Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

9171762934

PHYSICS **0625/22**

Paper 2 Core **October/November 2015**

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 an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, 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.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **18** printed pages and **2** blank pages.

DC (NF/CGW) 96017/4

CAMBRIDGE International Examinations

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1 A student uses a rule to measure a thin piece of wire as shown in Fig. 1.1.

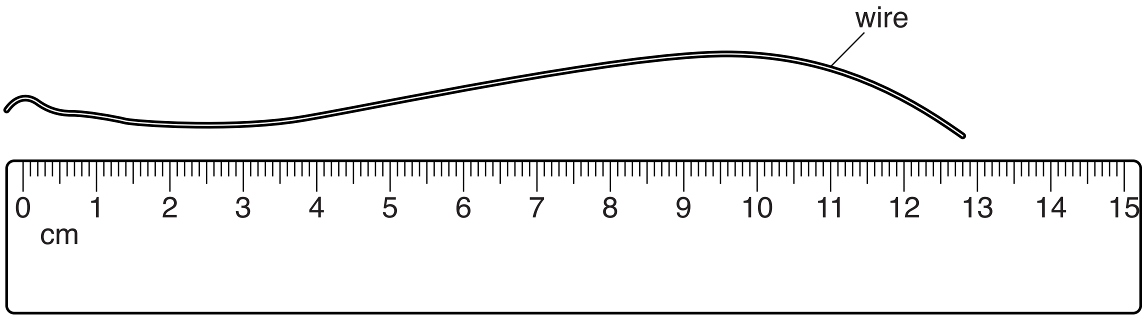

Fig. 1.1

The student records the length of the wire as 12.8 cm.

(a) State two errors in the student's measurement of the length of wire.

1. ....

....

2. ....

.... [2]

(b) The student is asked to measure the thickness of the wire using the same ruler. The student does this by bending a short length of the wire and measuring distance *x* as shown in Fig. 1.2.

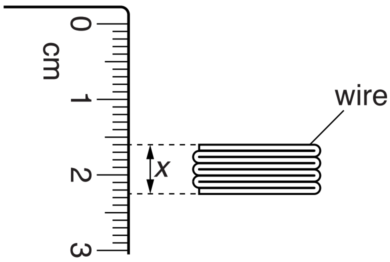

Fig. 1.2

(i) Use the ruler in Fig. 1.2 to determine the distance *x*.

distance *x* = ... cm [1]

(ii) Calculate the average thickness of the wire, **in mm**. Give your answer correct to two significant figures.

average thickness of wire = ... mm [3]

[Total: 6]

2 Two cyclists, A and B, are riding their bicycles on a flat and straight road.

(a) Fig. 2.1 shows a speed-time graph for the first part of their journey.

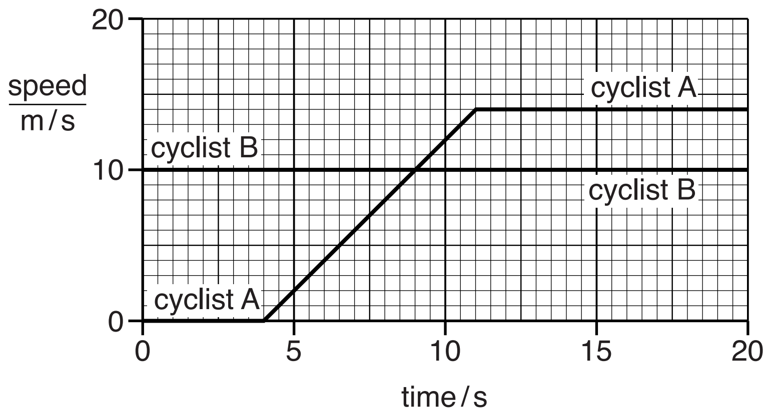

Fig. 2.1

(i) State the speed of cyclist B.

speed = ... m / s [1]

(ii) Calculate the distance travelled by cyclist B during the first 20 s.

distance travelled = ... m [2]

(iii) Determine the time for which cyclist A was accelerating.

time = ... s [1]

(b) Fig. 2.2 shows the horizontal forces acting on cyclist A and his bicycle at one instant.

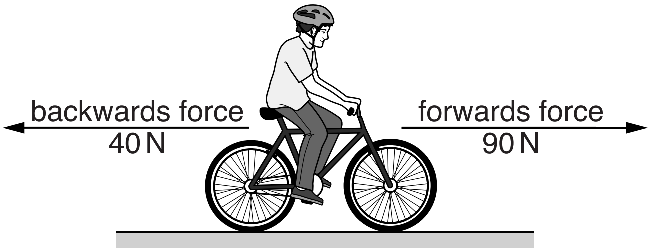

Fig. 2.2

(i) Calculate the resultant force acting on cyclist A and his bicycle.

force = ... N

direction = ...
[2]

(ii) Describe the effect of this resultant force on the cyclist's motion.

.... [1]

(iii) At time t = 20 s, the backwards force on the cyclist increases suddenly to 100 N. The forwards force remains the same at 90 N.

State the immediate effect on the cyclist's motion.

.... [1]

[Total: 8]

3 The following statements are about solids, liquids and gases.

Complete each of the statements by adding in the spaces the words **decreases**, **increases** or **does not change**.

(a) When a liquid evaporates, the more energetic molecules escape from the surface and the temperature of the remaining liquid .... [1]

(b) When the volume of a gas is decreased at constant temperature, the pressure of the gas .... [1]

(c) When the temperature of a gas is increased at constant volume, the pressure of the gas .... [1]

(d) When a metal block is heated, the volume of the block ...., the mass of the block .... and the density of the block .... [3]

[Total: 6]

4 Fig. 4.1 shows a farmer driving a tractor that has a diesel engine.

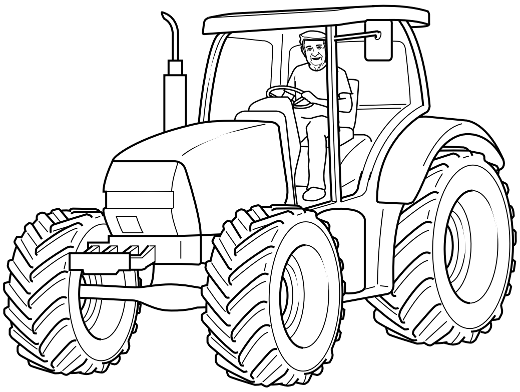

Fig. 4.1

(a) **(i)** State the unit of energy.

.... [1]

(ii) State the useful energy obtained from the diesel engine as the tractor starts to move.

.... [1]

(iii) State two other forms of energy output from the diesel engine.

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

(iv) Complete the following sentence by ticking **one** box.

Modern diesel engines waste less energy than older diesel engines. This means modern diesel engines are

☐ faster.

☐ more efficient.

☐ more reliable.

[1]

(b) The tractor in Fig. 4.1 is a lot heavier than a car. A car sinks into soft ground. The tractor does not sink.

Explain why this is.

....

....

.... [3]

[Total: 8]

5 A bimetallic strip is made from two metals, brass and invar, stuck together. A student clamps the bimetallic strip, as shown in Fig. 5.1, and heats the end.

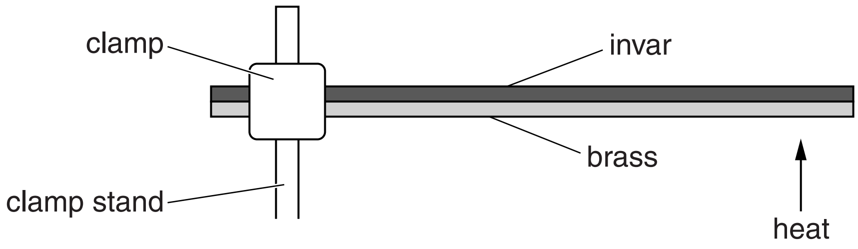

Fig. 5.1

When the bimetallic strip is heated, the brass expands more than the invar. The bimetallic strip bends.

(a) On Fig. 5.1, sketch the position of the strip after it has been heated. [1]

(b) (i) Suggest how the bimetallic strip may be used to measure temperature. Include the idea of fixed points.

....

....

....

....

....

.... [3]

(ii) Suggest one reason why, in practice, a thermometer using this bimetallic strip would be difficult to use.

....

.... [1]

[Total: 5]

6 Fig. 6.1 shows a piece of apparatus used to show the transfer of thermal energy in liquids.

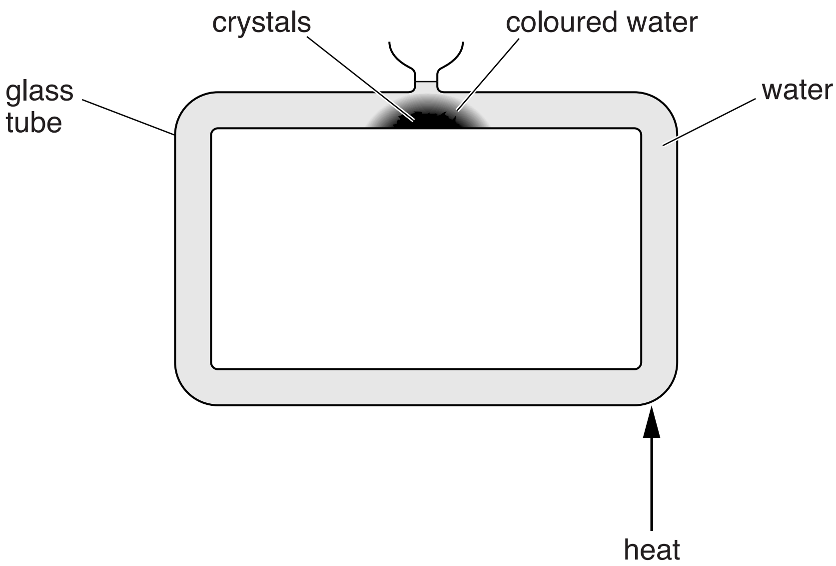

Fig. 6.1

The glass tube is filled with cold water. Crystals that dissolve slowly are inserted into the bottom of the tube. The water around the crystals becomes coloured.

When the glass tube is heated as shown in Fig. 6.1, the coloured water moves.

(a) **(i)** On Fig. 6.1, draw arrows indicating the direction of movement of the water in each section of the tube. [1]

(ii) State the name of this method of thermal energy transfer in the water.

.... [1]

(b) Explain why the water moves in this way.

....

....

....

....

....

.... [4]

[Total: 6]

7 A battle re-enactment enables observers to see and hear an old cannon being fired.

Fig. 7.1 shows the battle site and the distant cliffs.

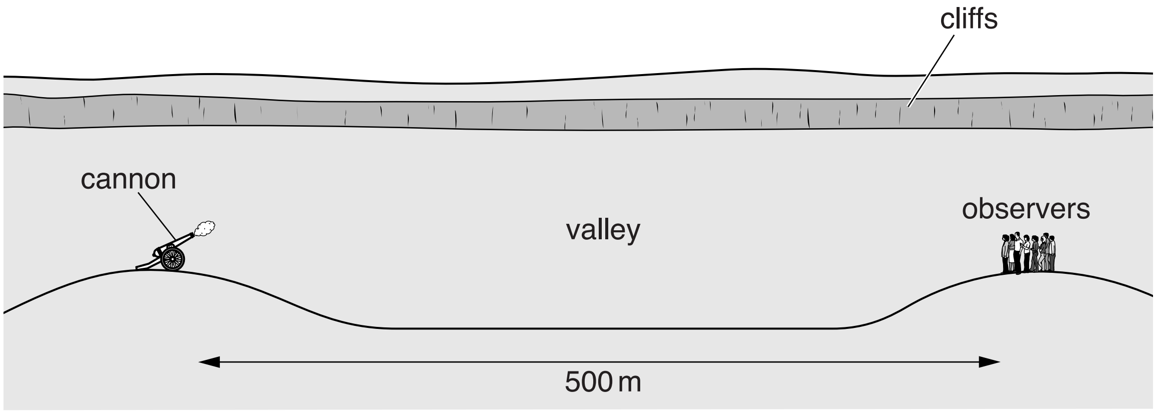

Fig. 7.1 (not to scale)

The cannon is fired. Observers see the smoke and then hear the bang.

(a) (i) Explain why there is a short delay between seeing the smoke and hearing the bang of the cannon.

....

....

.... [2]

(ii) An observer notices that, after the cannon is fired, she hears a loud bang and then a quieter bang a short time later.

Tick one box to identify the reason for the second bang.

☐ diffraction of the sound in the valley

☐ dispersion of the sound in the valley

☐ reflection of the sound from the cliff

☐ refraction of the sound from the cliff [1]

(b) Another observer is standing 500 m away from the cannon. He uses a stopwatch to measure the time delay between seeing the smoke and hearing the first bang. His timings are shown in the table.

measurement	time delay / s
1	1.9
2	1.5
3	1.3
4	1.4
5	1.7

Use the measurements in the table to calculate an accurate value for the speed of the sound produced by the cannon.

speed of sound = ... m / s [4]

[Total: 7]

8 Fig. 8.1 represents an object positioned on the principal axis of a thin lens.

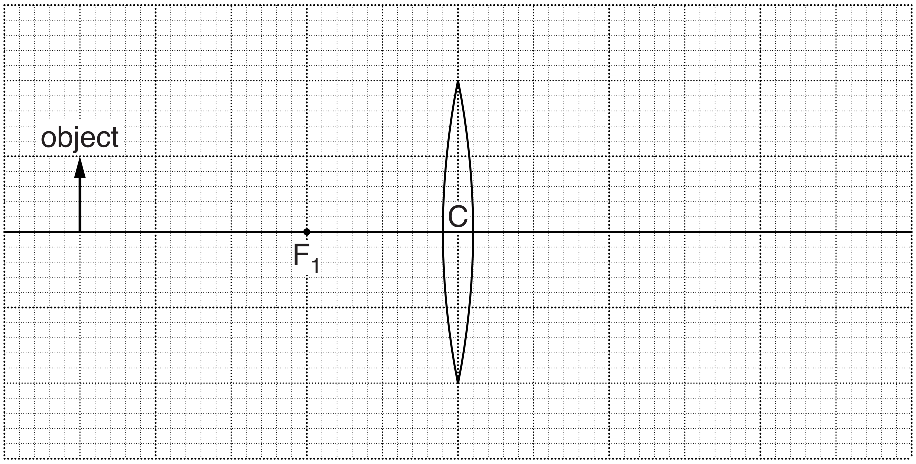

Fig. 8.1

The principal focus on the left hand side of the lens is labelled F_1.

(a) **(i)** On Fig. 8.1, clearly mark the position of the principal focus on the right hand side of the lens and label it F_2.

(ii) On Fig. 8.1, carefully draw a ray from the top of the object that passes through the centre C of the lens. Continue the path of the ray to the edge of the graph paper.

(iii) On Fig. 8.1, carefully draw a second ray from the top of the object that passes through a principal focus. Continue the path of the ray to the edge of the graph paper.

(iv) On Fig. 8.1, carefully draw the position of the image produced.

[4]

(b) Which of the following words describe the image produced? Tick **all** that are correct.

☐ diminished

☐ enlarged

☐ inverted

☐ upright

☐ real

[3]

[Total: 7]

9 A child has an electric car racing game. The game operates from a 120V a.c. supply.

(a) On Fig. 9.1, sketch a graph showing how voltage output varies with time for an a.c. supply.

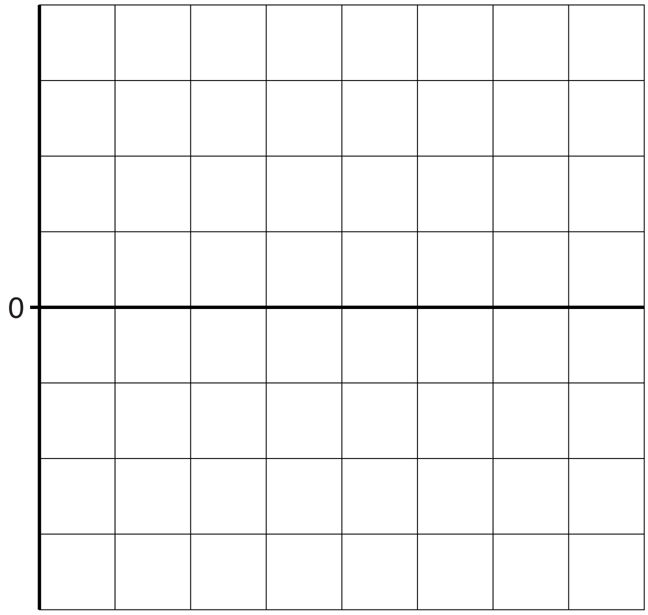

Fig. 9.1 [1]

(b) (i) A device is used to change the 120V supply to the 10V needed by the toy cars.

State the name of the device.

.... [1]

(ii) The device used in part **(b)(i)** has a primary coil consisting of 4800 turns.

Calculate the number of turns on the secondary coil.

turns on secondary coil = ... [3]

[Total: 5]

10 A coil is wound on an iron core. A student places a permanent bar magnet near the coil, as shown in Fig. 10.1.

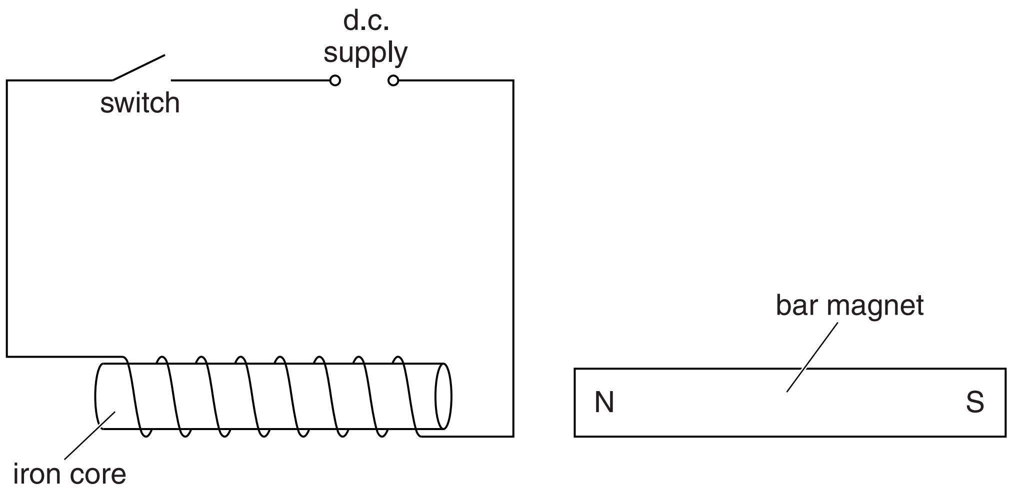

Fig. 10.1

When the switch is closed, the bar magnet moves away from the coil.

(a) (i) Explain why the magnet moves away.

....

....

.... [2]

(ii) The iron core is replaced with a new core. When the current is switched on, this new core becomes a permanent magnet.

State the name of the material used for the new core.

.... [1]

(b) Fig. 10.2 shows apparatus used to identify the pattern and direction of field lines around a bar magnet. The bar magnet is placed on a piece of card. A small pivoted magnet, with N-pole and S-pole as shown in Fig. 10.3, is placed near the magnet.

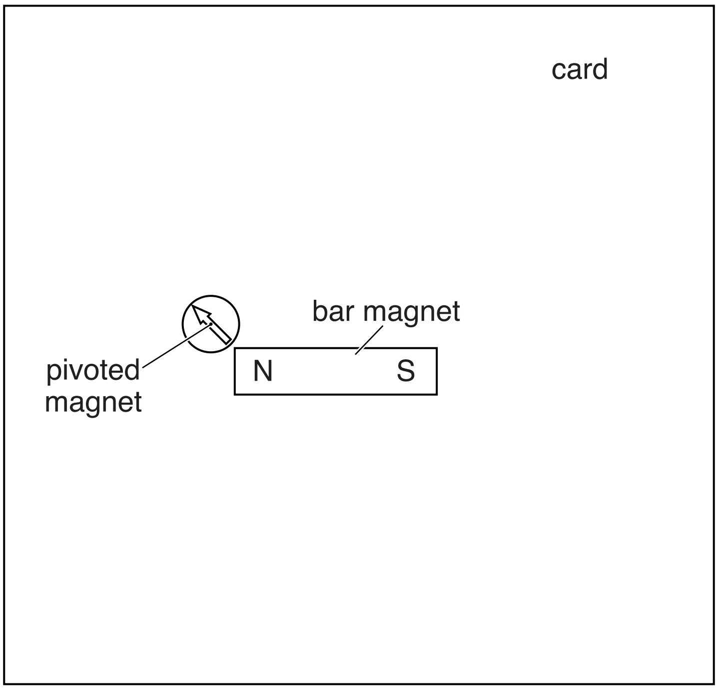

Fig. 10.2

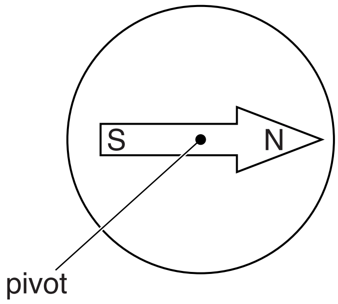

Fig. 10.3

Starting from the arrangement shown in Fig. 10.2, describe how the apparatus is used to produce a pattern of the field lines around the bar magnet.

....

....

....

....

....

.... [3]

[Total: 6]

11 Hair dryers are used by many people. Fig. 11.1 shows an example of a hair dryer.

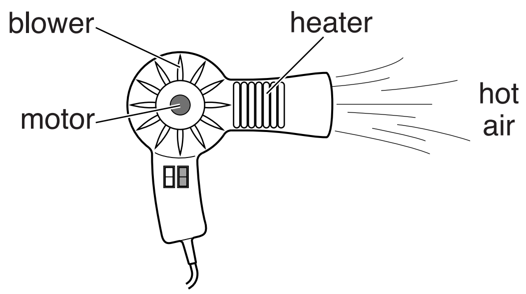

Fig. 11.1

The hair dryer has two switches, one for the heater, the other for the motor that operates the blower. Fig. 11.2 shows a simplified circuit diagram for the hair dryer.

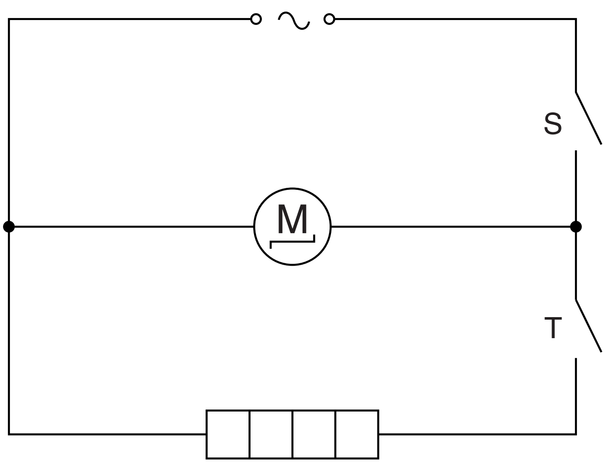

Fig. 11.2

(a) Complete the table identifying which of the circuit's components, if any, is operating.

switch S	switch T	component or components operating
closed	closed	
closed	open	
open	closed	
open	open	

[3]

(b) State the equation that links potential difference (p.d.), current and resistance.

.... [1]

(c) The current in the heater is 2.0 A when the potential difference across the heater is 250 V.

Calculate the resistance of the heater.

resistance = ... Ω [2]

(d) The hair dryer circuit contains a fuse.

(i) On Fig. 11.2, draw the symbol for a fuse between the power supply and switch S. [1]

(ii) State what happens if a fault develops in the hair dryer, causing a large current in the circuit.

....

....

.... [2]

[Total: 9]

12 A smoke detector contains a source of ionising radiation.

(a) Different types of ionising radiation have different properties, as shown in the table.

name	nature	charge
α-particle		2+
β-particle	an electron	
γ-ray	electromagnetic wave	zero

Complete the table by filling in the two blank spaces. [2]

(b) A smoke detector is placed in a building to warn people if there is a fire.

(i) Fig. 12.1 is a diagram of a smoke detector.

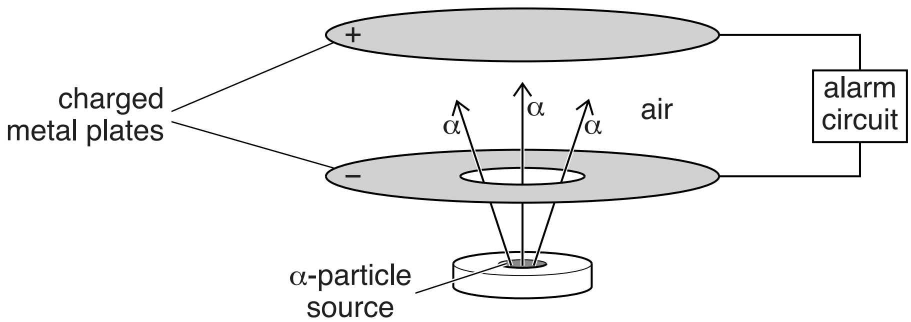

Fig. 12.1

The α-particles ionise the air inside the smoke detector. This results in a small current between the charged metal plates.

When smoke enters the smoke detector the current decreases and an alarm sounds.

Explain why α-particles are used rather than β-particles or γ-rays.

....

....

....

.... [2]

(ii) Suggest which of the following times would be a suitable half-life for the source of α-particles used in the smoke detector. Tick **one** box.

☐ 100 minutes

☐ 100 hours

☐ 100 days

☐ 100 years [1]

(c) The radioactive source in the smoke detector contains americium-241.

An americium-241 nucleus emits an α-particle to become a neptunium nucleus.

Complete the equation to show the nucleon number and proton number of neptunium.

$$^{241}_{95}\mathrm{Am} \longrightarrow \,^{\dots\dots\dots}_{\dots\dots\dots}\mathrm{Np} + \,^{4}_{2}\alpha$$

[2]

[Total: 7]

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