O

CONVENT OF THE HOLY INFANT JESUS SECONDARY
Preliminary Examination in preparation for
the General Certificate of Education Ordinary Level 2025

CANDIDATE NAME	
CLASS	
REGISTER NUMBER	

SCIENCE (PHYSICS) 5086/02

Paper 2 Physics **2 Sept 2025**

1 hour 15 minutes

Candidates answer on the Question Paper.

No additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your class, register number and name on the work you hand in.
You may use an HB pencil for any diagrams, graphs, tables or rough working.
Write in dark blue or black pen.
Do not use staples, paper clips, glue or correction fluid.

The use of an approved scientific calculator is expected, where appropriate.
You may lose marks if you do not show your working or if you do not use appropriate units.

Section A
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B
Answer **one** question.
Write your answers in the spaces provided on the question paper.

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

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

1 Fig.1.1 shows part of the speed-time graph for a rocket as it leaves the ground and travels into space.

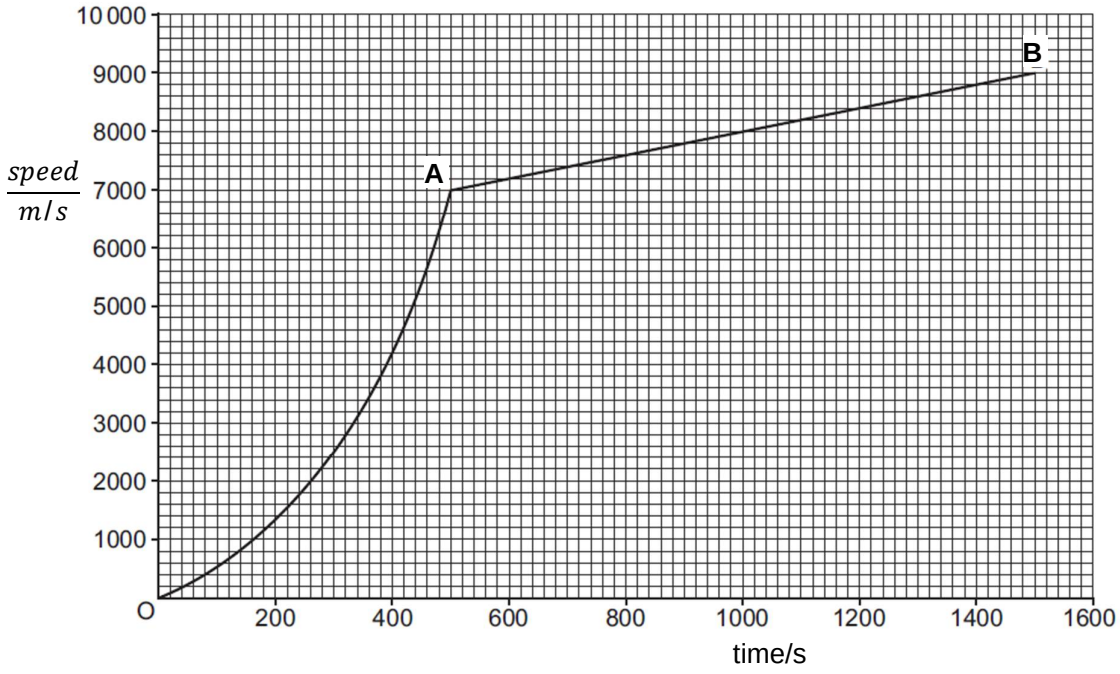


Fig. 1.1

(a) Define acceleration.

……...

……. [1]

(b) Describe the motion of the rocket:

(i) from **O** to **A**

……. [1]

(ii) from **A** to **B**

……. [1]

(c) Find the resultant force acting on the rocket from **A** to **B**. Assume the average mass of the rocket from **A** to **B** is 7.4 x 10^6 kg.

resultant force = …….. N [2]

[Total: 5]

2 A girl is cycling along a straight horizontal road.
Fig. 2.1 shows the directions of the forces acting on the cyclist as she cycles in the direction of force **C**.

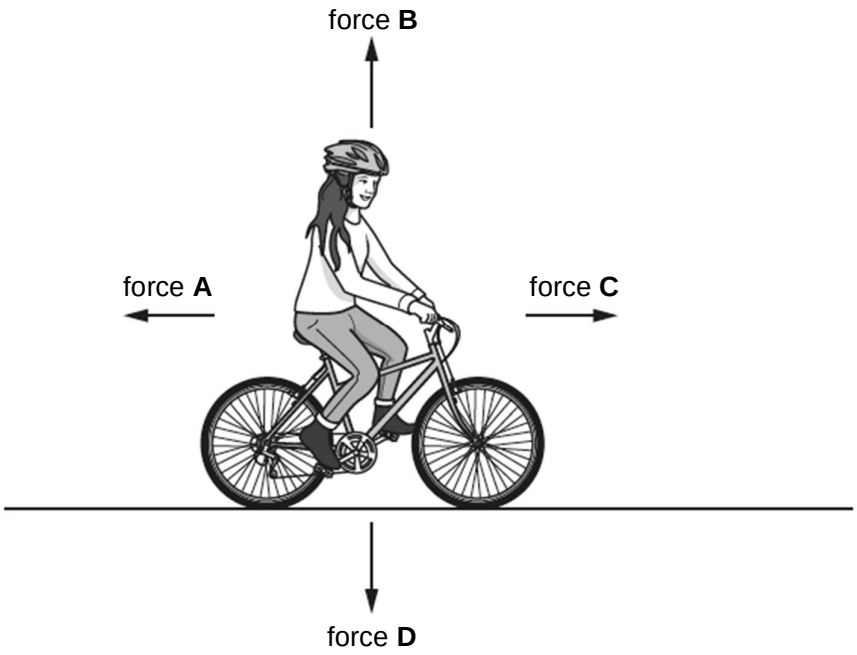


Fig. 2.1

(a) State which force shows the direction of the force due to air resistance.

…… [1]

(b) Force **A** changes and becomes larger than force **C**
State any effect this change has on the motion of the cyclist.

…….. [1]

(c) **(i)** The total mass of the girl and the bicycle is 70 kg and it is travelling with a constant speed of 11.0 m/s. The cyclist then slows down until it comes to rest.
Calculate the work done to make the bicycle come to rest.

work done = …… [2] unit = …….. [1]

(ii) State the main transfer of energy that takes place between energy stores when the cyclist slows down until it comes to a rest.

…… [1]

[Total: 6]

[Turn over

3 Fig. 3.1 shows the simple structure of a small hydroelectric power station.

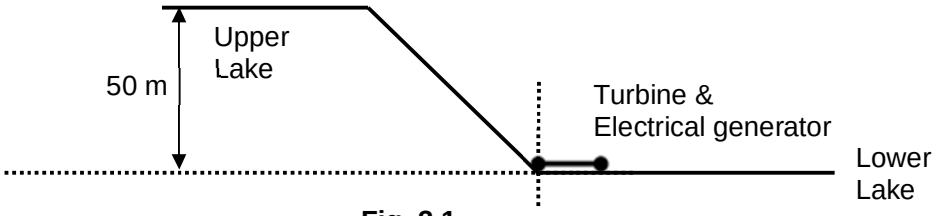
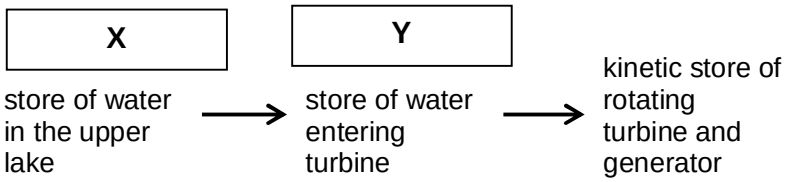


Fig. 3.1

The useful transfer of energy between energy stores occurring at each stage are as follows:



(a) State what are **X** and **Y**.

X ……

Y ……

[2]

(b) The hydroelectric power station is used for one hour. During the hour, the volume of water in the upper lake is 10 000 m^3 and it is 50 m above the turbine. No additional water enters the lake. The density of water is 1000 kg/m^3.
Calculate the loss in energy by the gravitational potential store in one hour.

potential energy loss = …… J [2]

[Total: 4]

4 Fig. 4.1 shows a wood burner in a cabin. The wood burner keeps the inside of the cabin warm when it is cold outside.

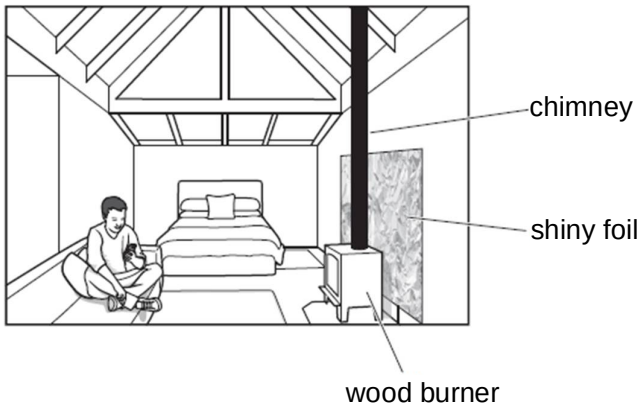


Fig. 4.1

(a) Explain how thermal energy from the wood burner warms the cabin by convection.
Use the ideas about the density of air. You may draw on Fig. 4.1 as part of your answer.

……...

……...

……...

…… [3]

(b) The outer surface of the chimney is dull and black.
Explain how the dull black surface helps to warm the cabin.

……...

……[2]

[Total: 5]

[Turn over

5 **(a)** Describe how a longitudinal wave differs from a transverse wave.

……...

……...

…… [1]

(b) Fig. 5.1 represents a seismic wave produced by an earthquake.

Fig. 5.1

(i) The wave represented in Fig. 5.1 has a wavelength of 1.2×10^4 m.
Calculate the actual distance between point **J** and point **K**.

distance = …….. km [2]

(ii) The wave in **(i)** travels through the ground at a speed of 4800 m/s.
As the wave passes a certain point, the ground completes 5 oscillations.
Calculate the frequency of the wave and the time it takes for the wave to complete 5 oscillations.

frequency = …… Hz [1]

time = …….. s [1]

[Total: 5]

6 A microphone is connected to an oscilloscope as shown in Fig. 6.1 below. When three different sounds, **A**, **B** and **C** are made in front of the microphone, these are the waveforms seen on the screen of the oscilloscope are shown in Fig. 6.1.

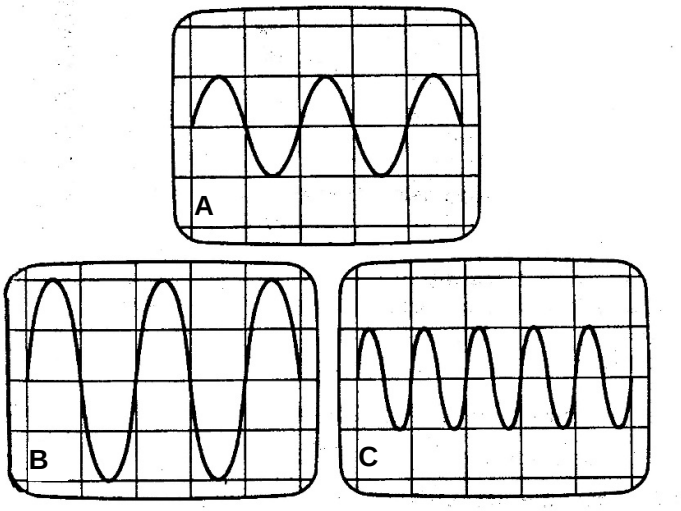


Fig. 6.1

(a) Comparing sounds **A** and **B**, explain how the sounds are different.

……...

……..[1]

(b) Comparing sounds **A** and **C**, explain how the sounds are different.

……...

……..[1]

[Total: 2]

[Turn over

7 Fig. 7.1 shows a ray of monochromatic light incident on an interface of air and corn oil at an angle of 35°. The ray is transmitted through parallel layers of corn oil and glycerol and is then reflected from the surface of a plane mirror, located below and parallel to the glycerol layer. The ray then emerges from the corn oil back into the air at point **P**. The refractive index of corn oil is 1.47.

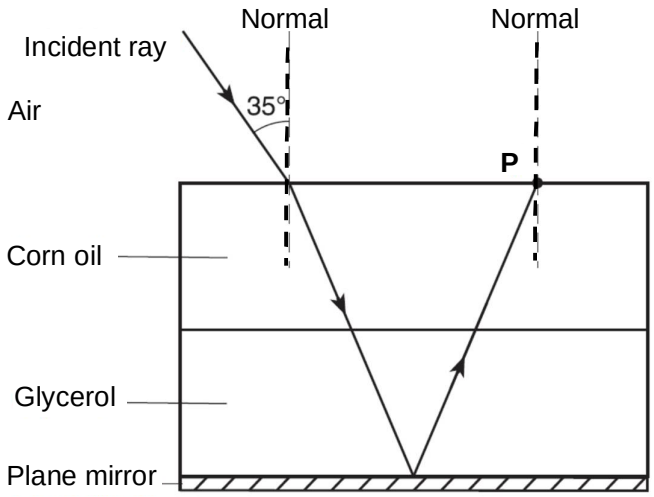


Fig. 7.1

(a) Calculate the angle of refraction of the light ray as it enters the corn oil from air.

angle of refraction = …….. [2]

(b) The ray does not bend at the corn oil and glycerol interface. Explain why.

……...

……..[1]

(c) Complete the ray diagram in Fig. 7.1 to show how the refracted ray leaves the interface of air and corn oil at **P**. [1]

[Total: 4]

8 Fig. 8.1 shows a ray diagram for a thin converging lens.
The lens forms an image of the object. The object is positioned 30 cm from the optical centre of the lens.

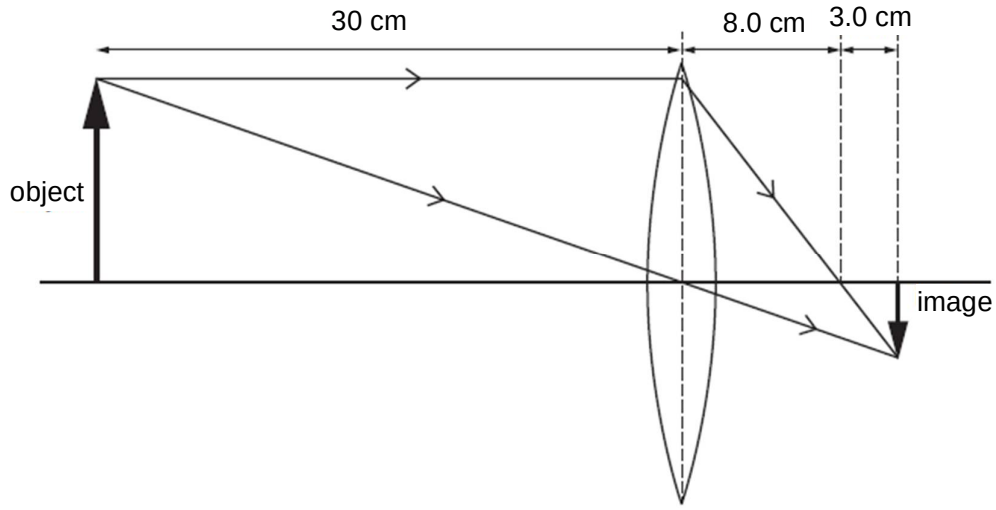


Fig. 8.1 (not to scale)

(a) Using information from Fig. 8.1, state the focal length of the lens.

focal length = …….. m [1]

(b) State two characteristic of the image formed by the lens in Fig. 8.1**.**

……..

……..[2]

(c) State one application for the placement of the object as shown in Fig. 8.1.

…… [1]

(d) When the object is brought closer to the lens, the image can no longer be found at the right side of the lens. Explain why this happens.

……...

……..[1]

[Total: 5]

[Turn over

9 Fig. 9.1 shows an electric with four resistors. Three switches S_1, S_2 and S_3 are opened.

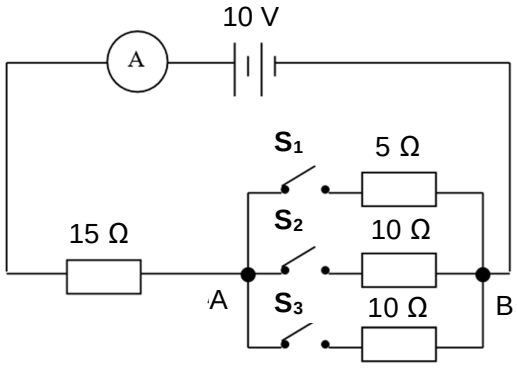


Fig. 9.1

(a) Calculate ammeter reading when

(i) only switch S_1 is closed.

ammeter reading = …… A [1]

(ii) all switches S_1, S_2 and S_3 are closed.

ammeter reading = …… A [2]

(b) If an infinite number of resistors is added in parallel across point A and B, deduce the eventual reading of ammeter with your working shown. Explain how you arrived at this value.

……...

……...

……...

……..[2]

[Total: 5]

10 Fig. 10.1 shows a light bare copper wire **XY** resting on two copper rods **PQ** and **RT** placed between the North pole and South pole of a horseshoe magnet. Ends **T** and **Q** are connected to a battery.

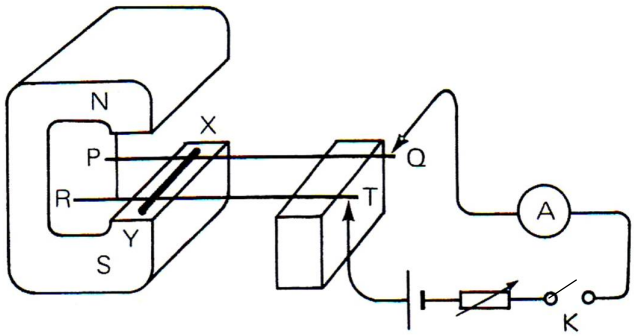


Fig. 10.1

(a) Describe and explain what happens to wire **XY** when switch **K** is closed.

……...

……...

…… [2]

(b) Describe and explain what happens to wire **XY** when the resistance of the variable resistor is lowered.

……...

……...

…… [2]

[Total: 4]

[Turn over

11 **(a)** Table 11.1 shows the electrical appliances, power rating and the number of hours each of them has been used in a certain week.

Electrical appliances	Power Rating	Number of hours
Refrigerator	240 V, 200 W	168
Television	240 V, 500 W	20
Bulb	240 V, 60 W	70
Air conditioner	240 V, 2 kW	50

Table 11.1

Fig. 11.1 shows how the electrical appliances are connected.

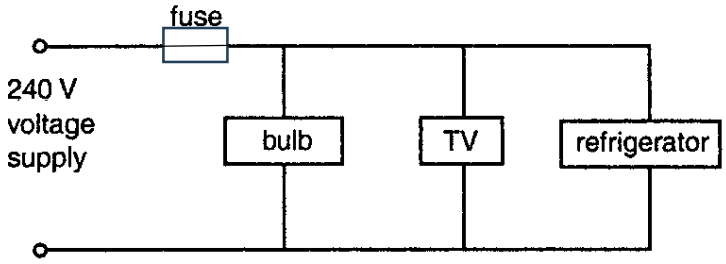


Fig. 11.1

(i) State the type of connection in Fig. 11.1.

…… [1]

(ii) The air conditioner is not connected together with the other appliances. It has a different circuit. Explain why.

……..

……..[1]

(iii) Calculate the electricity tariff per kWh if the total cost of using all the appliances in Table 11.1 for that particular week is $29.56

tariff = …… per kWh [2]

(b) An unqualified electrician connects two electric fans A and B at home. The domestic wiring is shown in Fig. 11.2 below. The mains supply is at 240 V and **L**, **N** and **E** denote the live, neutral and earth wires respectively. Both electric fans have metal casing enclosing their motors.

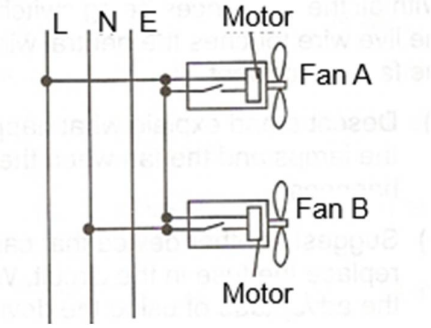


Fig. 11.2

(i) State two mistakes made by the unqualified electrician in the wiring of the fans in Fig. 11.2.

1. ……

……

2. ……

……

[2]

(ii) Draw on Fig. 11.3, the correct wiring for the 2 fans. [2]

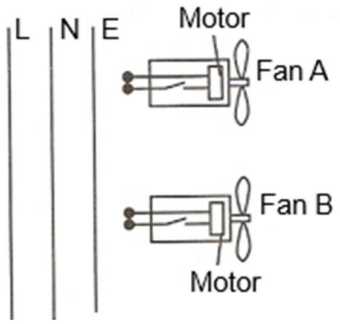


Fig. 11.3

(iii) An electrical safety component is missing from the fan's circuit.
Name the electrical safety component and explain how the safety component works.

……

……

……[2]

[Total: 10]

[Turn over

Section B

Answer **one** question in this section.

Write your answers in the spaces provided.

12 Fig. 12.1 shows a barrier at the entrance to a car park. The wooden barrier arm has a weight of 60 N which acts through the centre of gravity at the position shown on Fig. 12.1.

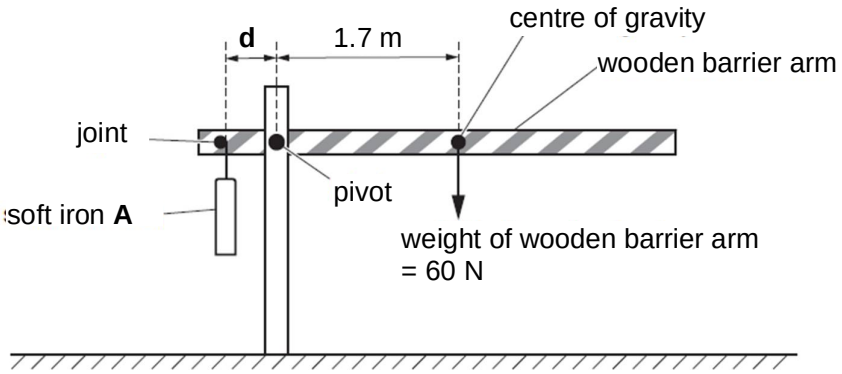


Fig. 12.1

(a) Define the principle of moments.

……

…… [1]

(b) Initially the wooden barrier arm is horizontal.

(i) Using Fig. 12.1, calculate the clockwise moment of the weight of the wooden arm about the pivot.

clockwise moment = …… Nm [2]

(ii) The wooden barrier arm is in equilibrium. The mass of the soft iron bar A is 23 kg.
Using the principle of moments, calculate the distance **d** between the pivot and the joint holding the soft iron bar **A**.

distance d = …… m [2]

(c) Fig. 12.2 shows a coil attached to a power supply placed below soft iron bar A.

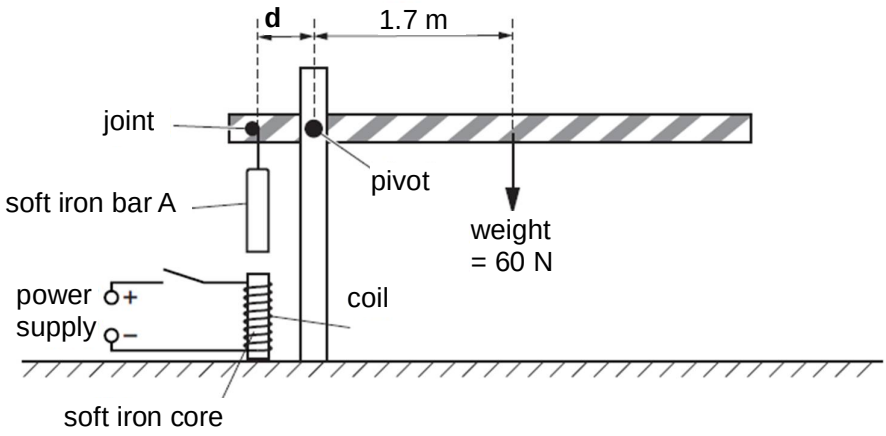


Fig. 12.2

(i) State and explain what happens to the wooden barrier arm when the switch in the coil circuit is closed.

statement ……..

explanation ……

……

……

……

……[3]

(ii) A student suggests that the soft iron bar A is replaced by a steel bar.
Explain why a steel bar is less effective than a soft iron bar in the barrier.

……

……

……[2]

[Total: 10]

[Turn over

13 **(a)** Fig. 13.1 represents how ionising radiation **P** collides and ionises an atom.

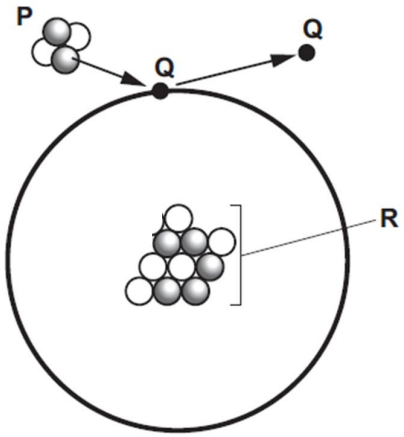


Fig. 13.1

The particle of ionising radiation **P** collides with particle **Q** which is in orbit around the central structure **R**.

(i) Deduce the name of:

particle **P** ……

particle **Q** …… [2]

(ii) In Fig. 13.1, all the particles in the central structure **R** are shown.
The chemical symbol for boron is $^{11}_{5}B$.
Explain why this atom is an isotope of boron.

……

…… [2]

(b) A teacher demonstrates radioactive decay by using a sample.

(i) The sample emits beta (β)-particle.
State the nature of a beta (β)-particle.

…… [1]

(ii) The teacher places the sample in a thick lead container. Fig. 13.2 shows a narrow beam of beta particle emerging from a small hole in one side of the container.

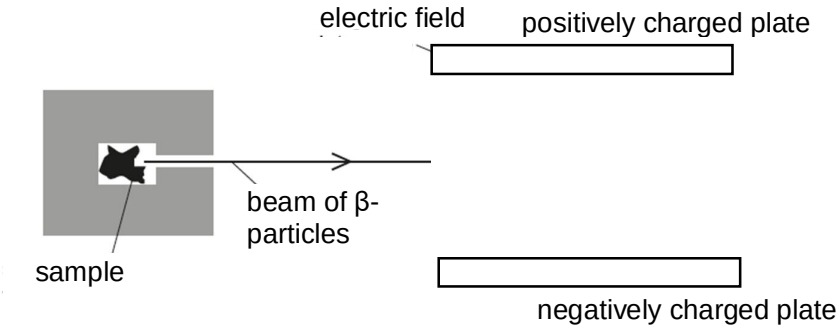


Fig. 13.2

The narrow beam enters a region where there is an electric field as shown in Fig. 13.2.

On Fig. 13.2, draw a line to indicate the path of the beta (β)-particle in the electric field. [1]

(iii) Define half-life of a radioactive sample.

……...

…….. [1]

[Turn over

(iv) The teacher obtains data for a decay curve. Fig. 13.3 shows the decay curve for the sample.

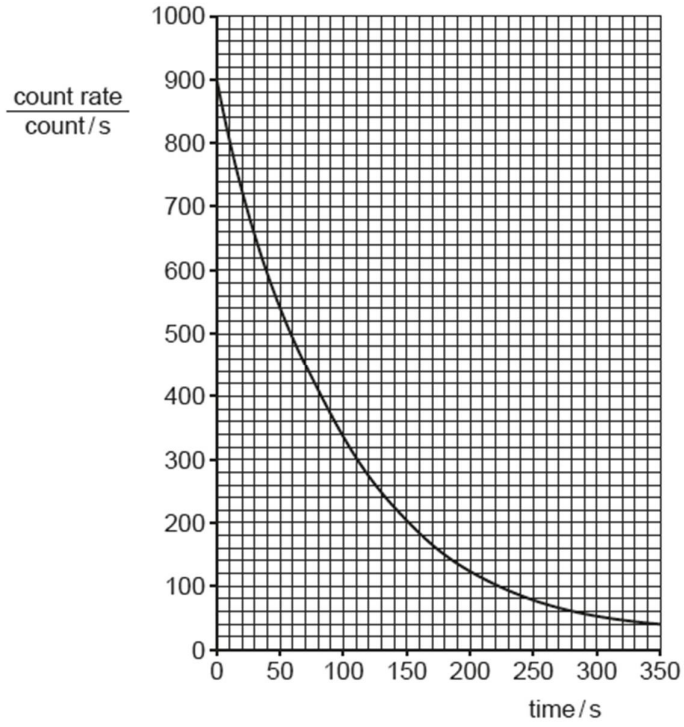


Fig. 13.3

Calculate the half-life of this sample using information in Fig. 13.3. Clearly show your working clearly on the graph or in the spaces provided.

half-life = ……. s [2]

(v) Suggest a reason why the half-life of this sample makes it suitable for this demonstration in a lesson.

……..

…… [1]

[Total: 10]

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