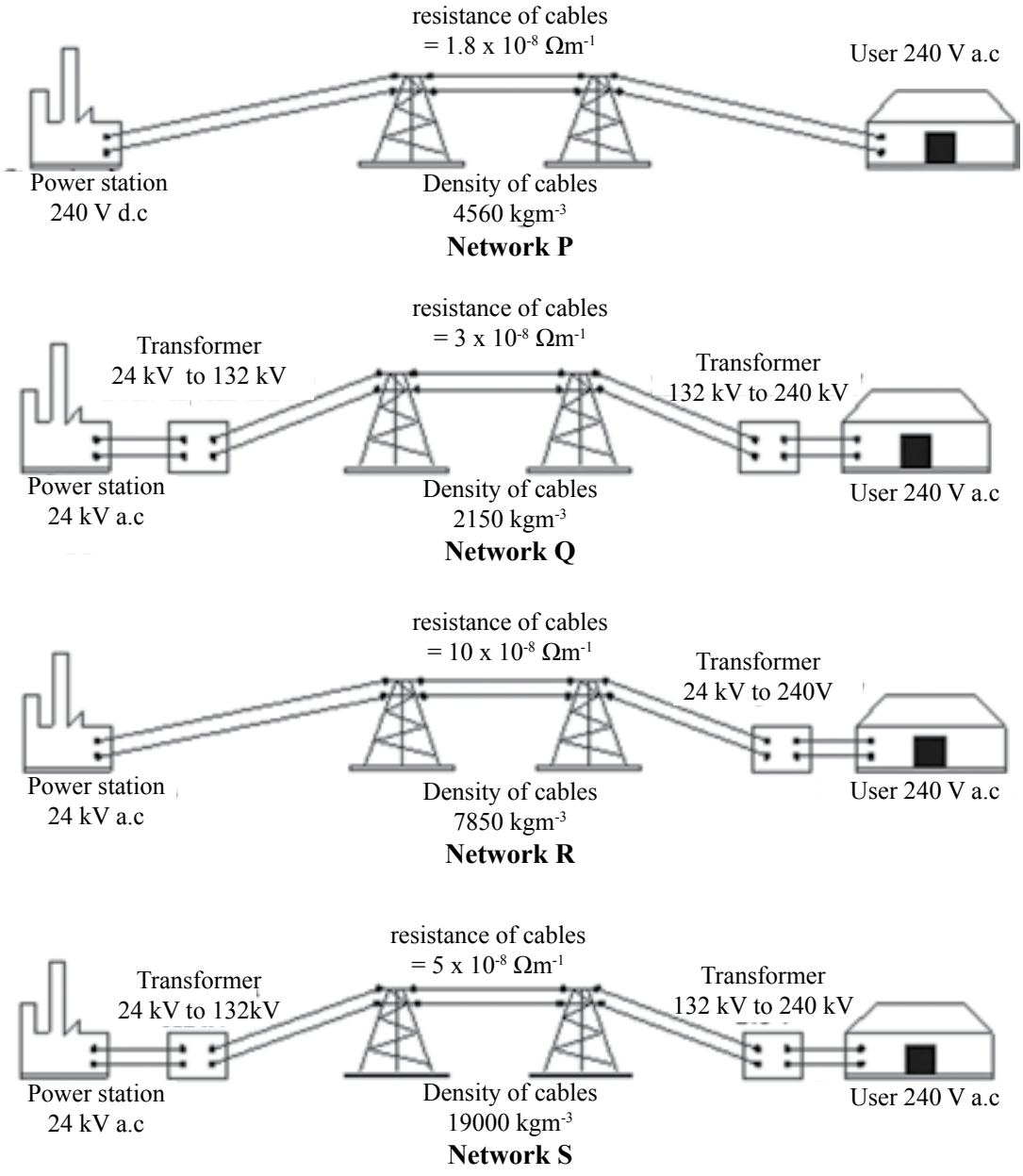


Figure 12.1

(a) (i) State the definition of electrical resistance. [1 mark]

(ii) Describe the operating principle of a transformer. [4 marks]

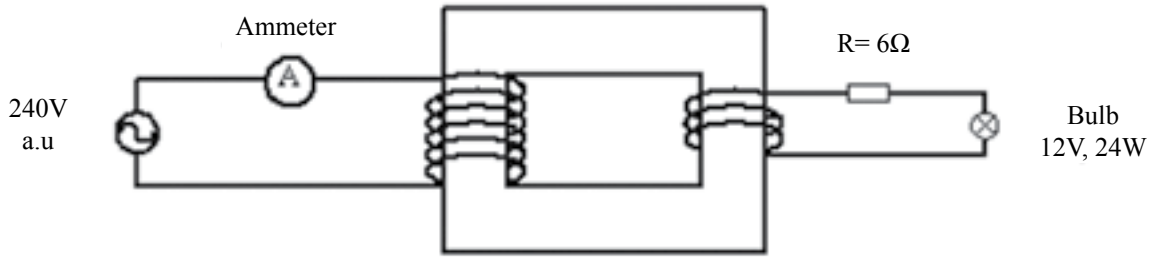
(iii) You are required to set up a network of electricity transmission cables from the power station to the users who need a voltage of 240V. Observe the models of the network cables P, Q, R and S in figure 12.1. Consider the aspects given:

(a) type of generated current.
(b) the voltage of the cables.
(c) the density of the cables
(d) the resistance of the cables.

Explain the suitability of each set of network cables by considering the aspects given above and hence determine the most suitable network for electricity transmission. Justify your choice. [10 marks]

(b) Figure 12.2 shows a bulb of 12V, 24W and a resistor of 6Ω that are connected in parallel to the secondary coil of a transformer. The bulb lights up with normal brightness and the reading of the ammeter is 0.25 A.

Figure 12.1



(i)What is the value of the current in the secondary coil? [1 mark]

(ii) Determine the efficiency of the transformer. [4 marks]

PAPER 3 **ONE HOUR THIRTY MINUTES**

Answer **all** *questions in* **Section A** *and any* **one** *question in* **Section B**

SECTION A
[28 marks]
Answer ***all*** *questions in this section. The suggested time to answer this section is* ***60 minutes.***

1. A student carries out an experiment to find out the relationship between the increase in temperature of a cooking oil, θ, and its mass, m. The arrangement of the apparatus for the experiment is shown in Figure 1.1.

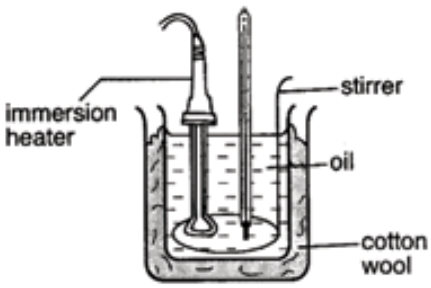


Figure 1.1

At the beginning of the experiment, no heat is supplied to the cooking oil. The initial temperature of the oil is θ_i. The reading of the thermometer for θ_i is shown in Figure 1.2.

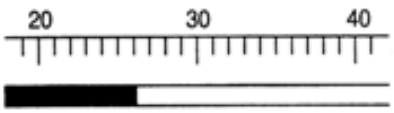


Figure 1.2

The beaker is initially filled with 0.20 kg of cooking oil. The power supply to the 100 W immersion heater is switched on and the stopwatch is started at the same time. The cooking oil is stirred gently using a stirrer as it is being heated up. After 5 minutes, the power supply is switched off. The water is stirred continuously until the thermometer registers the highest reading.

The final temperature is then recorded as θ_f, as shown in Figure 1.3. The experiment is repeated by using cooking oil with masses of 0.25 kg, 0.30 kg, 0.35 kg and 0.40 kg.

The readings of the thermometer are shown in Figures 1.4, 1.5, 1.6 and 1.7 respectively.

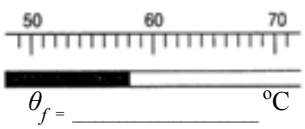


Figure 1.3 Mass of oil, m = 0.20 kg

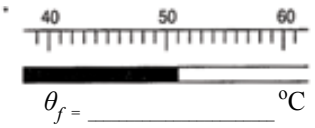


Figure 1.4 Mass of oil, m = 0.25 kg

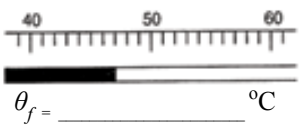


Figure 1.5 Mass of oil, m = 0.30 kg

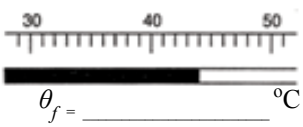


Figure 1.6 Mass of oil, m = 0.35 kg

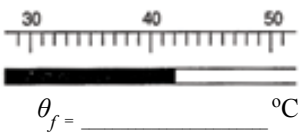


Figure 1.7 Mass of oil, m = 0.40 kg

(a) Based on the aim and the procedure of the experiment, state :

(i) the manipulated variable,

_____ [1 mark]

(ii) the responding variable,

_____ [1 mark]

(iii) the fixed variable.

_____ [1 mark]

(b) Determine the initial temperature, θ_i ,as shown in Figure 1.2.

θ_i = _____ºC [1 mark]

Determine the final temperatures, θ_f , of the cooking oil in Figure 1.3, 1.4, 1.5, 1.6, and 1.7 when the mass of cooking oil, m, is equal to 0.20 kg, 0.25 kg, 0.30 kg, 0.35 kg and 0.40 kg respectively. Write the values of θf on the space provided.
In each case, calculate the change in temperature, θ, of cooking oil where :

$$\theta = \theta_f - \theta_i$$

Tabulate your results for m, $\frac{1}{m}$, θ_f and θ. [6 marks]

(c) On a graph paper, draw the graph of θ against $\frac{1}{m}$ [5 marks]

(d) Based on your graph in (c), state the relationship between θ and m

_____ [1 mark]

2. A student carried out an experiment to investigate the relationship between the period, T, and the length of the pendulum, l, of a simple pendulum. A student varied the length of the pendulum and the pendulum was displaced to an initial angle and released. The pendulum swung back and forth with periodic motion and the period, T , was detemined using a stopwatch. The result of the experiment are shown in the graph of T^2 against l in Figure 2.1. The student intended to use this experiment to determine the acceleration due to gravity, g.

Graph of T^2 against l

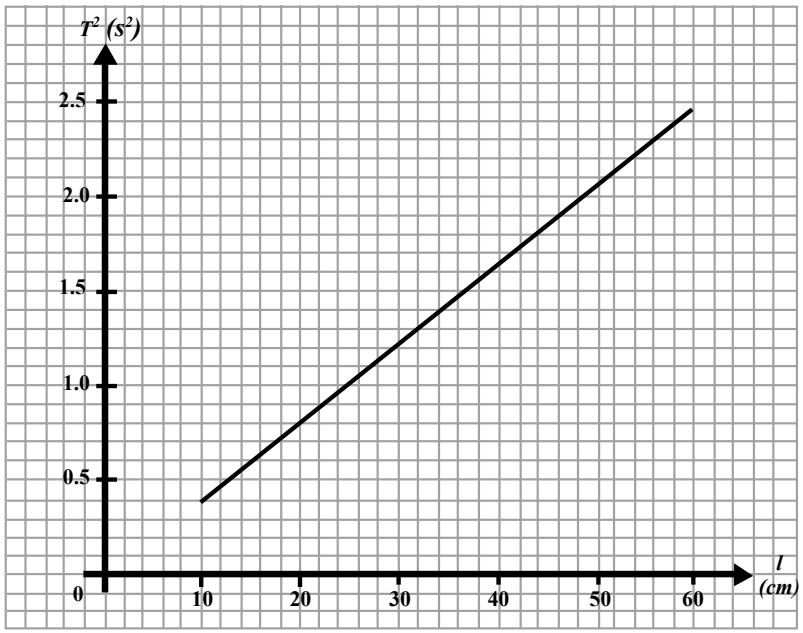


Figure 2.1

(a) State the relationship between T^2 and l.

_____ [1 mark]

(b) A simple pendulum has a period of 1.3 s. Using the graph of T^2 against l , determine the length of the pendulum. Show on the graph how you determined the length.

length of pendulum = _____ [3 marks]

(c) The squre of the period, T^2, is given by the formula : $T^2 = 0.3948\left(\frac{l}{g}\right)$

If $m = \frac{0.3948}{g}$, then T^2 = ml , where m is the gradient of the graph T2 against l.

(i) Calculate the gradient, m, of the graph T^2 against l.
Show on the graph how you determined m.

m = _____ [3 marks]

(ii) The acceleration due to gravity , g , in m s^{-2} , is given by the equation: $g = \frac{0.3948}{m}$

Calculate the value of the gravitational acceleration, g, of the pendulum.

[2 marks]

(d) The length of pendulum of a simple pendulum is 80 cm. Using the formula $T^2 = 0.3948\left(\frac{l}{g}\right)$ and the value of g in (c) (ii), calculate the period of the simple pendulum.

[2 marks]

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

_____

_____ [1 mark]

SECTION B
[12 marks]

*Answer any **one** question in this section. The suggested time to answer this section is **30 minutes.***

1.

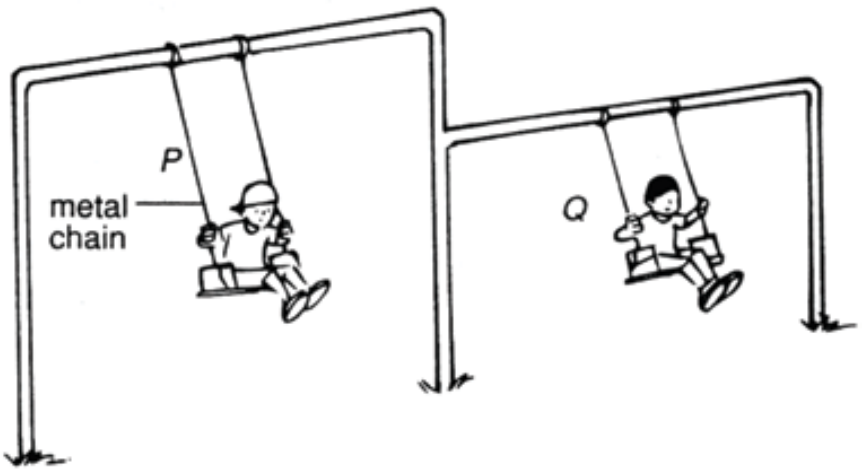


Figure 1.3

In Figure 1.3, two students P and Q of the same mass are oscillating with swing of different heights. When they swing with the same angle of oscillation, student P moves slower than student Q.

Based on the obsevations in Figure 1.3 :

(a) Make one suitable inference.

[1 mark]

(b) State one approriate hypothesis for an investigation.

[1 mark]

(c) With the use of a pendulum set and other approtiate apparatus, describe an experiment 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 includes the method of controlling the manipulated variable and the method of measuring the responding variable,

(vi) the way you would tabulate your data

(vii) the way you would analyse the data

[10 marks]

2.

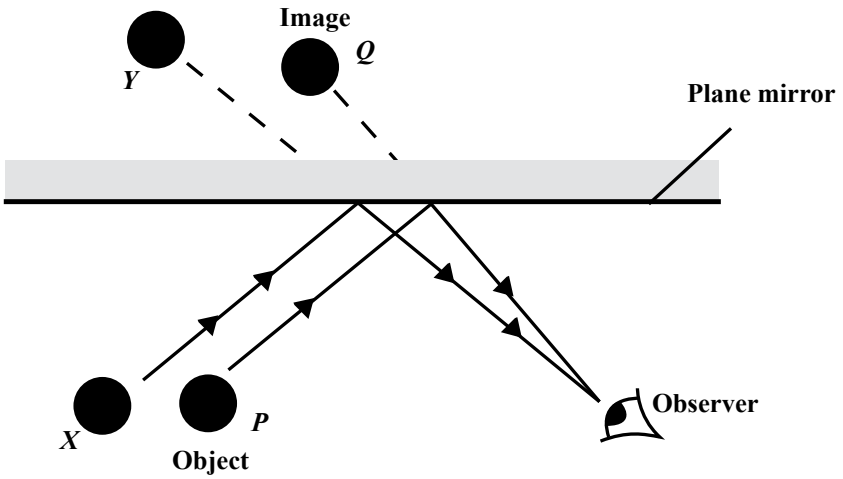


Figure 1.4

In Figure 1.4, an observer seen an image of an object placed at P in front of a plane mirror. When the object is moved to X, the image is seen at Y. This has caused the reflected ray towards the observer to change with respect to the plane mirror. By considering the changes in the incident and reflected rays,

(a) Make **one** suitable inference.

[1 mark]

(b) State **one** approriate hypothesis that could be investigated.

[1 mark]

(c) With the use of appropriate apparatus like a plane mirror, suitable light source, and protractor, describe an experimental framework to test your hypothesis.

In your description, state clearly the following :

(i) aim of the experiment,

(ii) variables involved 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 you would tabulate your data

(vii) the way you would analyse the data

[10 marks]

KERTAS SOALAN TAMAT