

[Science] Physics O Level Exam Paper
Preliminary Examination Set [V]
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.

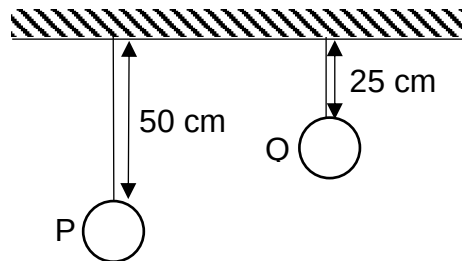
The use of an approved scientific calculator is expected, where appropriate.

Section A (40 marks)

1 What is the order of magnitude of the width of a human hair?

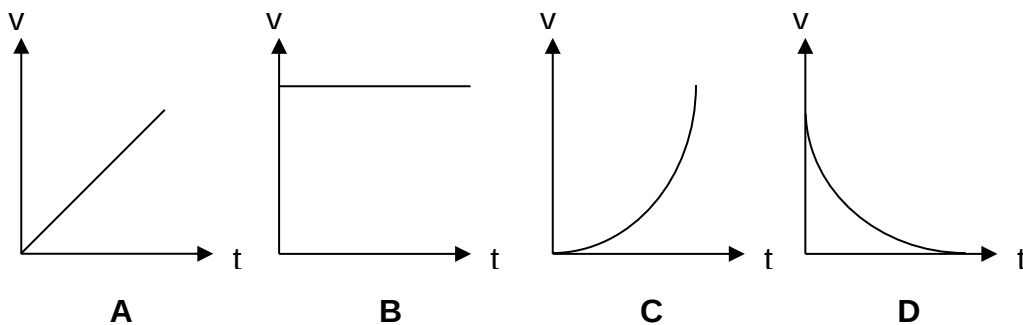
- A** 10^1 m
- B** 10^{-2} m
- C** 10^{-4} m
- D** 10^{-9} m

2 The mass of pendulum P is 1 kg and pendulum Q is 2 kg. Which of the following statements is correct?

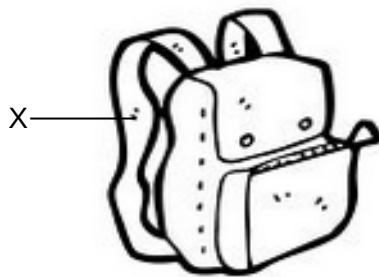


- A** Pendulum P has a longer period because the length is longer.
- B** Pendulum P has a longer period because the mass is smaller.
- C** Pendulum P has a shorter period because the length is longer.
- D** Pendulum P has a shorter period because the mass is smaller.

3 Which velocity-time graph represents the motion of a car moving at increasing acceleration?



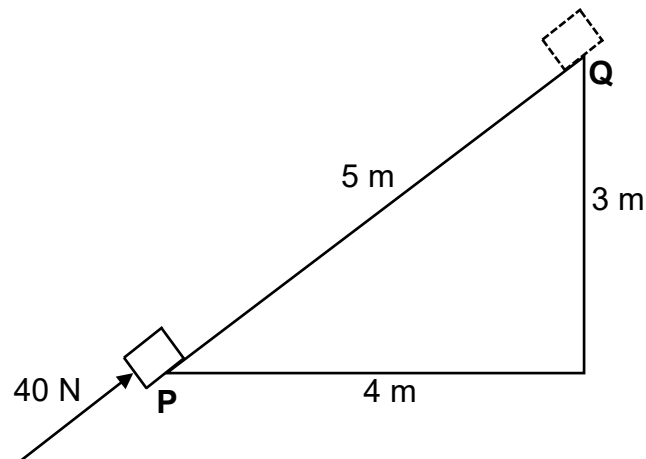
- 4 Which of the following statements correctly describes the acceleration of a freely falling object near the surface of the Earth, neglecting air resistance?
- A The acceleration of the object decreases as the object falls.
 - B The acceleration of the object increases as the object falls.
 - C The acceleration of the object remains constant as the object falls.
 - D There is no acceleration as the object falls.
- 5 The diagram below shows a typical backpack.



Why is the shoulder strap at X wider?

- A To decrease the contact area with the shoulders so the pressure is high
- B To decrease the weight of the backpack so the pressure is low
- C To increase the contact area with the shoulders so the pressure is low
- D To increase the weight of the backpack so the pressure is high

- 6 A 40 N force is applied to a 20 N box in the direction as shown in the diagram. How much work is done by the force in moving the box from **P** to **Q**?



- A 60 J
B 120 J
C 160 J
D 200 J
- 7 A cyclist travels down a hill from point **X** without pedalling. The cyclist then applies his brakes and the bicycle stops at point **Y**.

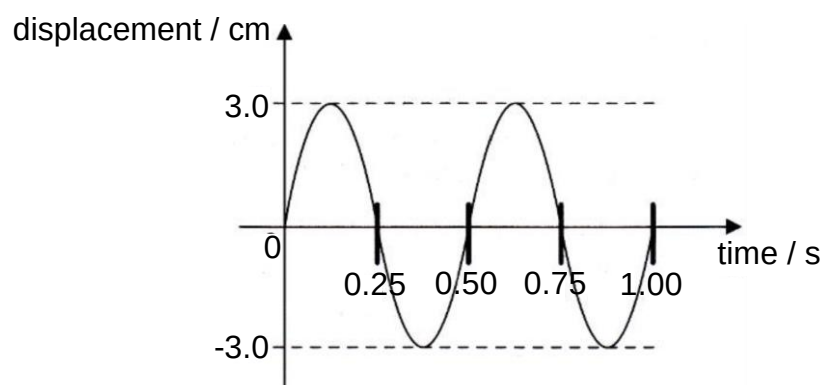


Which energy changes have taken place between **X** and **Y**?

- A gravitational potential -> internal -> kinetic
B gravitational potential -> kinetic -> internal
C kinetic -> gravitational potential -> internal
D kinetic -> internal -> gravitational potential

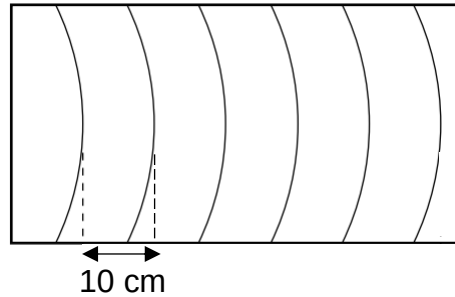
- 8** In terms of the kinetic particle model of matter, why does temperature increase as a liquid is heated?
- A** The average spacing between the molecules becomes larger.
 - B** The average speed of the molecules increases.
 - C** The collision rate of molecules increases.
 - D** The forces of attraction between the molecules becomes stronger.

For Question **9** and **10**, please refer to the diagram below.



- 9** What is frequency of the wave?
- A** 0.50 Hz
 - B** 1.00 Hz
 - C** 1.50 Hz
 - D** 2.00 Hz
- 10** What is amplitude of the wave?
- A** 1.5 cm
 - B** 3.0 cm
 - C** 4.5 cm
 - D** 6.0 cm

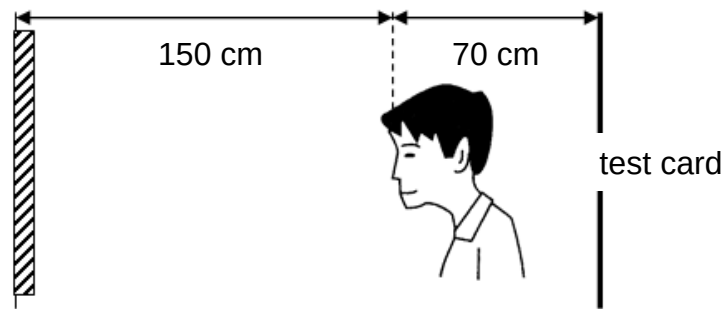
- 11** The dipper in a ripple tank vibrates at a frequency of 2.0 Hz and the resulting wave fronts are photographed. The distance between two adjacent wavefronts is 10 cm.



The speed of the wave increases as it enters a deeper part of the tank. Which of the following best describes how the wave changes?

- A** The distance between two adjacent wavefronts decreases.
 - B** The distance between two adjacent wavefronts increases.
 - C** The frequency of the wave decreases.
 - D** The frequency of the wave increases.
- 12** Which of the following is most likely to cause ionization in body cells?
- A** gamma rays
 - B** microwaves
 - C** radio waves
 - D** ultraviolet

13 The diagram below shows the setup to test the eyesight of a patient.



If the test card is fixed at 70 cm behind the eyes of the patient, what is the distance of the image of the test card from the patient?

- A** 150 cm
 - B** 300 cm
 - C** 370 cm
 - D** 440 cm
- 14** Which of the following cannot be an image formed by a thin converging lens?
- A** real and diminished
 - B** real and magnified
 - C** virtual and diminished
 - D** virtual and magnified

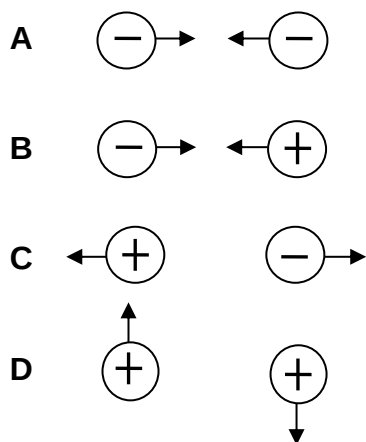
- 15** A piece of wire has a length of 1.0 m and a cross-sectional area of 2 mm². If another piece of wire of the same material is to have a resistance half of the first wire, what should be the length and cross-sectional area of the second wire?

	Length / m	cross-sectional area / mm ²
A	0.5	1
B	0.5	2
C	2.0	1
D	2.0	2

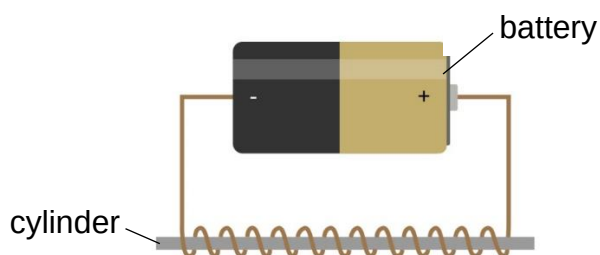
- 16** A resistor, R, is placed in series with a cell. When the potential difference across R is 2.0 V, the current through it is 1.5 A.

Calculate the time it takes for 5.0 C of charge to flow through R.

- A** 1.3 s
- B** 2.5 s
- C** 3.3 s
- D** 7.5 s
- 17** Which diagram correctly shows the directions of the electrostatic forces on a pair of charges?



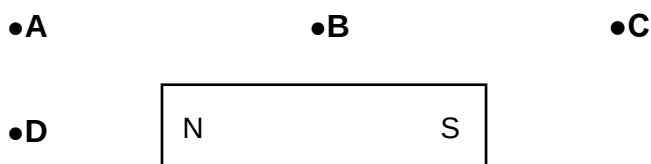
- 18** Identical iron and steel cylinders are magnetised by placing them in a solenoid connected to a battery as shown below.



The cylinders are used to pick up paper clips. Which of the following shows the most suitable number of paper clips picked up by each cylinder?

	iron	steel
A	0	10
B	5	10
C	10	5
D	10	10

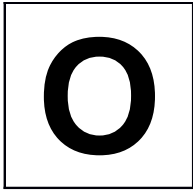
- 19** A student plots the resultant magnetic field of a bar magnet with a compass. The Earth's magnetic field can be ignored.



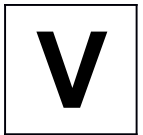
At which point does the compass point towards the right?

- 20** Which of the following correctly lists the electricity charges of the three radiation α , β , γ ?

	α	β	γ
A	+2	-1	0
B	+2	0	+1
C	+4	-1	0
D	+4	0	0



[Science] Physics O Level Exam Paper
Preliminary Examination Set [V]
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** the questions in the spaces provided.

- 1 (a) Circle the number in the list below that is equal to the number of micrograms (μg) in 1.0 kilograms (kg).

1.0×10^{-6} 1.0×10^{-3} 1.0×10^3 1.0×10^6 1.0×10^9 [1]

- (b) Table 1.1 shows some **base units** that are used to measure physical quantities.

Table 1.1

physical quantity	base units
velocity	m / s
	A s
Force	

Complete Table 1.1. The first one has been done for you. [2]

- 2 A wooden block of mass 0.200 kg rest on horizontal surface as show in Fig. 2.1.

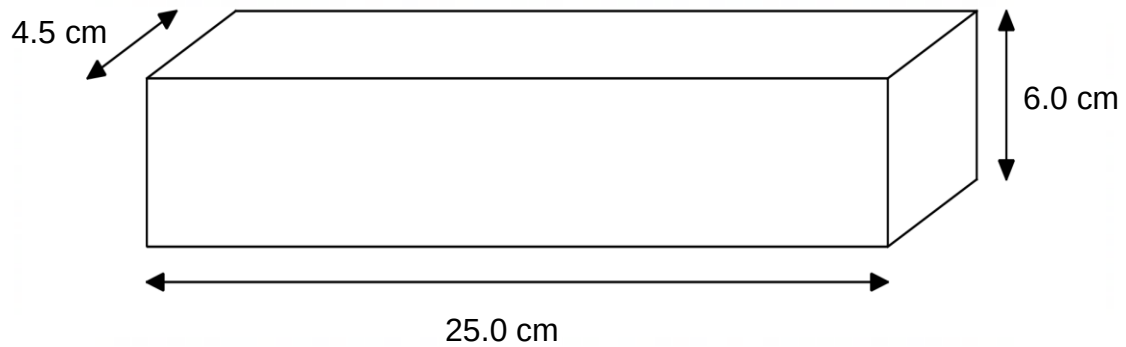


Fig. 2.1

- (a) The gravitational field strength of the Moon is $\frac{1}{6}$ of that on Earth. If this wooden block is brought to the moon, explain how these quantities will change, if any.

weight:.....

.....

density:.....

.....

..... [3]

- (b) Calculate the pressure exerted by the block in Fig. 2.1 on the surface.

pressure = N / cm² [2]

- 3 A construction worker uses a uniform steel bar of length 3.0 m and weight 4.0 N to lift a heavy stone just off the ground as shown in Fig. 3.1. The construction worker exerts a force of 300 N to do so.

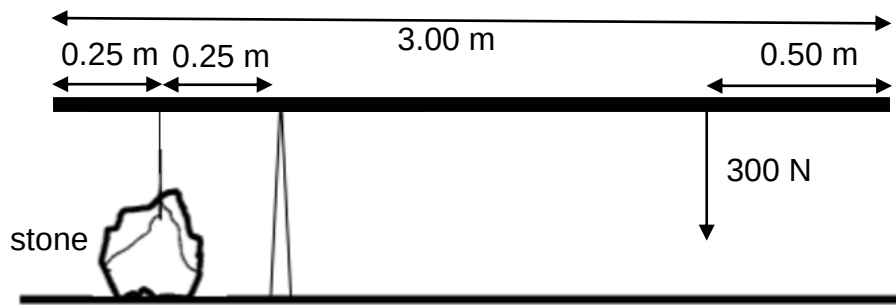


Fig. 3.1

- (a) State the *Principle of Moments*.

.....

 [2]

- (b) Indicate clearly, on Fig. 3.1, the position of the weight of the steel bar with a cross (x). Label this position as **C**. [1]

- (c) Determine the maximum weight of the stone that the construction worker can lift.

weight = N [2]

- 4 Fig. 4.1 shows the graph of how the temperature of material P changes when it is heated to melt it.

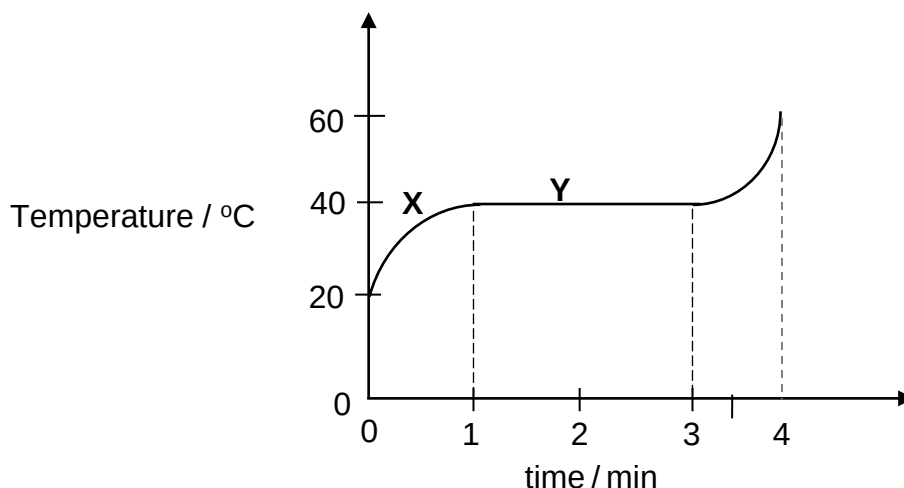


Fig. 4.1

- (a) Name the state(s) of material P at X and Y.

X:

Y: [2]

- (b) In terms of kinetic theory of particles, explain why the temperature at Y remains constant even though material P is being heated.

.....

.....

.....

..... [2]

- 5 Electronic components can be damaged by overheating. To overcome this problem, the component, such as a computer chip, can be fitted with a heat sink, as shown in Fig. 5.1.

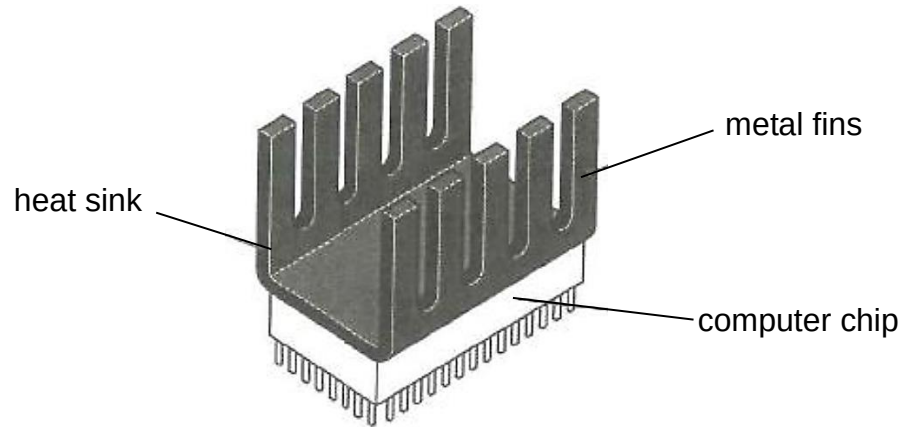


Fig. 5.1

The heat sink is specially designed to keep the computer chip cool.

- (a)** Explain, in microscopic terms, how the heat sink keeps the computer chip cool by conduction.

.....

.....

.....

.....

..... [3]

- (b)** In addition to **(a)**, explain how the metal fins and black surface of the heat sink help to keep the computer chip cool.

.....

.....

.....

..... [3]

- (c)** Suggest one other way in which thermal energy can be lost from the heat sink to the surroundings so more thermal energy can be gained from the computer chip.

..... [1]

- 6 Fig. 6.1 shows how a pair of wireless earphones plays music from the mobile phone via waves sent. To do so, the mobile phone sends a signal to the wireless earphones by means of Wave **A** of wavelength 0.13 m. Wave **A** also travels at a speed of 3.0×10^8 m/s in air. The wireless earphones then send Wave **B** that travel the ears. Wave **B** travels at a speed of 330 m/s in air.

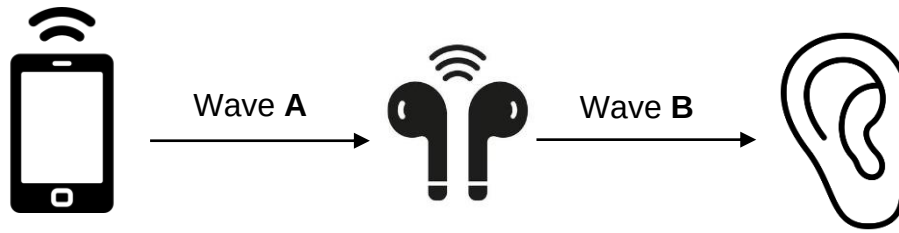


Fig. 6.1

- (a) Identify 2 other differences between Wave **A** and **B**.

.....
.....
.....
..... [2]

- (b) Calculate the frequency of Wave **A**.

frequency = Hz [2]

- 7 Fig. 7.1 shows a ray of light directed towards O, the centre of a semi-circular glass block.

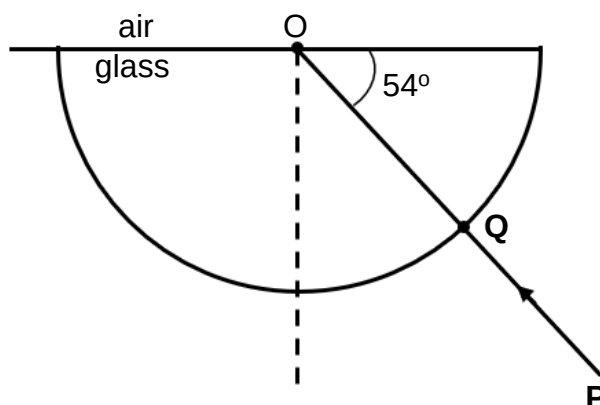


Fig. 7.1

The ray of light **PQ** hits the glass at **Q** perpendicularly as shown in Fig. 7.1.

- (a) Explain why the ray of light **PQ** does not deviate when it enters the glass block at **Q**.

.....
 [1]

- (b) Given that the refractive index of the glass block is 1.50, complete Fig. 7.1 by drawing the refracted ray and indicating the angle of refraction. You may use the space below for any workings. [2]

- (c) Determine the speed of light in the glass block.

speed = m/s [2]

- 8 An electrical circuit is set up as shown in Fig. 8.1. The voltmeter reads 5.0 V.

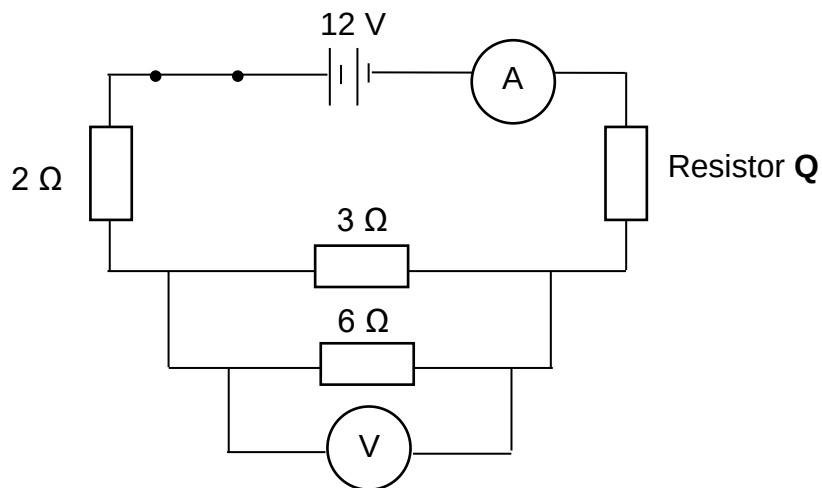


Fig. 8.1

- (a) Calculate the effective resistance of the 3 Ω and 6 Ω resistors.

effective resistance = Ω [2]

- (b) Determine the reading in the ammeter.

ammeter reading = A [2]

(c) Determine the resistance of Resistor Q.

resistance = Ω [2]

(d) Explain how the ammeter reading will change when the $6\ \Omega$ resistor is removed.

.....
.....
..... [2]

9 Fig. 9.1 shows a rigid wire held between the poles of a magnet.

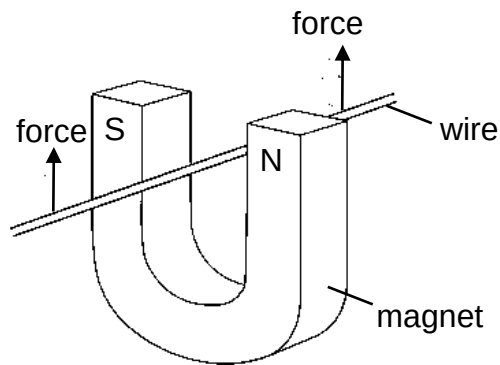


Fig. 9.1

There is an upward force on the wire when the current flows in the wire.

(a) On Fig. 9.1, draw an arrow to show the direction of the current in the wire. [1]

(b) State two ways to increase the magnitude of the force on this wire.

.....
.....
.....
..... [2]

(c) Draw the magnetic field lines of the current carrying conductor in Fig. 9.2.

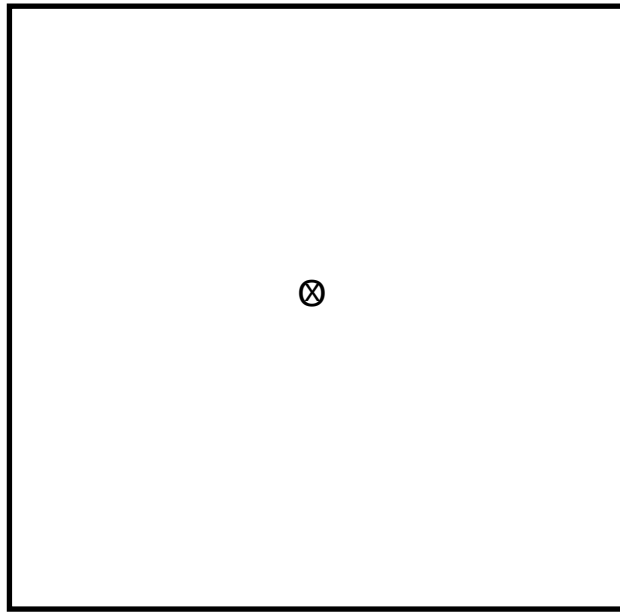


Fig. 9.2

[1]

- 10 (a)** The activity of a sample of $^{184}_{78}\text{Pt}$ was measured at regular intervals. The results after allowing for background radiation are shown in Table 10.1.

Table 10.1

count rate/min	510	330	210	138	102
time/min	0	15	30	45	60

- (i)** On the grid of Fig. 10.1, draw a graph to show how the activity of this source varies with time.

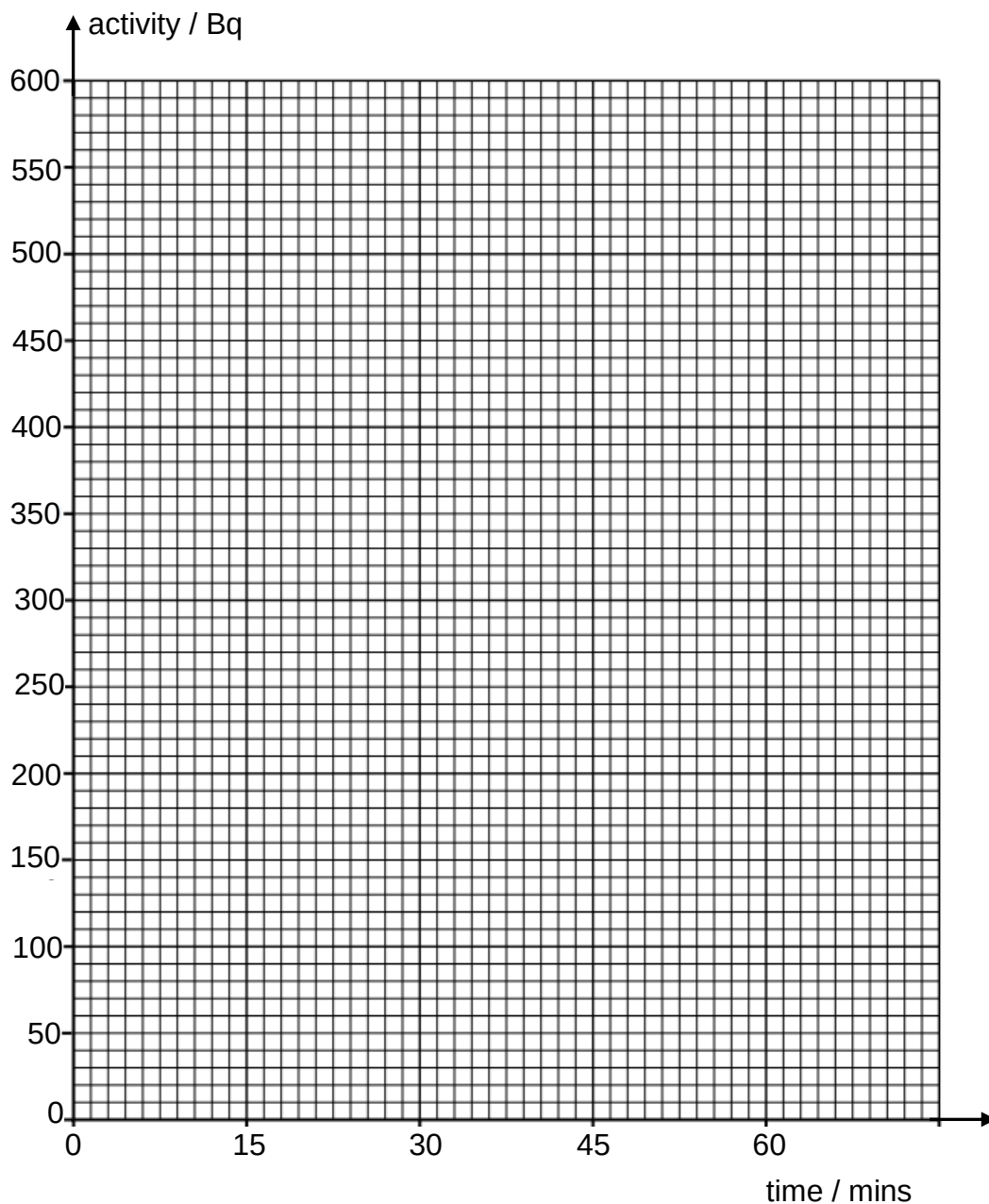


Fig 10.1

- (ii) Determine the half-life of this source. Show clearly on your graph how you arrive at your answers.

half-life = mins [2]

- (iii) It was realised that the half-life determined in (a)(ii) was not accurate. Suggest one improvement to make the determination of half-life more accurate.

.....
.....
..... [1]

- (b) Fig 10.2 shows the apparatus that can be used to detect the radiation from a radioactive source.

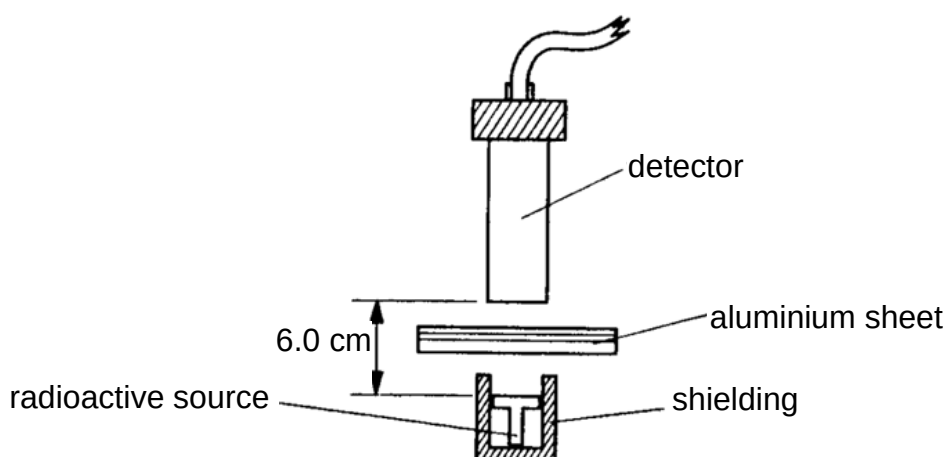


Fig. 10.2

Different thicknesses of aluminum sheet are placed between the source and the detector. The count rate is obtained for each thickness. Fig 10.3 shows the variation of count rate with thickness x of aluminum.

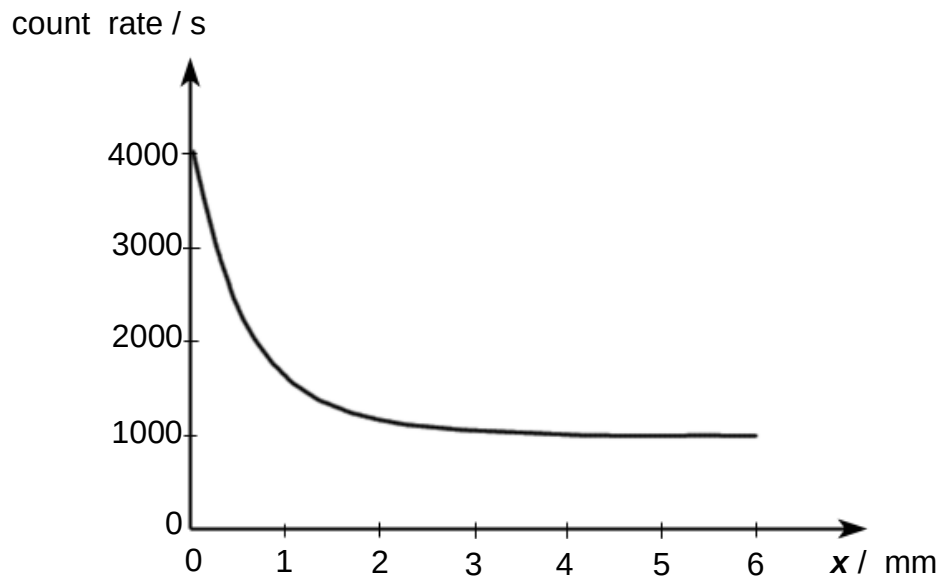


Fig. 10.3

- (i) Suggest why it is not possible to detect the presence of the emission of α -particles from the source.

.....
 [1]

- (ii) State the evidence provided in Fig 10.3 for the emission from the source of

β -particles;

.....

 [2]

γ -radiation.

.....

 [2]

Section B

Answer **one** question from this section.

- 11** A car of mass 1250 kg travels on a flat horizontal ground, as shown in Fig. 11.1.



Fig. 11.1

For the first part of the journey, the car accelerates uniformly and the velocity changes from 0 m/s to 25.0 m/s in 6.0 s.

- (a)** Calculate the acceleration of the car in the first 6.0 s.

acceleration = m/s² [2]

- (b)** Calculate the distance covered by the car in the first 6.0 s.

distance =m [2]

- (c)** Calculate the resultant force applied on the car in the first 6.0 s.

resultant force = N [2]

(d) Given that the engine force is 8000 N, calculate the resistive forces.

resistive forces = N [1]

(e) As the velocity of the car increases, the resistive forces exerting on the car also increases. State how the motion of the car will change.

.....
.....
.....
..... [2]

(f) State the one difference between velocity and speed.

.....
..... [1]

12 An electric vacuum cleaner has a power of 1250 W and it operates with a 240 V mains electric supply. To protect the user and the vacuum cleaner, a fuse is used.

(a) Describe the purpose of the fuse and determine the correct fuse rating to be used.

.....
.....
.....
..... [3]

- (b) The vacuum cleaner operates an average of 30 hours per month. The cost of electrical energy is 26 cents per kWh.

Calculate the average cost of using the vacuum cleaner per month.

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

- (c) There are 3 wires from the mains connected to the vacuum cleaner as shown in Fig. 12.1.



Fig. 12.1

- (i) Identify the wires that are connected wrongly in Fig. 12.1.

.....
 [1]

- (ii) Explain if the vacuum cleaner will still work when the wires are connected as shown in Fig. 12.1.

.....

 [2]

- (iii) The same manufacturer makes another vacuum cleaner that does not require the earth wire but uses another safety feature to protect the user. Explain why the earth wire is not required and describe the safety feature that is used by the manufacturer.

.....

.....

.....

..... [2]

End of paper