UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

5638748962

PHYSICS **0625/32**

Paper 3 Extended **May/June 2013**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1 kg to be 10 N (i.e. acceleration of free fall = 10 m / s^2).

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.

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1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
Total	

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

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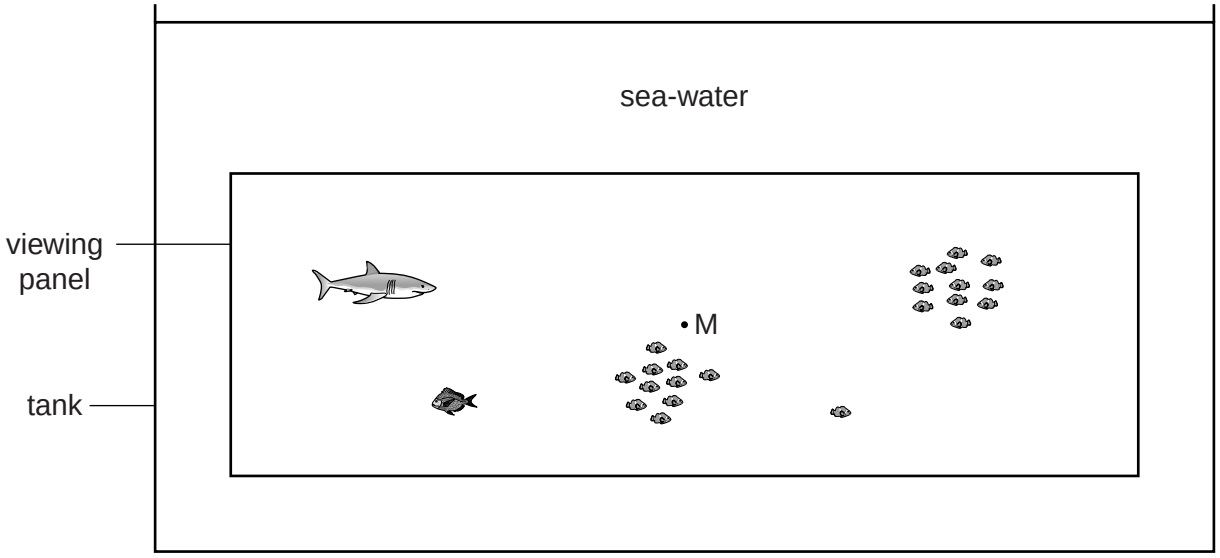


Fig. 1.1 (not to scale)

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.

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force = ... [2]

[Total: 7]

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

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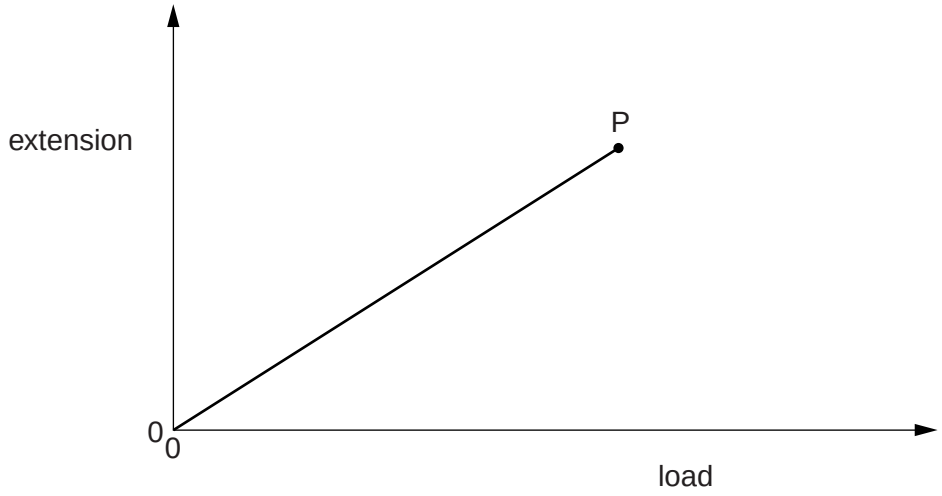


Fig. 2.1

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]

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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]

[Total: 6]

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

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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.

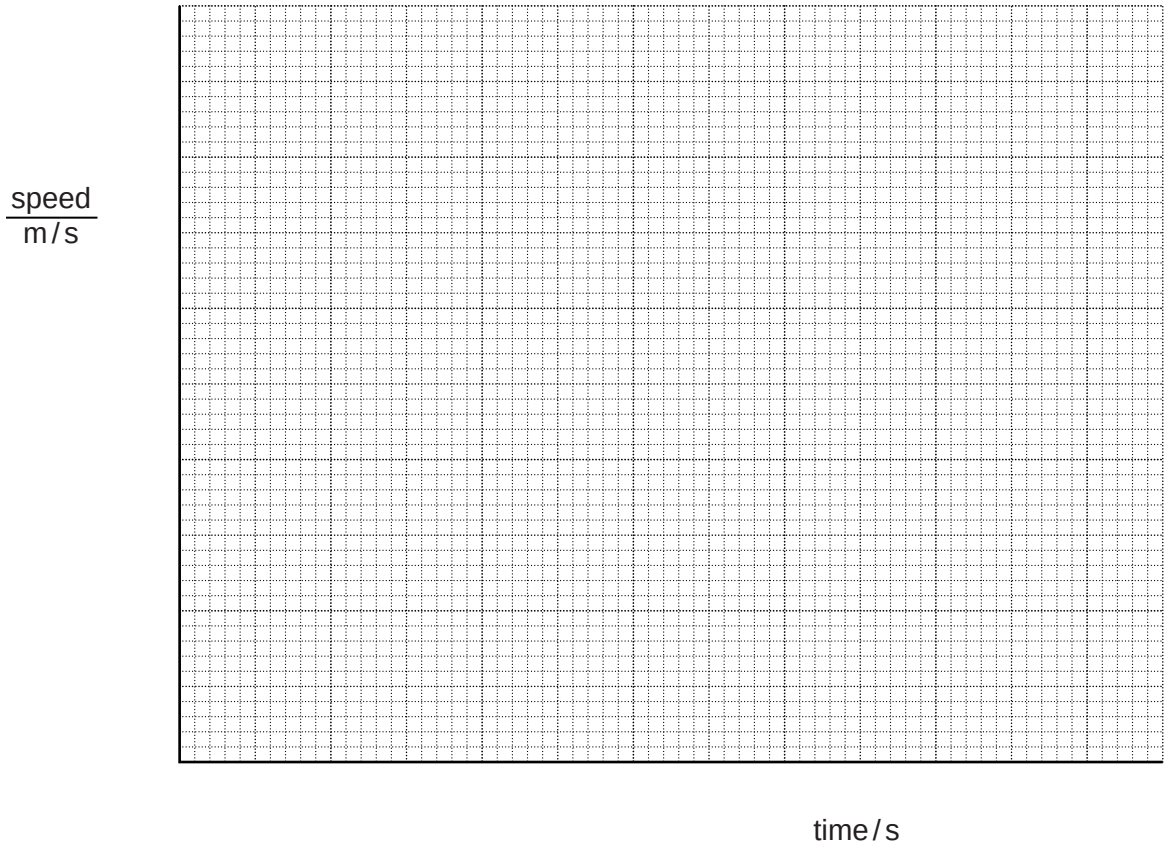


Fig. 4.1 [4]

(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.

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height reached = ...[2]

[Total: 8]

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

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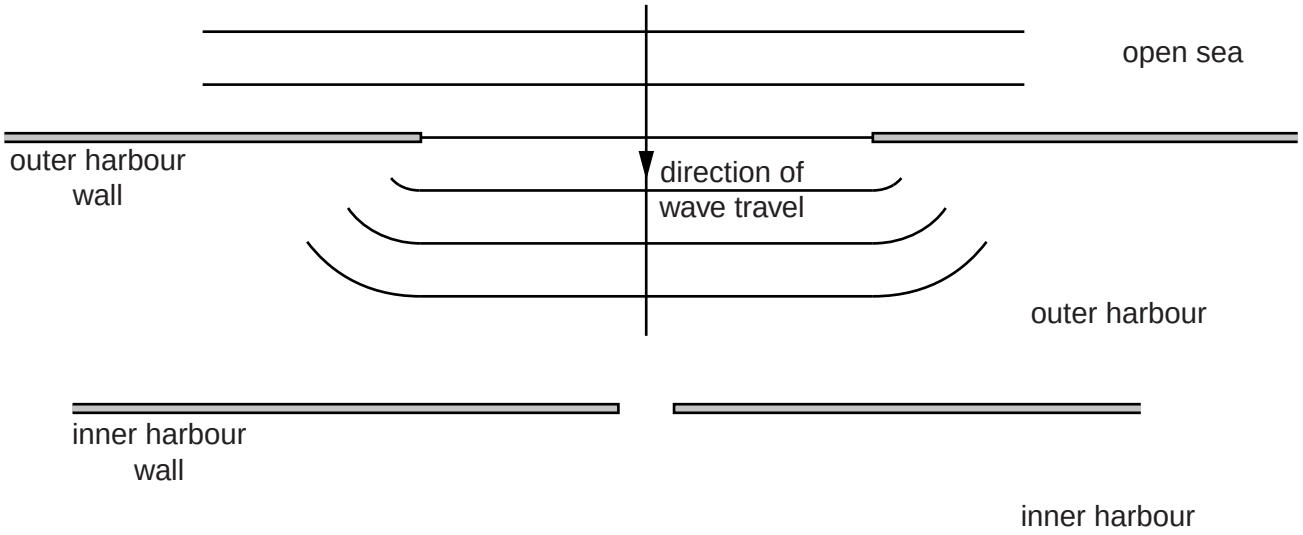


Fig. 5.1

(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]

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

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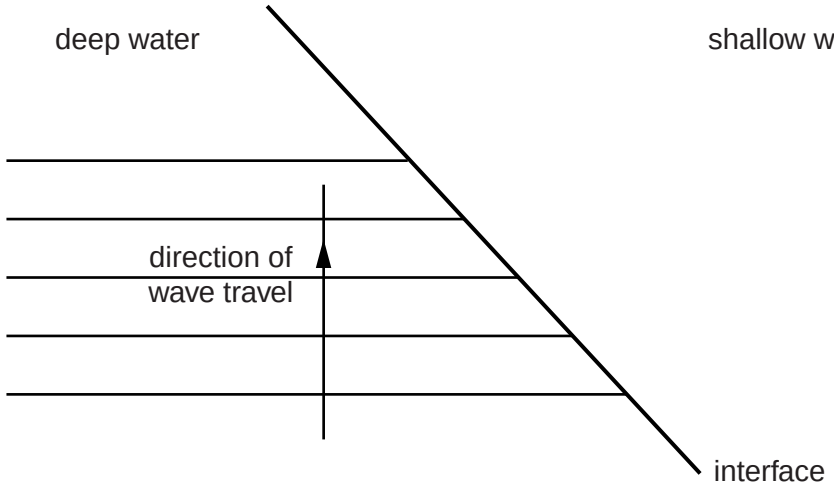


Fig. 5.2

(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]

[Total: 7]

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6 **(a)** Fig. 6.1 shows two rays from a point object P incident on a water surface.

An observer sees the image of P produced by reflection at the surface of the water.

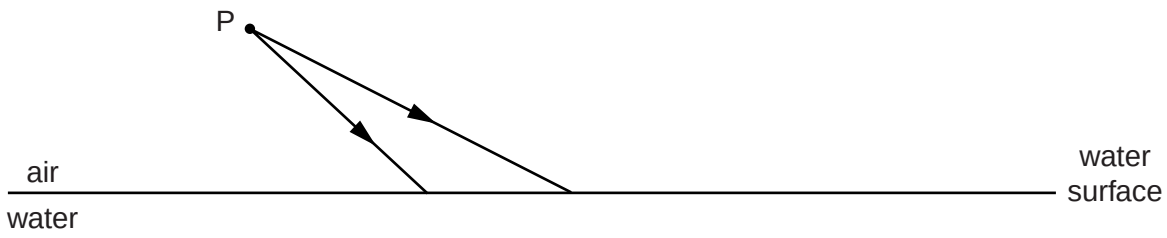


Fig. 6.1

On Fig. 6.1, draw the reflected rays and complete the diagram to locate the position of the image. Label the position of the image I. [2]

(b) Fig. 6.2 shows two rays from a point object Q incident on another water surface.

An observer sees the image of Q produced by refraction at the surface of the water.

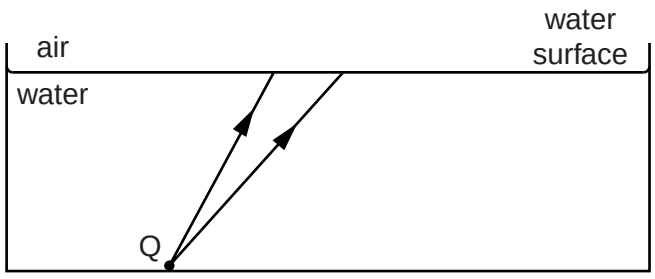


Fig. 6.2

On Fig. 6.2, draw possible refracted rays and complete the diagram to locate a possible position of the image. Label the position of the image J.
You do not need to calculate any angles. [2]

(c) The refractive index of water is 1.33.

Calculate the critical angle.

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critical angle = ...[2]

(d) Describe, with a diagram, a medical use of optical fibres.

.....

.....

.....

.....

.....[3]

[Total: 9]

7 The solar charger shown in Fig. 7.1 is used to charge portable electronic devices in a part of the world without any other electricity supply.

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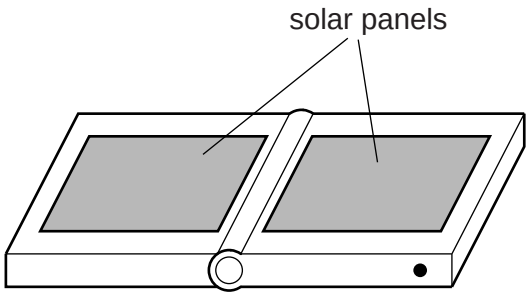


Fig. 7.1

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]

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(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.

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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.

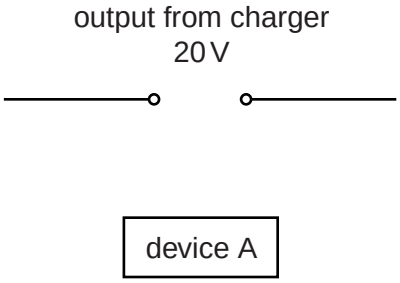


Fig. 7.2 [2]

(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]

[Total: 9]

8 Fig. 8.1 shows a vertical current-carrying wire passing through a card at point X.

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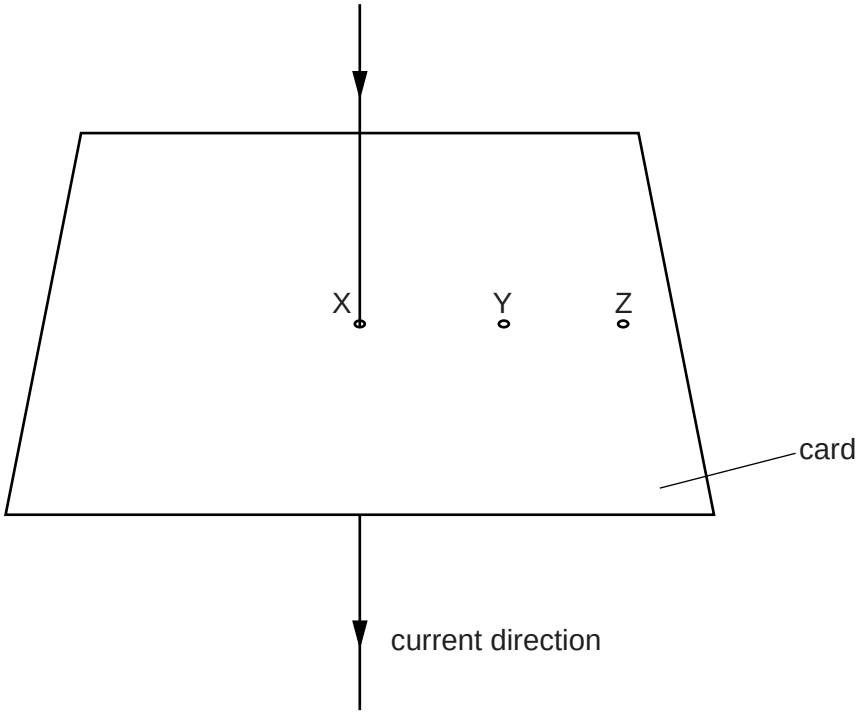


Fig. 8.1

(a) On Fig. 8.1, sketch on the card the pattern of the magnetic field produced by the current in the wire. The detail of your sketch should suggest the variation in the strength of the field. Show the direction of the field with arrows. [3]

(b) Using your knowledge of investigating the magnetic field around a bar magnet, suggest an experiment or experiments to confirm that you have drawn the correct pattern and direction in **(a)**.

.....

.....

.....

.....

.....

.....

.....

.....

[4]

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(c) A second current-carrying wire is inserted vertically through the card at Y.

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Suggest why there is now a force on the wire at X.

.....

.....

.....

.....[2]

(d) The wire at Y is moved to Z. It still carries the same current.

Tick the appropriate box to indicate whether the force on the wire at X is now smaller, greater or the same.

smaller ☐

greater ☐

same ☐ [1]

[Total: 10]

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

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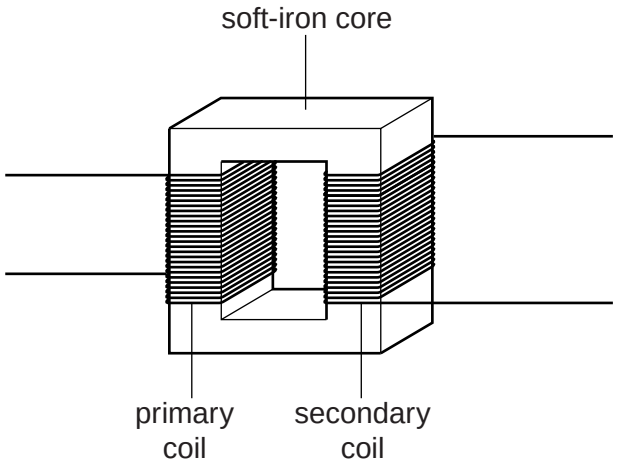


Fig. 9.1

(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.

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output .....

explanation .....

.....

.....

.....

[2]

[Total: 6]

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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]

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(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.

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Name this process.

.....[1]

[Total: 9]

Turn over for Question 11

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

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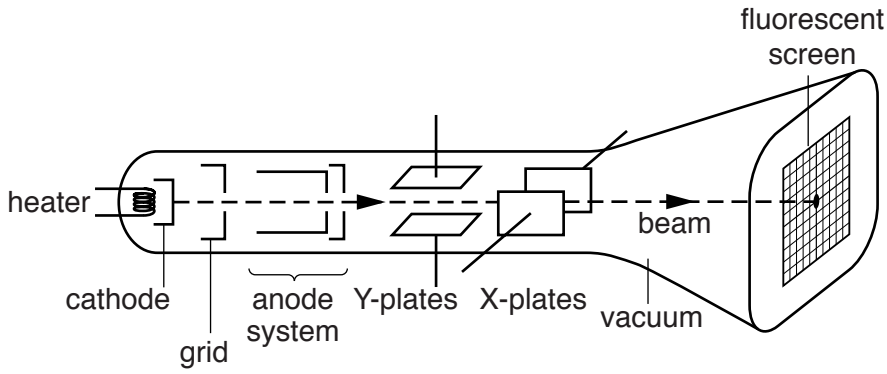


Fig. 11.1

(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]

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