IGCSE TEST EXAM PAPER

ACADEMIC YEAR 2023 - 2024

QOC Learning

STUDENT NAME							
MARKS OBTAINED	80			TIME TAKEN		VIVA MARKS	

PHYSICS

Paper 4 Theory (Extended)

0625/P4/101

1 hour 15 minutes

DATE

DAY:	MONTH:	**2024**

INSTRUCTION AND RULE

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.
- You may lose your mark up to 15% for late submission.

REMARKS:

1 Fig. 1.1 shows a side view of a large tank in a marine visitor attraction.

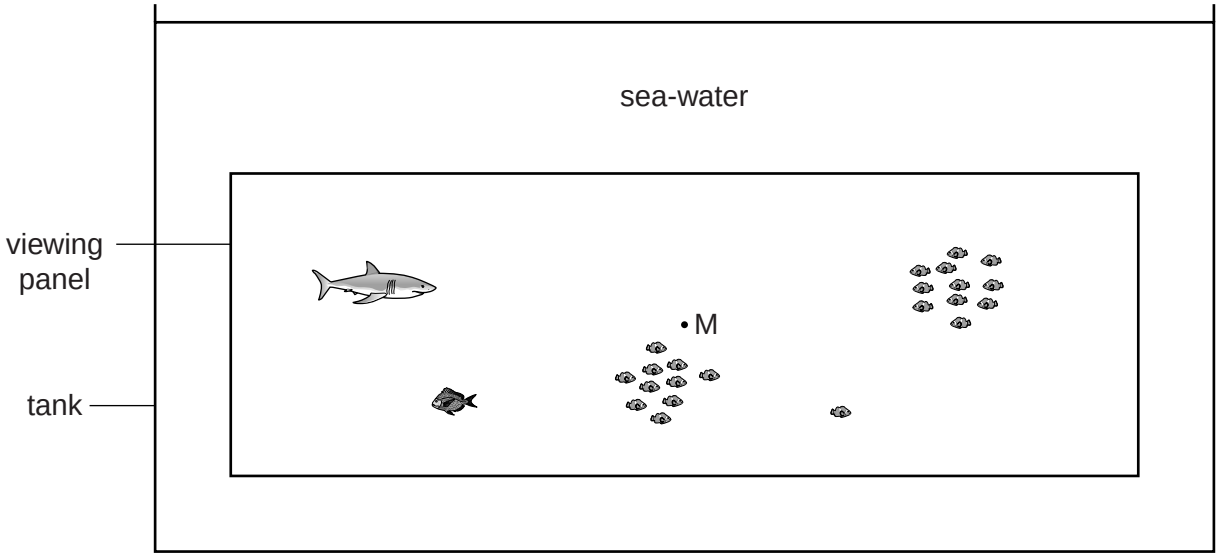

Fig. 1.1 (not to scale)

The tank is 51 m long and 20 m wide. The sea-water in the tank is 11 m deep and has a density of 1030 kg / m^3.

(a) Calculate the mass of water in the tank.

mass = ... [3]

(b) The pressure at point M, halfway down the large viewing panel, is 60 kPa more than atmospheric pressure.

Calculate the depth of M below the surface of the water.

depth = ... [2]

(c) The viewing panel is 32.8 m wide and 8.3 m high.

Calculate the outward force of the water on the panel. Assume that the pressure at M is the average pressure on the whole panel.

force = ... [2]

[Total: 7]

2 Fig. 2.1 shows the extension-load graph for a spring.

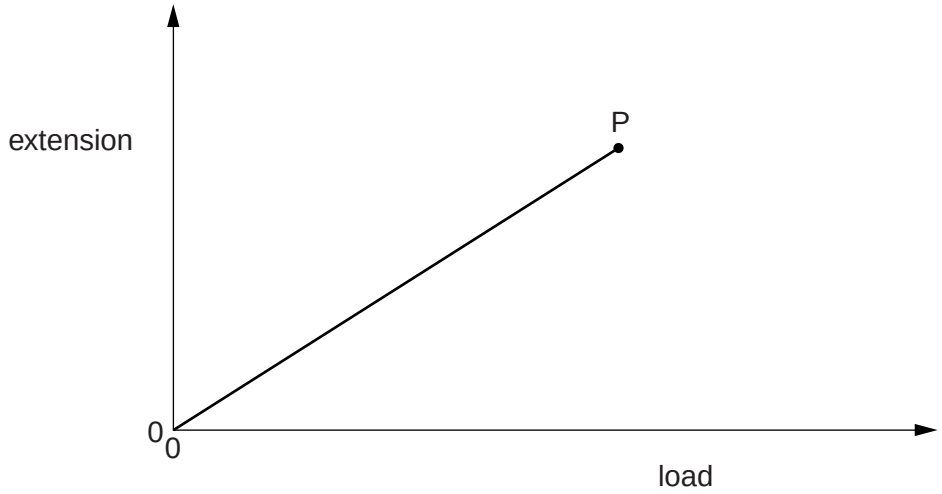

Fig. 2.1

Point P is the limit of proportionality.

(a) **(i)** Name the law obeyed by the spring from the origin to P.

.....[1]

(ii) Describe two features **of the graph** which show that the law is obeyed.

1. .....

2. .....
[2]

(b) On Fig. 2.1, sketch a possible continuation of the graph when the spring is loaded beyond the limit of proportionality. [1]

[Total: 4]

3 Water molecules evaporate from a puddle and escape to the atmosphere. Water molecules also escape to the atmosphere from water boiling in a kettle.

(a) State two ways in which *evaporation* differs from *boiling*.

1. .....

.....

2. .....

.....

[2]

(b) This part of the question is about an experiment to determine the specific latent heat of vaporisation of water.

(i) Suggest apparatus that will provide thermal energy (heat) and state the readings needed to determine the amount of thermal energy provided.

apparatus .....

.....

readings .....

.....

.....

[2]

(ii) Suggest apparatus required for determining the mass of liquid vaporised and state the readings needed to determine that mass.

apparatus .....

.....

readings .....

.....

.....

[2]

4 A rocket, initially at rest on the ground, accelerates vertically.

It accelerates uniformly until it reaches a speed of 900 m / s after 30 s.

After this period of uniform acceleration, the rocket engine cuts out. During the next 90 s, the upward speed of the rocket decreases uniformly to zero.

(a) On Fig. 4.1, plot a speed-time graph for the rocket for the first 120 s of its flight.

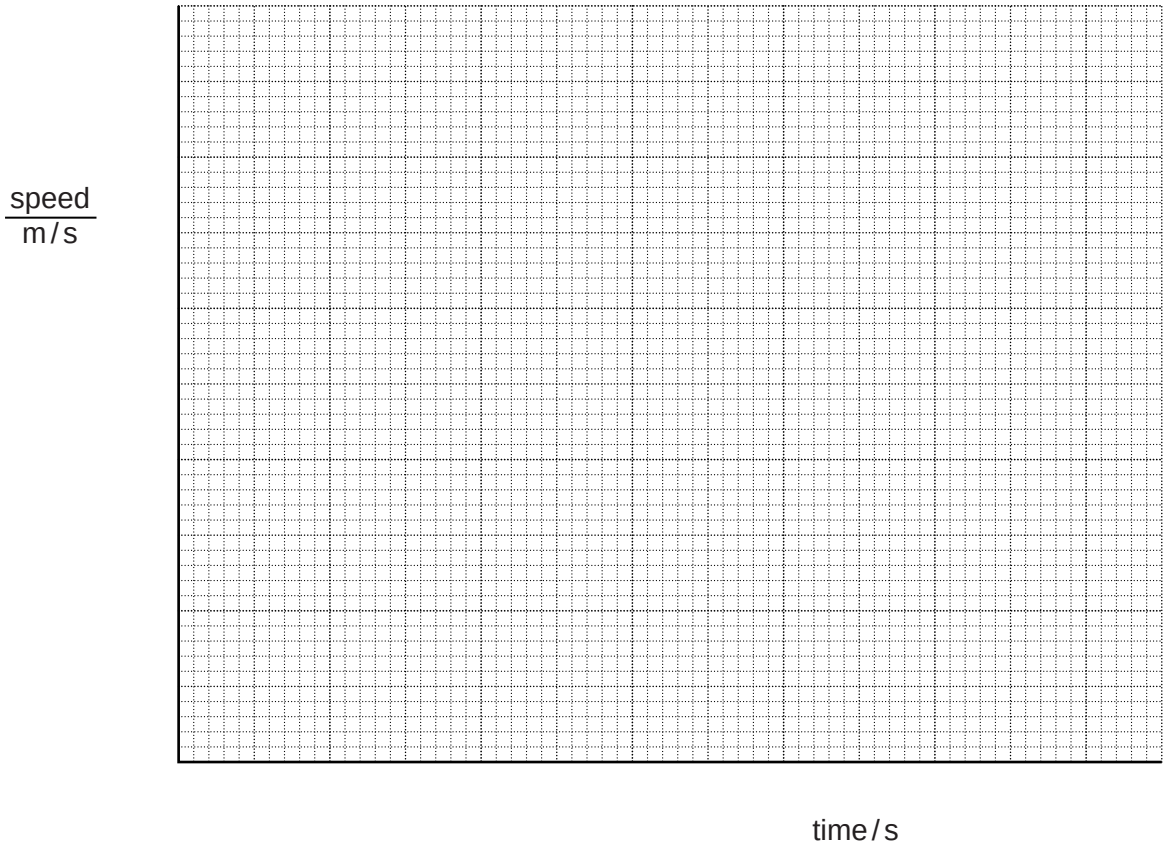

Fig. 4.1 [4]

(b) Using the graph,

(i) calculate the acceleration during the first 30 s,

acceleration = ... [2]

(ii) determine the height reached by the rocket after 120 s.

height reached = ...[2]

[Total: 8]

5 **(a)** Fig. 5.1 shows an aerial view of wavefronts passing from the open sea into an outer harbour.

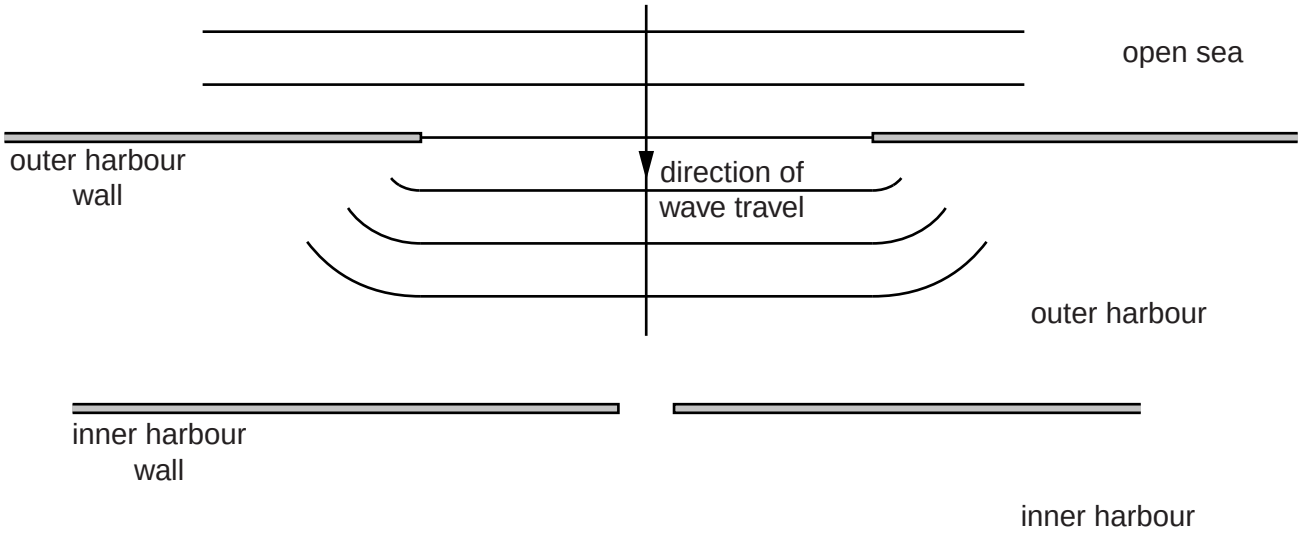

Fig. 5.1

(i) The wavefronts in the outer harbour are curving at their ends.

Name the process that is occurring at the entrance to the harbour.

.....[1]

(ii) On Fig. 5.1, carefully complete the wave pattern as the wavefronts progress through the outer harbour and into the inner harbour. Show the rest of the wave pattern in the outer harbour and three wavefronts in the inner harbour. [3]

(b) Fig. 5.2 shows an aerial view of wavefronts in deep water approaching a region of shallow water where they travel more slowly.

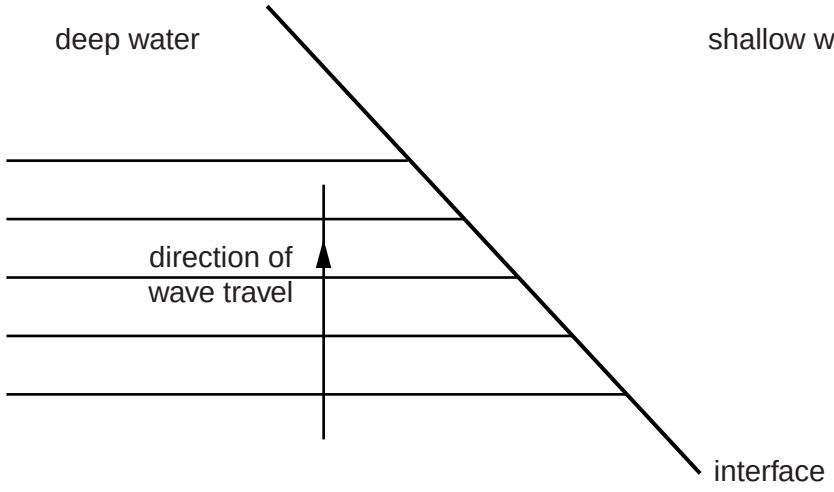

Fig. 5.2

(i) Name the process that occurs as the wavefronts pass from deep to shallow water.

.....[1]

(ii) Complete Fig. 5.2 to show possible positions of the five wavefronts in the shallow water. [2]

6 **(a)** Fig. 6.1 shows the results of an experiment to find the critical angle **in the** circular glass block.

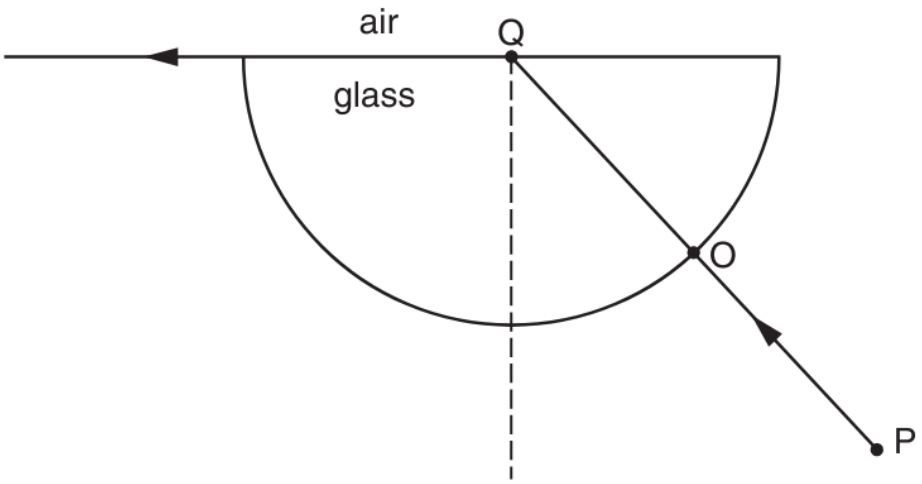

Fig. 6.1

The ray of light PO hits the glass at O at an angle of incidence of 0°.
Q is the centre of the straight side of the block.

(i) Measure the critical angle of the glass from Fig. 6.1.

critical angle = ...

(ii) Explain what is meant by the *critical angle* of the light in the glass.

.....

.....

.....

(b) Fig. 6.2 shows another ray passing through the same block.

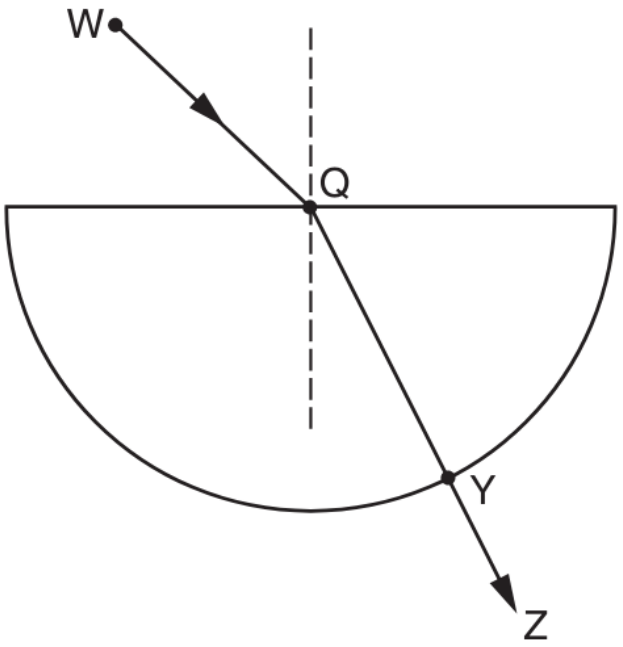

Fig. 6.2

The speed of the light between W and Q is 3.0×10^8 m/s. The speed of the light between Q and Y is 2.0×10^8 m/s.

(i) State the speed of the light between Y and Z.

speed = ...

(ii) Write down an expression, in terms of the speeds of the light, that may be used to find the refractive index of the glass. Determine the value of the refractive index.

refractive index = ...

(iii) Explain why there is no change of direction of ray QY as it passes out of the glass.

.....

(iv) What happens to the wavelength of the light as it passes out of the glass?

.....

7 Fig 7.1 shows an arrangement that could be used for making an electromagnetic permanent magnet

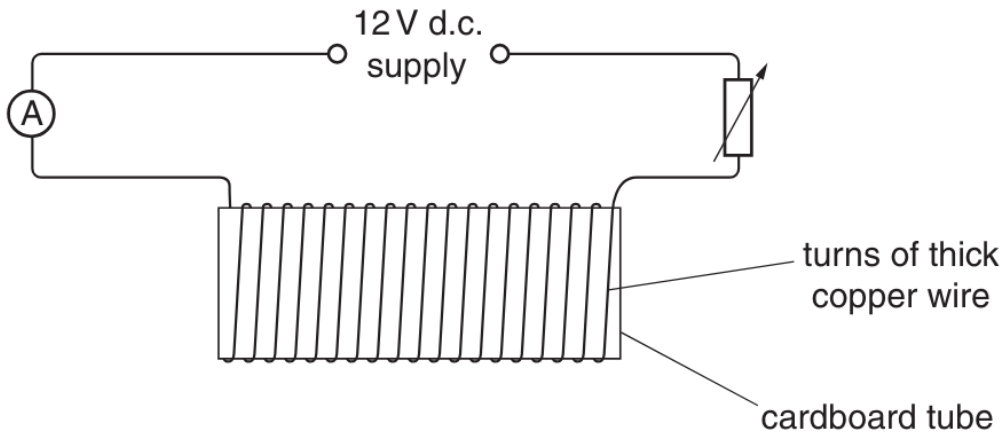

Fig. 7.1

Two bars of the same size are also available, one made of iron and the other of steel.

(a) (i) State which bar should be used to make a permanent magnet.

.....

(ii) Describe how the apparatus would be used to make a permanent magnet.

.....

.....

.....

(iii) Suggest one reason why the circuit contains an ammeter and a variable resistor.

.....

.....

(b) During the making of a permanent magnet, the ammeter reads a steady current throughout the 5.0 s that the current switched on. The voltage is 12V supply.

Calculate

(i) the total circuit resistance,

resistance = ...

(ii) the power of the supply,

power = ...

(iii) the energy supplied during the 5.0 s.

energy = ...

(c) The potential difference across the variable resistor is 7.0 V and that across the ammeter is zero.

(i) Calculate the potential difference across the magnetising coil.

potential difference = ...

(ii) State the general principle used in making this calculation.

.....

.....

7 The solar charger shown in Fig. 8.1 is used to charge portable electronic devices in a part of the world without any other electricity supply.

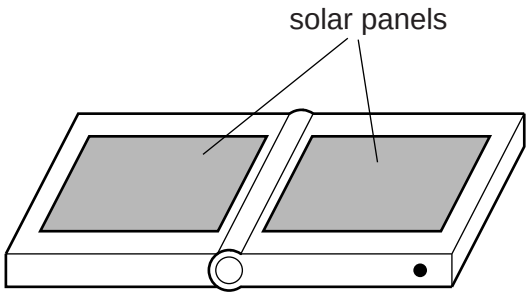

Fig. 8.1

The dimensions of each of the solar panels are 0.25 m × 0.20 m. The solar power incident on 1.0 m^2 of flat ground in this part of the world is 260 W.

(a) Calculate the total solar power incident on the two panels of the charger.

solar power = ... [2]

(b) The output of the charger is 0.95 A at 20 V.

Calculate the efficiency of the charger.

efficiency = ...[3]

(c) Three devices A, B and C are connected together and then connected to the 20V charger. The potential difference (p.d.) across A is measured as 14V, across B it is 14V and across C it is 6V.

Complete Fig. 7.2 to show the arrangement of the devices connected to the charger. Draw devices B and C as similar boxes to the box shown for device A.

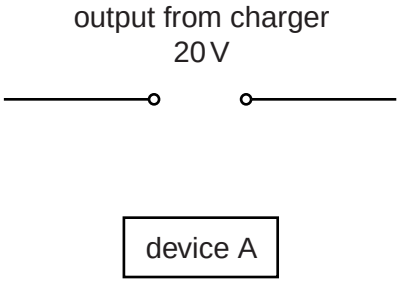

Fig. 8.2

(d) Two other devices, D and E, have resistances of 20Ω and 30Ω.

Calculate the total resistance of D and E when they are connected in parallel.

total resistance = ...[2]

9 There is an alternating current in the primary coil of the transformer shown in Fig. 9.1.

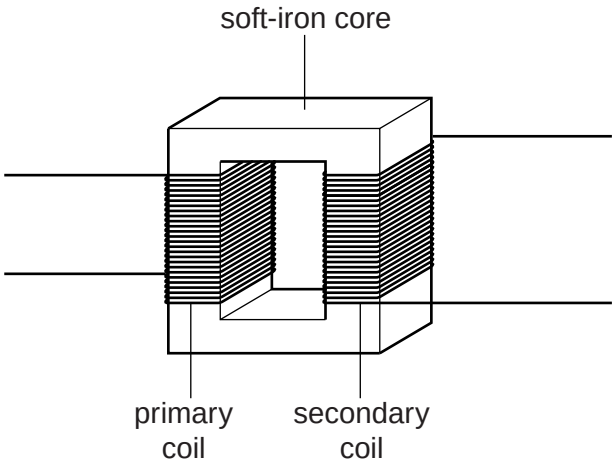

Fig. 9.1

(a) Tick **one** box in each line of the table that best describes the magnetic field in the core and the magnetic field in the secondary coil.

	magnetic field			
	continually increasing and decreasing	continually increasing	continually decreasing	zero
soft-iron core				
secondary coil				

[2]

(b) State and explain the effect on the output from the secondary coil of

(i) increasing the voltage across the primary coil,

output .....

explanation .....

.....

.....

.....

[2]

(ii) replacing the alternating current in the primary coil with direct current from a battery.

output .....

explanation .....

.....

.....

.....

[2]

[Total: 6]

10 There are two stable, naturally occurring isotopes of hydrogen.

Common hydrogen (hydrogen-1) has a proton number of 1 and a nucleon number of 1.

Hydrogen-2 (deuterium) has a nucleon number of 2.

There is also a radioactive isotope of hydrogen called tritium (hydrogen-3), with a nucleon number of 3.

(a) Complete the table for neutral atoms of these isotopes.

	hydrogen-1	hydrogen-2 (deuterium)	hydrogen-3 (tritium)
number of protons			
number of neutrons			
number of electrons			

[3]

(b) Two samples of tritium are stored in aluminium containers of different thickness.

Sample 1 is in a container of thickness 0.5 mm and radiation can be detected coming through the container.

Sample 2 is in a container of thickness 5 mm and no radiation comes through.

(i) State the type of radiation coming through the container of Sample 1.

.....[1]

(ii) Explain your answer to **(b)(i)**.

.....

.....

.....

.....[2]

(c) Under conditions of extremely high temperature and pressure, as in the interior of the Sun, hydrogen nuclei can join together.

(i) Name this process.

.....[1]

(ii) State whether energy is released, absorbed or neither released nor absorbed during this reaction.

.....[1]

(d) When a nucleus of a certain isotope of uranium is bombarded by a suitable neutron, it splits into two smaller nuclei and energy is released.

Name this process.

.....[1]

[Total: 9]

Turn over for Question 11

11 Fig. 11.1 shows the main components of a cathode-ray oscilloscope.

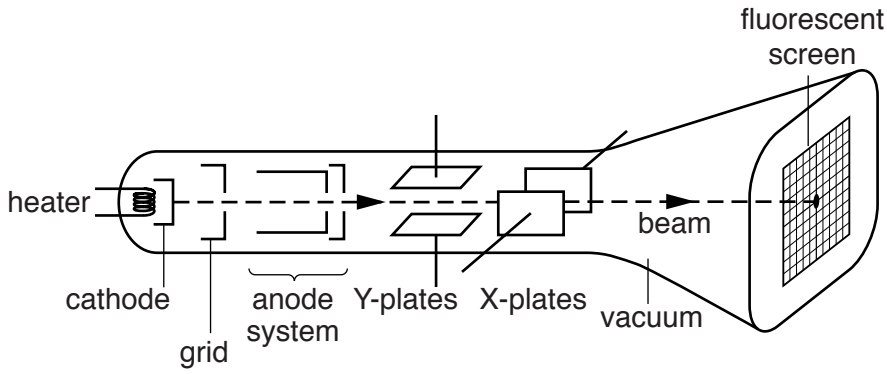

Fig. 11.1

(a) **(i)** Name the particles that are in the beam.

.....[1]

(ii) Explain the purpose of the heater.

.....[1]

(iii) Explain why there is a vacuum in the tube.

.....

.....[1]

(b) When no potential difference (p.d.) is applied across either the X-plates or the Y-plates, a spot is seen in the centre of the fluorescent screen.

Describe the p.d.s applied to the X-plates and to the Y-plates when the spot moves up and down in the centre of the screen.

X-plates .....

Y-plates .....
[2]

[Total: 5]