

**[Science] Physics O Level Exam Paper
Preliminary Examination Set [IV]
Secondary Four Express & Five Normal**



CANDIDATE NAME:

CLASS:

INDEX NUMBER:

Science(Physics)

5076/01

Paper 1 Multiple Choice

5077/01

2024

30 min

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluid/tape.

Write your name, class and index number on the Answer Sheet in the spaces provided.

There are **forty** questions on this paper. Answer **all** questions. For each question, there are four possible answers **A, B, C** or **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

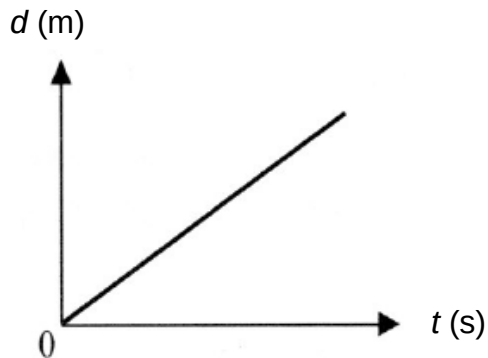
Any rough working should be done in this booklet.

The use of an approved scientific calculator is expected, where appropriate.

- 1 Which of the following is **not** a correct unit for the corresponding physical quantity?

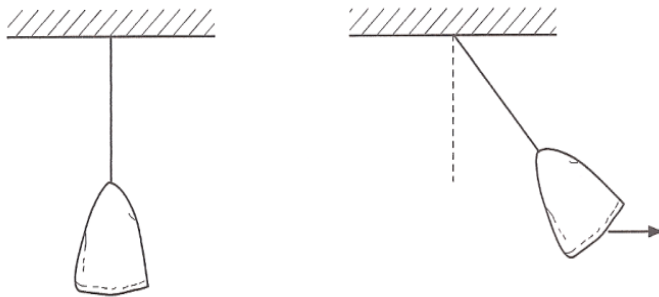
	unit	physical quantity
A	joule	power
B	volt	electromotive force
C	coulomb	charge
D	ampere	current

- 2 Which of the following best describes the distance – time graph as shown below?

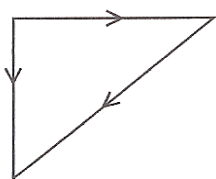


- A** The object is travelling with increasing acceleration.
B The object is travelling with constant acceleration.
C The object is travelling with increasing speed.
D The object is travelling at constant speed.

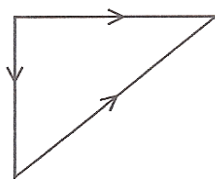
- 3 The sack is pulled to one side and held stationary.



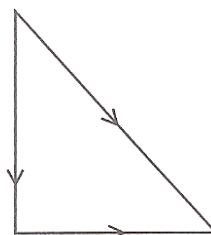
Which diagram represents the forces acting on the sack in its new position?



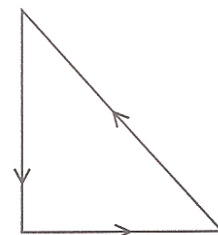
A



B



C



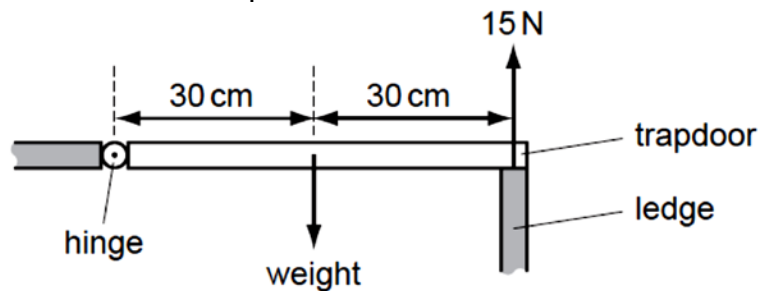
D

- 4 A passenger is sitting in an aeroplane, which takes off and climbs 10 000 m.

During this time, what happens to the mass and weight of the passenger?

	mass	weight
A	decreases	decreases
B	increases	increases
C	unchanged	decreases
D	unchanged	increases

- 5 A uniform wooden trapdoor is hinged along one end and when closed, is supported on the other end by a ledge. When the trapdoor is closed, the ledge exerts an upward force of 15 N on the trapdoor.



What is the mass of the trapdoor?

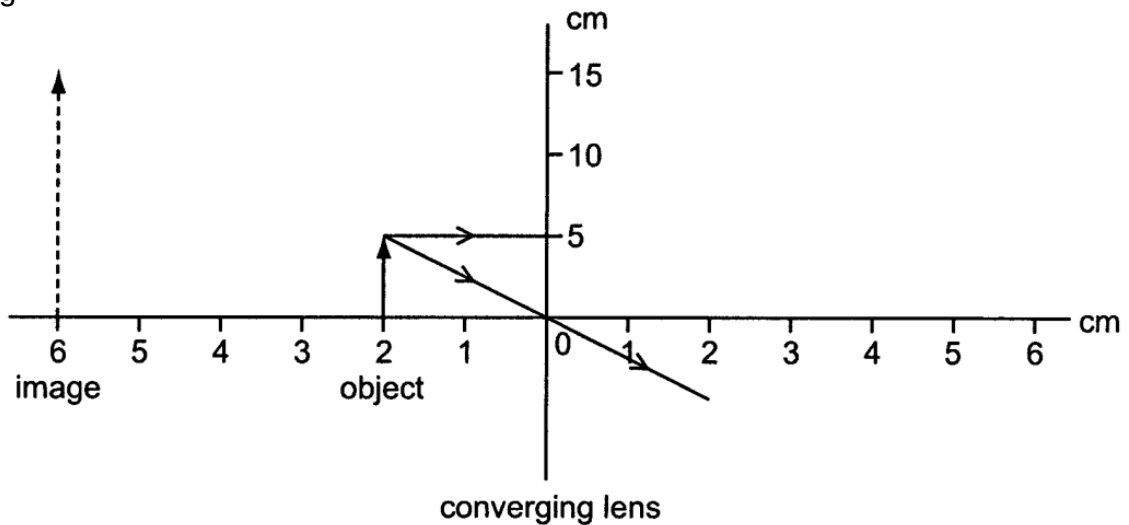
- A** 1.5 kg **B** 3.0 kg **C** 7.5 kg **D** 9.0 kg
- 6 Which lorry would be the **least** likely to sink into soft ground?
- A** A loaded lorry with four wheels.
B A loaded lorry with six wheels.
C An empty lorry with four wheels.
D An empty lorry with six wheels.

- 7 Some gas trapped in a rigid sealed container is heated with a Bunsen burner.

Which of the following describes the gas internal energy?

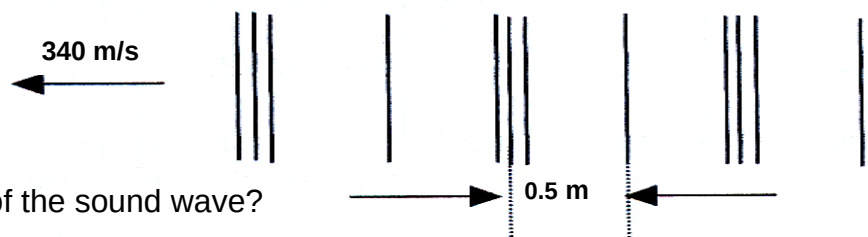
	internal kinetic energy	internal potential energy
A	unchanged	increases
B	increases	unchanged
C	increases	increases
D	unchanged	unchanged

- 8 An object 5.0 cm high is placed 2.0 cm from a converging lens which is being used as a magnifying glass. The image produced is 6.0 cm from the lens and is 15.0 cm high.



What is the focal length of the lens?

- A 2 cm B 3 cm C 4 cm D 6 cm
- 9 What is the main difference between transverse and longitudinal waves?
- A wavelength
B amplitude
C medium through which they travel
D direction of wave particles' vibration
- 10 Which of the following correctly describes the properties exhibited by infrared, light, ultraviolet and X-rays?
- A They are all transverse waves.
B They all travel at the same speed of 3×10^8 m/s
C They are all invisible to human eye.
D They can only travel in vacuum.
- 11 As a sound wave progresses at 340 m/s, regions of compression and rarefaction appear. The diagram shows one such typical waveform.

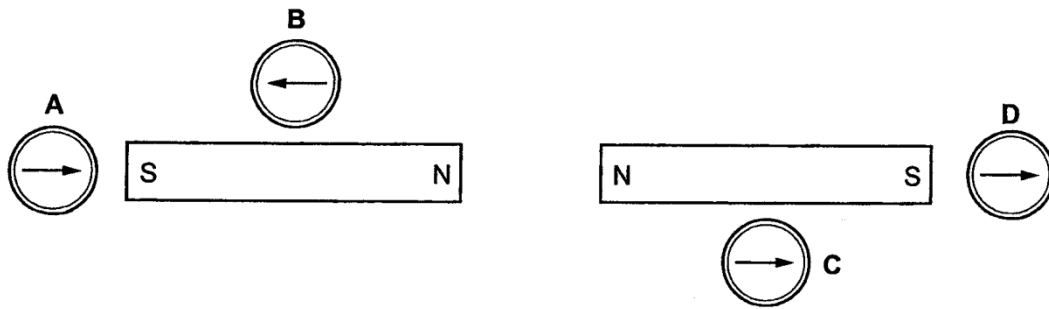


What is the frequency of the sound wave?

- A 170 Hz B 340 Hz C 680 Hz D 1360 Hz

- 12** Four plotting compasses are placed in the magnetic field of two identical bar magnets as shown in the diagram.

Which compass is shown pointing in the wrong direction?



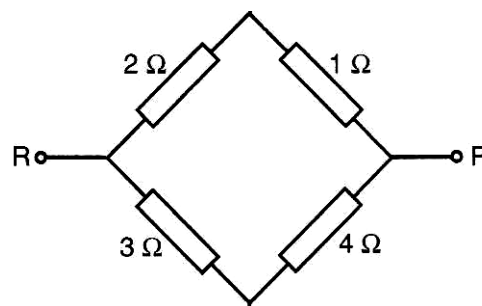
- 13** Sphere X carries a positive charge and sphere Y carries a negative charge. They are placed a short distance apart and a small positive charge P is placed between them.



In which direction does P move, and what is the force between X and Y?

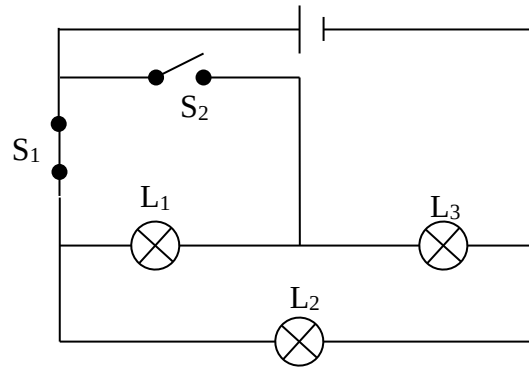
	movement of P	force between X and Y
A	towards X	repulsion
B	towards Y	repulsion
C	towards X	attraction
D	towards Y	attraction

- 14** Calculate the effective resistance between R and P



- A** 0.5 Ω
- B** 2.1 Ω
- C** 2.5 Ω
- D** 10 Ω

- 15 In the circuit shown below, all the light bulbs are identical.



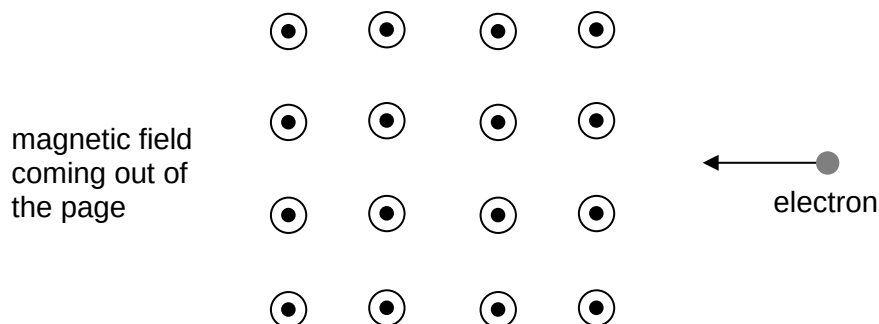
What happens to the brightness of the bulbs L1, L2 and L3 if switch S1 is opened and S2 is closed?

	L1	L2	L3
A	off	off	increases
B	decreases	increases	remains unchanged
C	decreases	decreases	increases
D	remains unchanged	decreases	increases

- 16 Which of the following safety device is to protect the appliance from electrical fault?

- A earth wire
- B Fuse
- C circuit breaker
- D double insulation

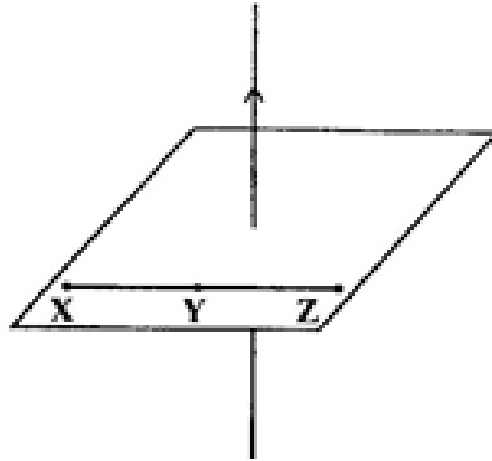
- 17 An electron is projected into a magnetic field.



What is the initial direction of deflection of the electron?

- A Into the page.
- B Out of the page.
- C Towards the bottom of the page.
- D Towards the top of the page.

- 18** Diagram below shows a current-carrying wire passing through the center of a sheet of paper.



How do the strengths of the magnetic field at points X, Y and Z compare?

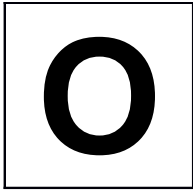
- A** Equal at X, Y and Z
 - B** Equal at X and Z, but stronger at Y
 - C** Equal at X and Z, but weaker at Y
 - D** Stronger at X than Y and stronger at Y than Z
- 19** What is the structure of a neutral atom of $^{90}_{38}\text{Sr}$?

	number of protons	number of neutrons	number of electrons
A	38	52	38
B	38	52	52
C	52	38	38
D	52	38	52

- 20** The half-life of isotope X is four days and its initial mass is 64 mg.

What mass of the isotope will remain after twenty days?

- A** 1 mg **B** 2 mg **C** 4 mg **D** 8 mg



[Science] Physics O Level Exam Paper
Preliminary Examination Set [IV]
Secondary Four Express & Five Normal



CANDIDATE NAME:

CLASS:

INDEX NUMBER:

Science(Physics)

Paper 2 Theory

5076/03

2024

5078/03

1 hour 15 minutes

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use a HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid/tape.

Section A

Answer **all** questions.

Section B

Answer **all** questions. Question 11 has a choice of parts to answer.

Candidates are reminded that **all** quantitative answers should include appropriate units.
The use of an approved scientific calculator is expected, where appropriate.
Candidates are advised to show all their working in a clear and orderly manner, as more marks are awarded for sound use of Physics than for correct answers.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [] at the end of each question or part question.

Section A	
Section B	
Total	

SECTION A

Answer **all** questions in the spaces provided.

- 1 The graph in Figure 1.1 shows how the speed of a bus changes over time on a straight road.

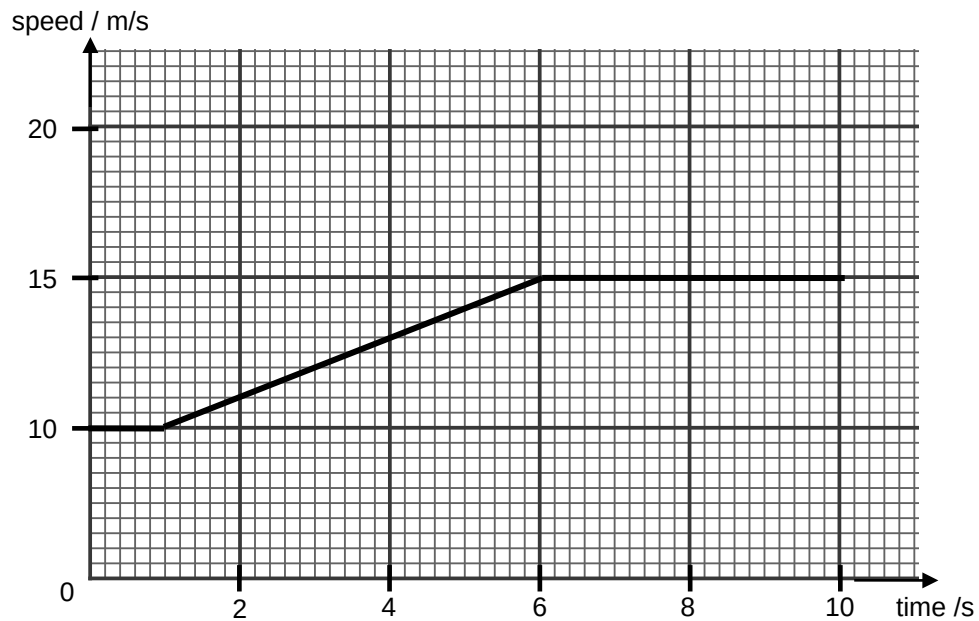


Fig. 1.1

- (a) Calculate the distance travelled by the bus during the first 8 s.

distance = m [2]

- (b) Calculate the acceleration of the bus between the first and sixth seconds.

acceleration = m/s^2 [2]

- (c) Calculate the average speed of the bus during the first 8 s.

average speed = m/s [1]

- 2 Fig. 2.1 shows a block of mass 5 kg resting on a table. The block is pulled with a force of 15 N in the direction shown for 4.0 s, giving it an acceleration of 2 m/s^2 .



Fig. 2.1

- (a) Calculate the resultant force acting on the block.

resultant force = N [2]

- (b) Calculate the frictional force acting on the box

frictional force = N [2]

- (c) Calculate the speed of the block at the end of the 4th second.

speed = m/s [2]

- 3 An airport trolley carries baggage of uniform mass 50 kg. A force F is applied at the handle to raise the cases to the horizontal position as shown in Fig.3.1.

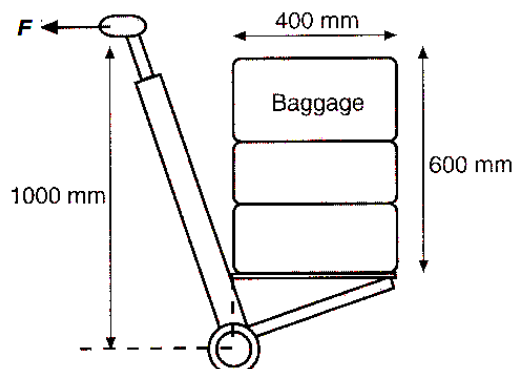


Fig. 3.1

Calculate the force required on the handle to keep the luggage horizontal as shown.

force = N [3]

- 4 A gymnast of mass 48 kg is swinging on a high bar of height 2.2 m. He is momentarily at rest at the top of the swing. At this position, the gymnast's centre of gravity is at a height of 0.9 m above the bar as shown in Fig. 4.1.

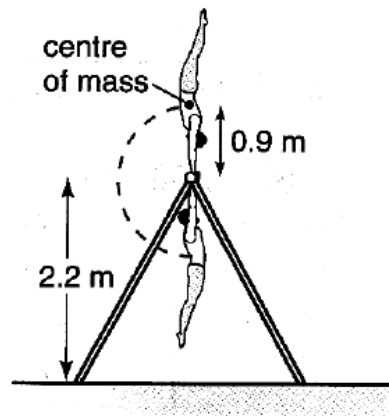


Fig. 4.1

- (a) What is the amount of energy possessed by gravitational potential store of the gymnast when he is at the top of the swing?

energy = J [2]

- (b) Calculate the amount of energy possessed by the kinetic store of the gymnast at the bottom of the swing.

kinetic energy = J [2]

- (c) Hence determine the velocity of the gymnast at the bottom of the swing.

velocity = m/s [2]

- 5 Fig. 5.1 illustrates how the temperature of the substance changes with time when it is heated from 0 °C to 175 °C. Assume there is negligible heat loss to the surroundings during heating.

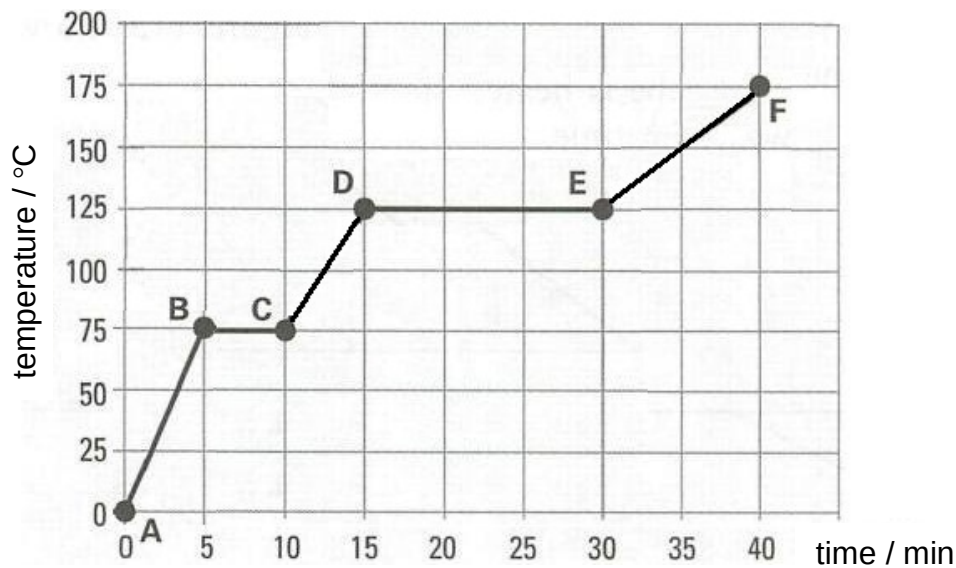


Fig. 5.1

- (a) What is meant by the boiling point of a substance.

.....
 [1]

- (b) Using the kinetic theory of matter, describe the change, if any, in the forces of attraction and speed of the molecules at BC.

.....

 [2]

- (c) If the power of the heater is 500 W, calculate the heat energy needed to boil the substance completely assuming heat loss to the surroundings is negligible.

energy = J [2]

6 Fig. 6.1 shows a radioactive source used to measure and control the thickness of cardboard during manufacture.

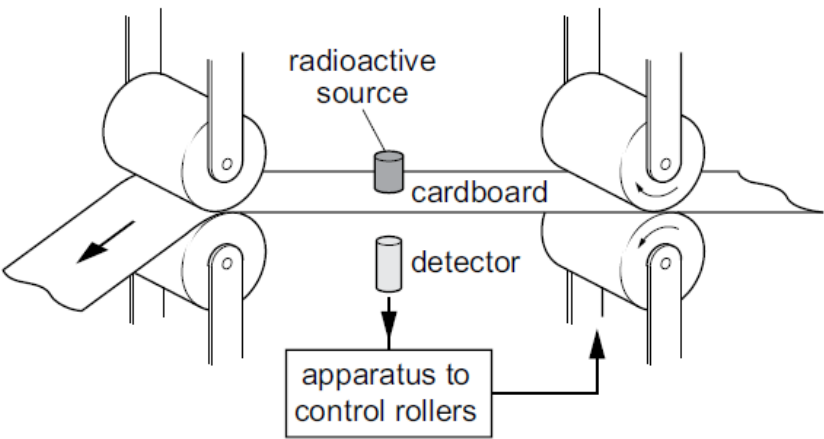


Fig. 6.1

- (a) Some radioactive sources emit alpha-particles, some beta-particles and some gamma radiation. These different radiations have different penetrating abilities.

Place one tick (✓) in each row of Table 6.1 to compare alpha, beta and gamma radiation.

	alpha (α)	beta (β)	gamma (γ)
least penetrating			
most penetrating			

[1]

Table 6.1

- (b) Strontium-90 is an isotope used in the radioactive source in Fig. 6.1.

A nucleus of strontium-90 emits a beta-particle as it decays.

Explain

- (i) why the position of the detector may not capture all beta-particles?

.....

.....

[1]

- (ii) what is meant by a spontaneous decay?

.....

.....

[1]

- (iii) what is meant by half-life?

.....

.....

[1]

- 7 Bob holds the loose end of a long rope which is fixed to a pole. He moves it up and down at a rate of 20 complete oscillations every 5 s. Fig 7.1 shows a section of the wave moving along the rope.

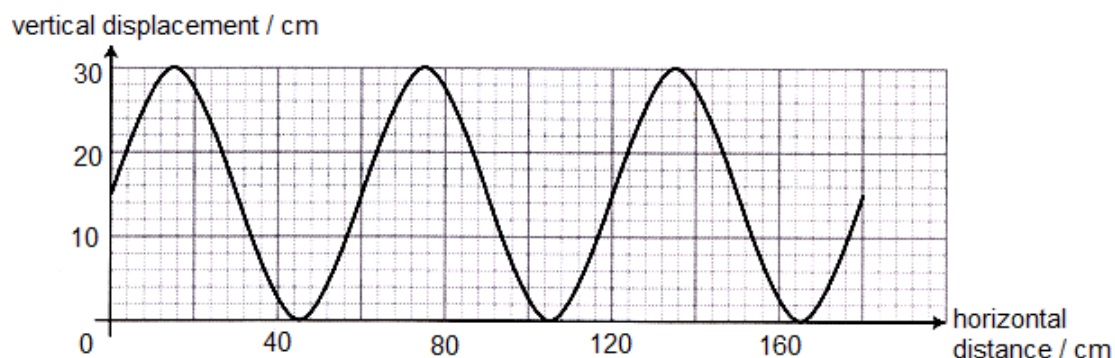


Fig. 7.1

- (a) State the amplitude of the wave.

amplitude = cm [1]

- (b) Determine the speed of the wave.

speed = [2]

- 8 Fig. 8.1 shows a circuit.

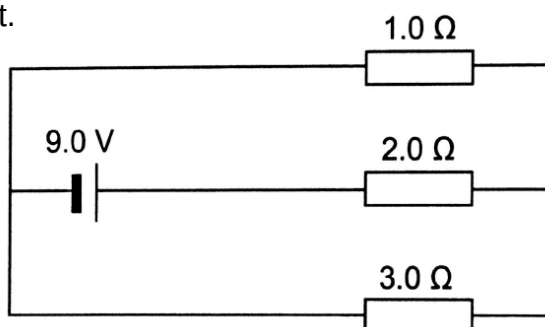


Fig. 8.1

Calculate the

- (a) effective resistance of the circuit.

resistance = [2]

- (b) total charge flowing through the battery in 1 minute.

charge = [2]

- (c) work done by the charge flowing through the $2.0\ \Omega$ resistor in 1 minute.

work done = [2]

- 9 Fig. 9.1 below shows a circuit with a straight hanging wire dipped in a pool of mercury which is a conductor.

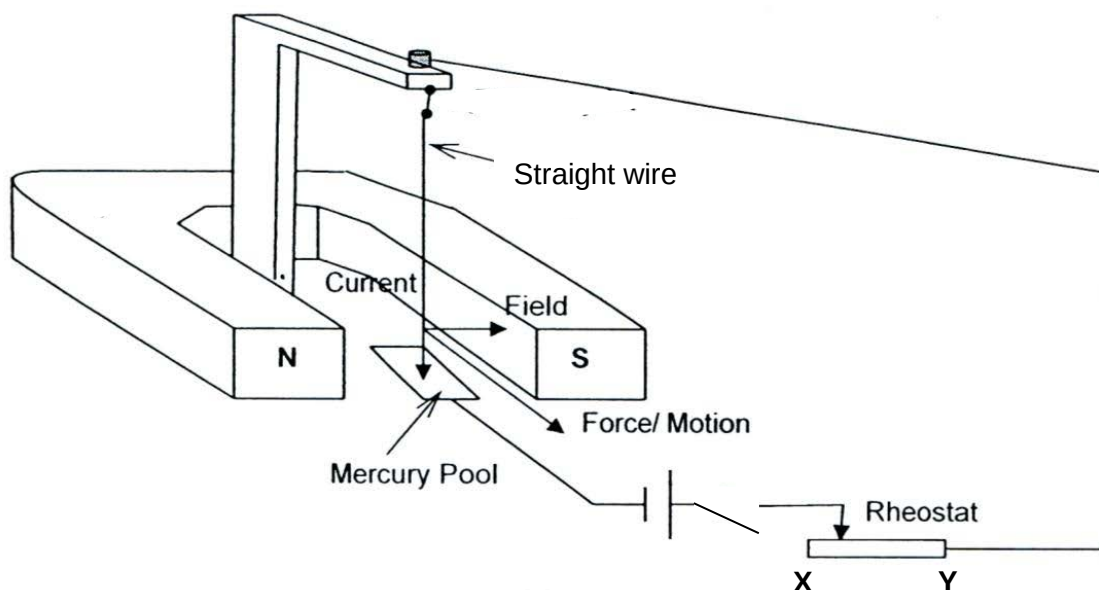


Table 9.1

The rheostat has maximum and minimum resistance at points X and Y respectively. The rheostat is currently fixed at a point near to X.

- (a) Draw in Fig. 9.1, the direction of conventional current in the straight wire when the circuit is closed. [1]

- (b) State and explain in terms of Fleming's Left Hand Rule, the motion of the straight wire once the circuit is closed.

.....

[3]

- (c) The experiment is repeated with the rheostat now fixed at point Y. Describe any changes you would expect in your observation in (b). Explain your answer.

.....

[3]

- 10** The table lamp shown in Fig. 10.1 is made from plastic. It has only 2 wires in the cable. The lamp has a power rating of 60 W and is used on a 240 V supply.



Fig. 10.1

- (a)** State which wire, Earth, Live or Neutral, is **not** needed in the cable for the table lamp.

..... [1]

- (b)** The lamp is safe to use even though it has only two wires because its cable is double insulated.

Describe how the double insulated cable keeps the lamp safe.

.....
 [2]

- (c)** Determine the value of the fuse that should be used in the plug of this lamp.

fuse value = [2]

- (d)** One unit of electricity costs 25 cents.

Calculate the cost of leaving the lamp on for a full day (24 hours).

cost = \$...... [2]

- (e)** Draw a circuit diagram to show how **three** of these table lamps are connected to the mains supply so that each lamp can be switched on separately. Include a fuse to protect the entire circuit. Label the fuse rating clearly.

Section B

Answer **one** question from this section.

- 11 (a)** Fig 11.1 shows a ray of light passing through the edge of a converging lens.

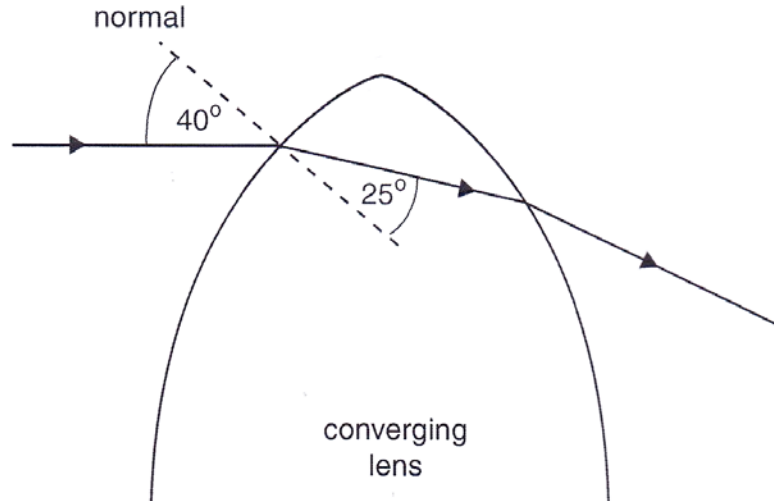


Fig 11.1

- (i)** What causes the ray of light to bend as it travels from air into the lens?

..... [1]

- (ii)** Determine the refractive index of the lens material.

refractive index = [2]

- (iii)** A pencil of length 10 cm is placed 25 cm in front of the converging lens of focal length 10 cm. With a suitable scale, draw a ray diagram and determine the size of its image.

size = [3]

- (iv)** Describe the characteristics of the image formed by the lens.

..... [1]

- 11 (b)** The diagram in Fig. 11.2 shows two rays which have been reflected from a mirror MN.

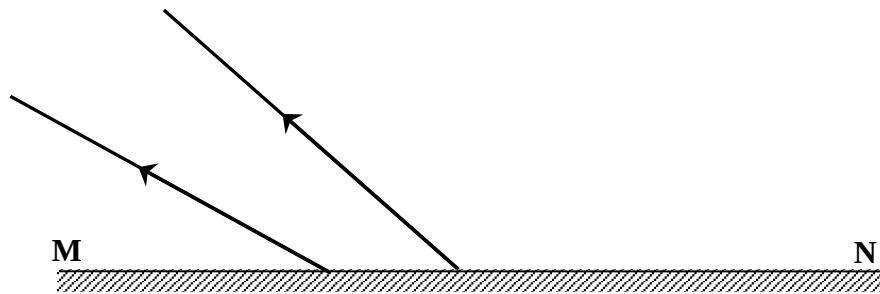


Fig 11.2

- (i)** Add lines to the diagram to find the position of the reflected image. Label this position I. [1]
- (ii)** Show, on the diagram, the position O of the object from which the two rays have started. [1]
- (iii)** Complete the ray diagram to show the two rays emerging from the object. [1]

12 Fig.12.1 shows an electric kettle.

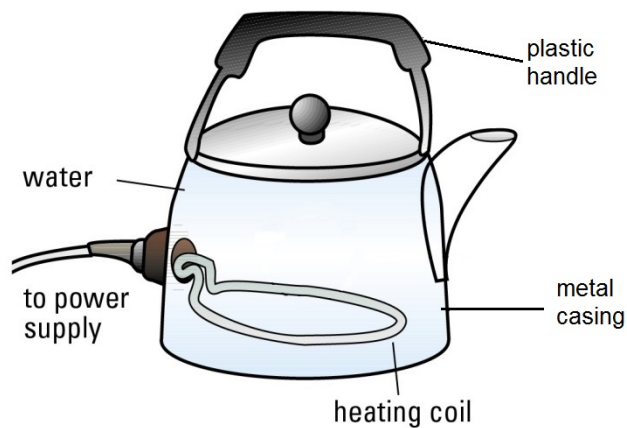


Fig. 12.1

(a) (i) Explain why, although water is a poor conductor of heat, all the water is heated when the kettle is switch on.

.....

.....

.....

.....

[3]

(ii) Explain, in terms of thermal energy transfer, why electric kettles are usually shiny and smooth on the outside.

.....

.....

.....

[2]

(iii) Explain why the handle of the kettle is made of plastic instead of metal.

.....

.....

.....

[2]

- (b) Fig.12.2 shows steam produced is invisible and escapes from the spout. On contact with the cooler air outside, the steam condenses to form visible water droplets.

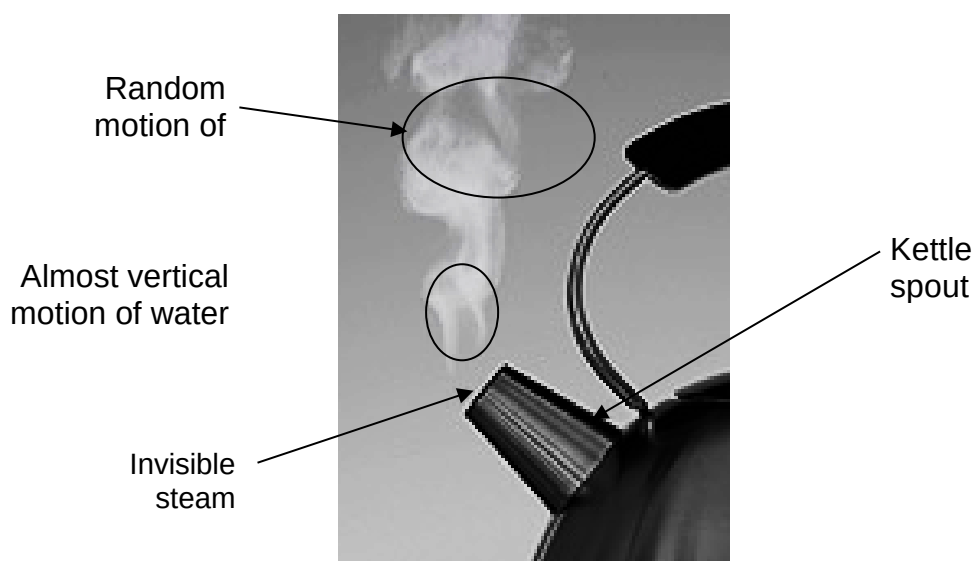


Fig. 12.2

- (i) It is observed that the visible water droplets near the spout rise almost vertically and at a high speed. Explain, using the kinetic theory of matter, this observation.

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

[2]

- (ii) Furthermore, it is observed that further away from the kettle spout, the water droplets exhibit a random motion. Explain, using the kinetic theory of matter, this observation.

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

[1]

END OF PAPER