Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

PHYSICS **0625/32**

Paper 3 Theory (Core) **February/March 2020**

1 hour 15 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number 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.
- Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages. Blank pages are indicated.

[Turn over

1 **(a)** A student places 8 similar coins in a pile, as shown in Fig. 1.1.

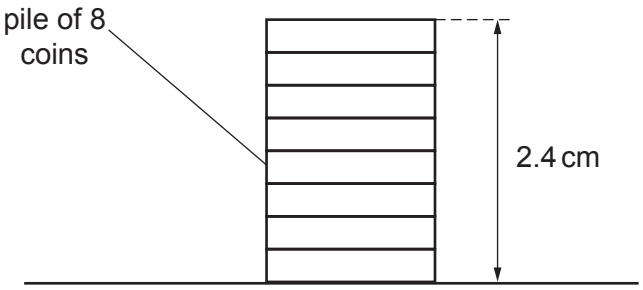

Fig. 1.1 (not to scale)

The height of the pile of coins is 2.4 cm.

Calculate the average thickness of one coin.

average thickness = ... cm [2]

(b) Fig. 1.2 shows the pile of coins, a measuring cylinder and a beaker containing some water.

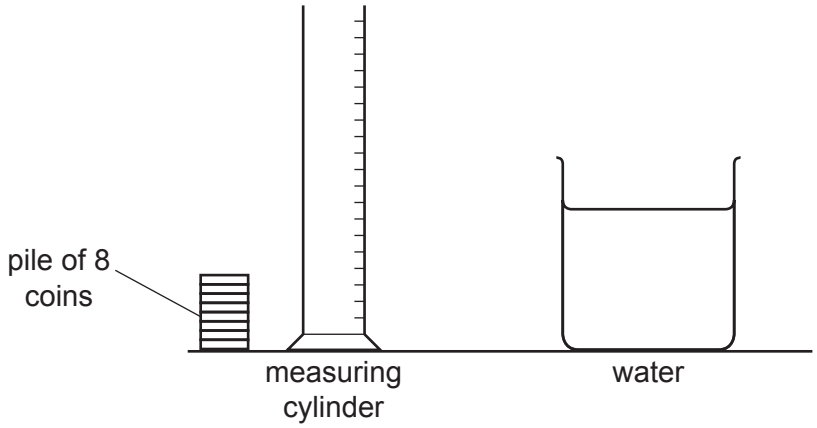

Fig. 1.2 (not to scale)

Describe how the student can measure the volume of **one** of the coins using the set-up shown in Fig. 1.2.

.....

.....

.....

..... [4]

[Total: 6]

2 A 50 cm rule is balanced at its mid-point. A force of 8.0 N acts at a distance of 10 cm from one end of the rule.

Fig. 2.1 shows the arrangement.

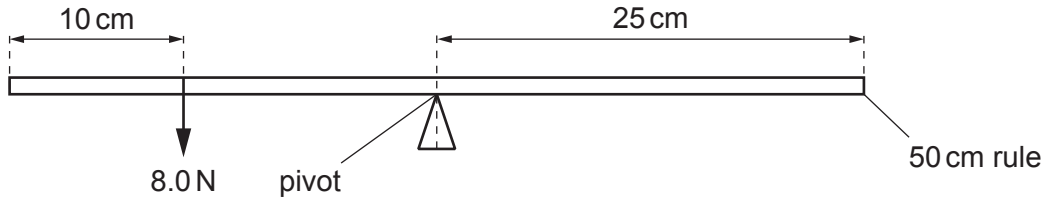

Fig. 2.1

(a) Calculate the moment of the 8.0 N force about the pivot. Give the unit.

moment = ...

unit = ...
[5]

(b) Another force acts at a point 10 cm from the pivot. It makes the rule balance.

On Fig. 2.1, draw an arrow to show the position and direction of this force. [2]

[Total: 7]

[Turn over

3 A student drops a ball from a high window.

(a) The mass of the ball is 0.12 kg.

Calculate the weight of the ball.

weight = ... N [3]

(b) Fig. 3.1 shows the speed of the ball while it is falling. The points **S**, **T**, **U**, **V** and **W** are shown on the graph.

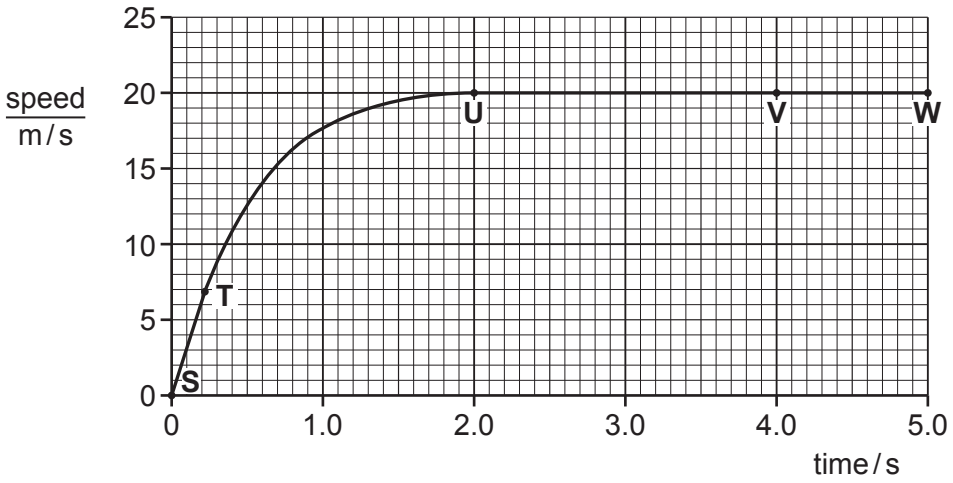

Fig. 3.1

Draw **one** line from each section of the graph to the correct description of the motion.

One has been drawn for you.

section of graph	**description of motion**
	at rest
S – T	
	decreasing acceleration
T – U	constant acceleration
	moving with constant speed
U – V	
	slowing down

[2]

(c) Determine the distance fallen by the ball in section **U – V** of the graph.

distance = ... m [3]

(d) State the distance fallen by the ball in section **V – W** of the graph.

distance = ... m [1]

[Total: 9]

4 Fig. 4.1 shows an electric circuit.

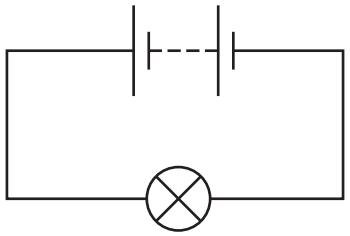

Fig. 4.1

An electric current transfers energy from the battery to the filament lamp.

(a) State the **two** forms of energy emitted by the filament lamp.

1. .....

2. .....
[2]

(b) State which form of energy in the battery is decreasing.

..... [1]

(c) Explain how the principle of conservation of energy applies to this circuit.

.....

.....

..... [1]

[Total: 4]

5 Fig. 5.1 shows a wind turbine.

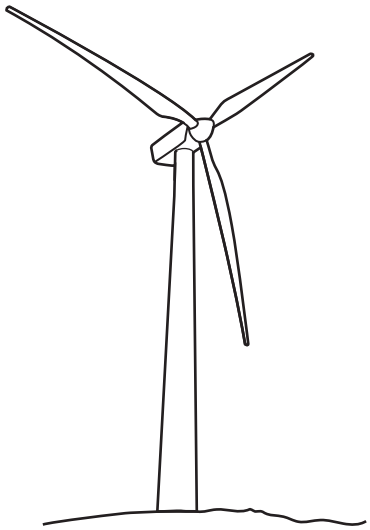

Fig. 5.1

(a) Describe how the wind turbine produces electrical energy.

.....

.....

.....

..... [3]

(b) Wind turbines are used in many countries to replace coal-fired power stations.

(i) State **one** disadvantage of using wind turbines compared to coal-fired power stations.

.....

..... [1]

(ii) State **two** advantages of using wind turbines instead of coal-fired power stations.

1. .....

2. .....
[2]

[Total: 6]

6 **(a)** Table 6.1 gives a list of statements about molecules in gases and solids.

Table 6.1

statement	gas	solid
molecules are closely packed		
molecules are free to move around from place to place		
molecules are far apart compared to their size		
molecules can only vibrate about a fixed position		
molecules change position randomly		

Put **one** tick in every row to indicate whether each statement refers to a gas or a solid.

[4]

(b) Fig. 6.1 represents a smoke particle in air. The smoke particle is moving.

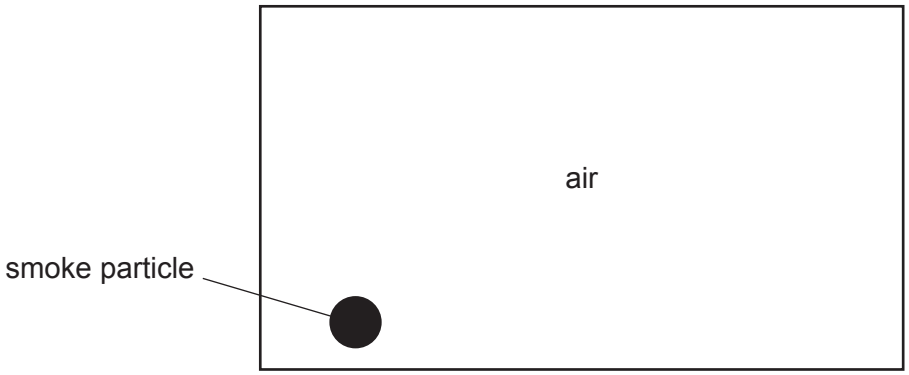

Fig. 6.1

Fig. 6.2 shows the path of the smoke particle and the position of the smoke particle a short time later.

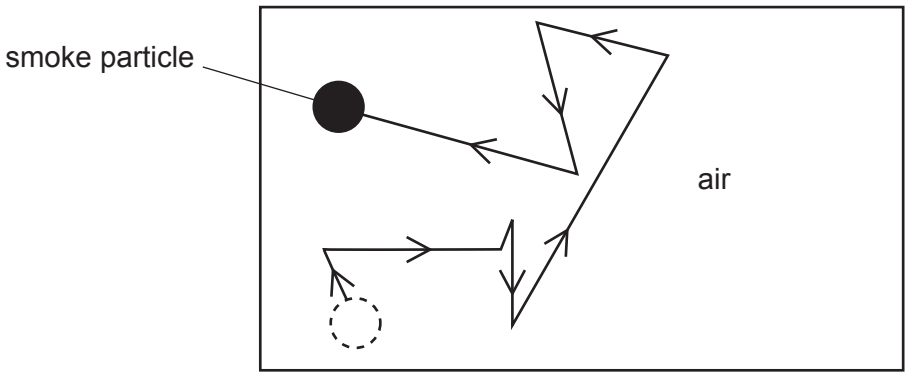

Fig. 6.2

(i) State the term given to the movement of the smoke particle.

..... [1]

(ii) State what the motion of the smoke particle shows about air molecules.

.....

.....

.....

..... [3]

[Total: 8]

7 **(a)** Equal volumes of steel, oil and hydrogen are heated from 20 °C to 60 °C.
Their volumes increase by thermal expansion.

State which of these substances has the greatest increase in volume.

..... [1]

(b) Fig. 7.1 shows a liquid-in-glass thermometer.

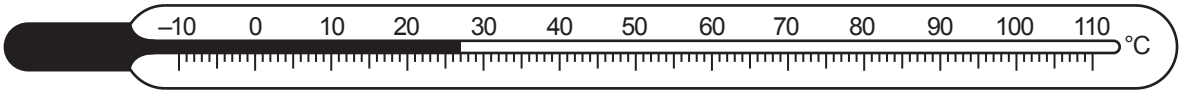

Fig. 7.1

(i) State the temperature **reading** on the thermometer.

..... [1]

(ii) State the temperature **range** of the thermometer.

..... [1]

(iii) State the values of the fixed points of the Celsius scale of temperature.

..... [1]

(c) The liquid-in-glass thermometer uses the thermal expansion of mercury.

State and explain **one** other application or consequence of thermal expansion.

.....

.....

.....

.....

..... [3]

[Total: 7]

8 Fig. 8.1 represents a travelling wave at an instant in time.

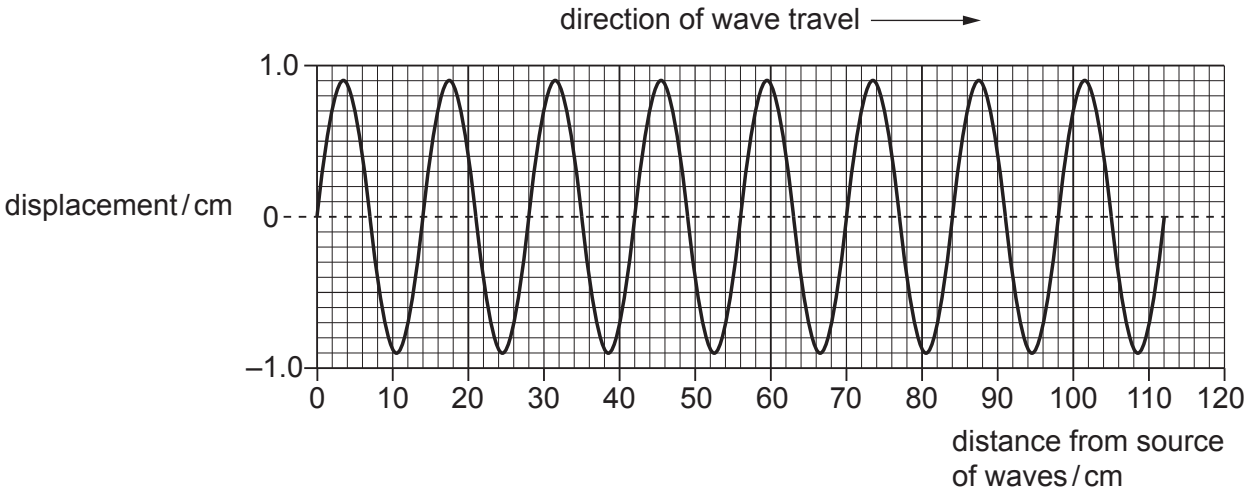

Fig. 8.1

(a) (i) Determine the amplitude of the wave.

amplitude = ... cm [1]

(ii) Determine the wavelength of the wave.

wavelength = ... cm [2]

(iii) It takes 2.0 s for a source to emit the wave shown in Fig. 8.1.

Calculate the frequency of the wave.

frequency = ... Hz [2]

[Turn over

(b) Fig. 8.2 shows the main regions of the electromagnetic spectrum.

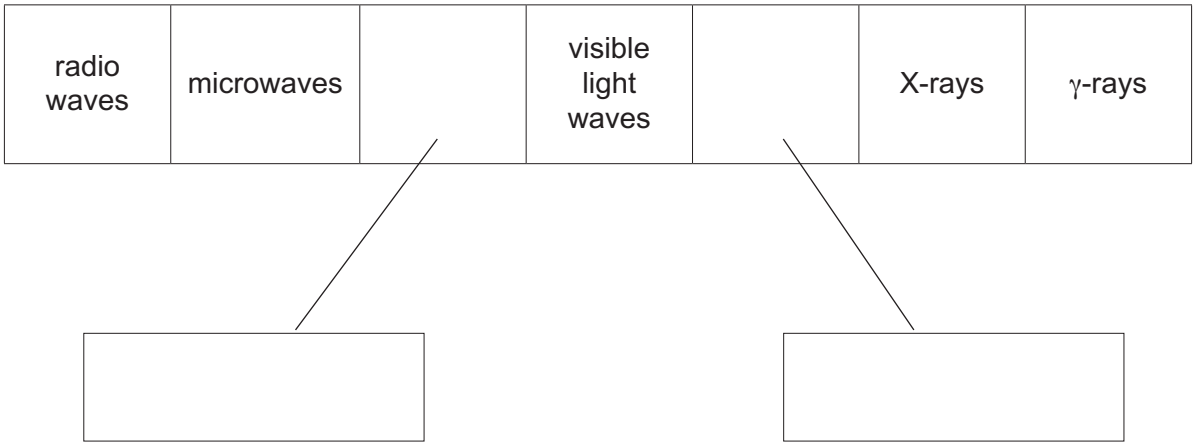

Fig. 8.2

(i) Two of the regions are not labelled.

Add the correct label to each of the unlabelled regions by writing in each box. [2]

(ii) Describe one use of γ-rays.

.....

..... [1]

[Total: 8]

9 **(a)** Fig. 9.1 shows two rays of light X and Y leaving an object O. The rays strike a plane mirror. Ray X is reflected as shown.

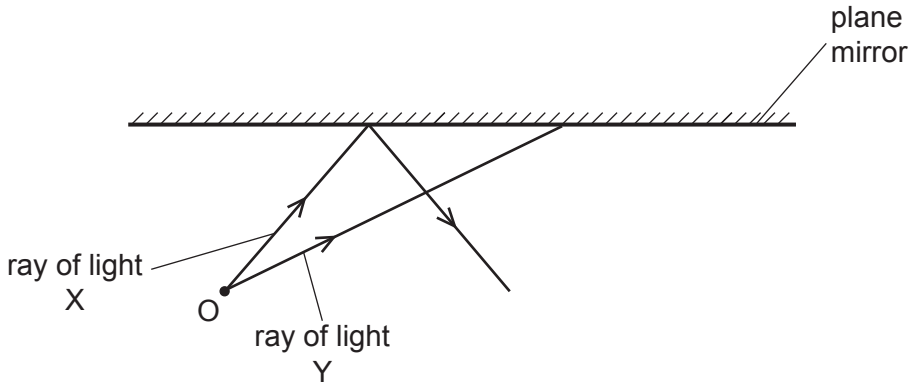

Fig. 9.1

(i) On Fig. 9.1, draw the normal at the point where ray X strikes the mirror. [1]

(ii) On Fig. 9.1, draw the path of ray Y after it strikes the mirror. [1]

(b) An object O is placed on the left of a thin converging lens. F is the principal focus.

This arrangement is shown in Fig. 9.2.

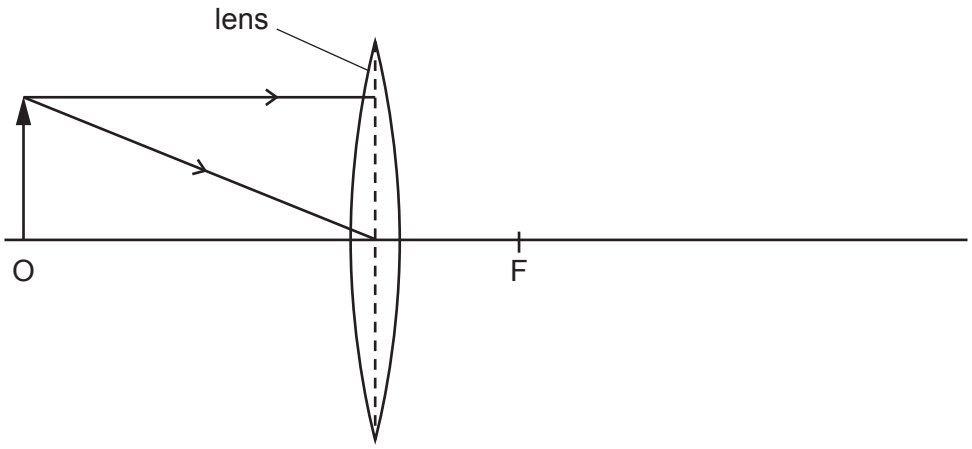

Fig. 9.2

Two rays from the top of the object are incident on the lens, as shown in Fig. 9.2.

On Fig. 9.2, draw the path of each ray to locate the position of the image of O formed by the lens.

On Fig. 9.2, draw an arrow to represent the image and label it I.

[3]

[Total: 5]

[Turn over

10 Fig. 10.1 shows an arrangement for making an electromagnet.

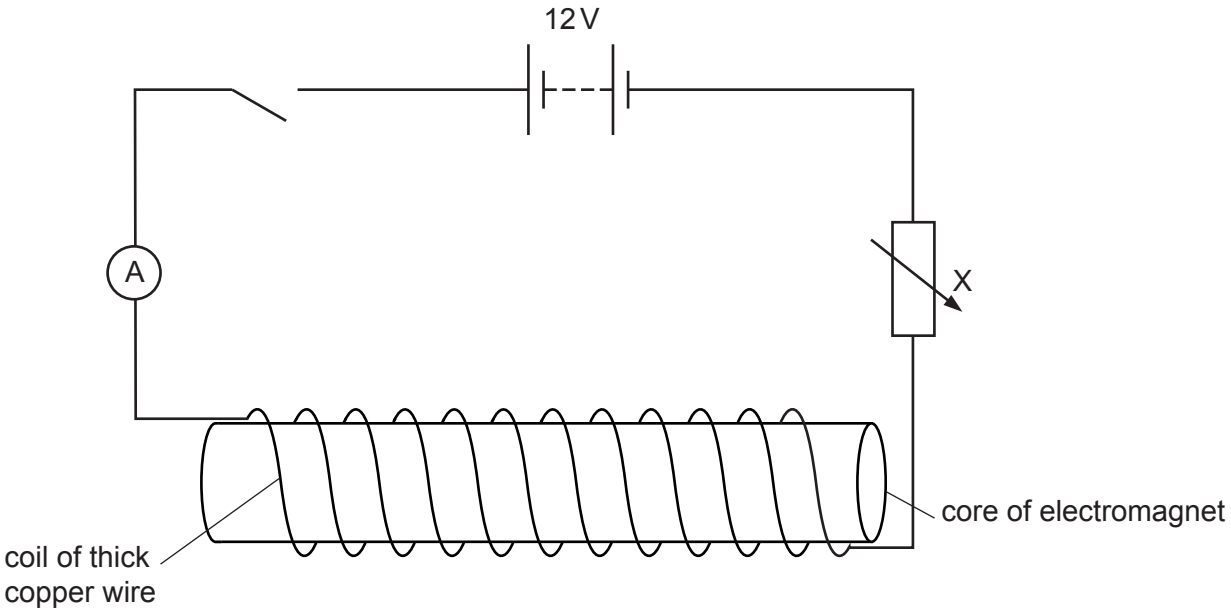

Fig. 10.1

(a) **(i)** State a material which is suitable for the core of the electromagnet.

..... [1]

(ii) State the name for component X in Fig. 10.1.

..... [1]

(iii) Describe and explain how component X varies the strength of the electromagnet.

.....

.....

..... [2]

(b) The switch is closed. The reading on the ammeter is 1.5A.

Calculate the resistance of the circuit.

resistance = ... Ω [3]

[Total: 7]

11 Fig. 11.1 shows lamps in series. Fig. 11.2 shows lamps in parallel.

The lamps are all identical 6.0 V lamps. In each circuit there are three ammeters A_1, A_2 and A_3.

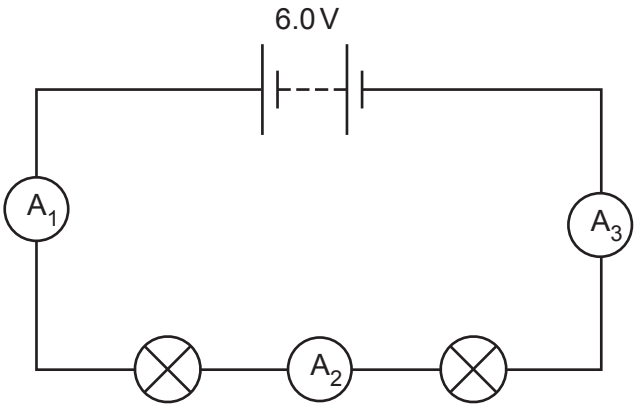

Fig. 11.1

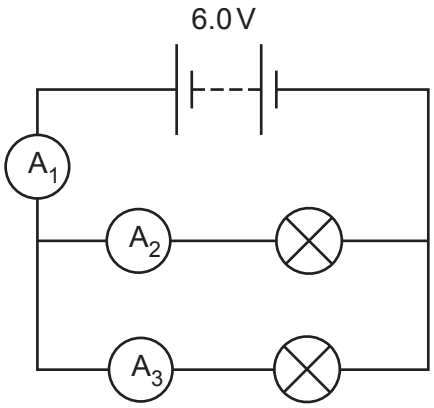

Fig. 11.2

(a) (i) Compare the readings on ammeters A_1, A_2 and A_3 in Fig. 11.1.

..... [1]

(ii) Compare the readings on ammeters A_1, A_2 and A_3 in Fig. 11.2.

..... [1]

(iii) State **two** advantages of connecting the 6.0 V lamps in parallel with the 6.0 V battery, compared with connecting the lamps in series with the battery.

1. .....

.....

2. .....

.....

[2]

(b) Each lamp has a resistance of 12 Ω.

(i) Determine the combined resistance of the two lamps connected in **series**.

resistance = ... Ω [1]

(ii) Compare the resistance of one lamp with the combined resistance of the two lamps in **parallel**.

.....

..... [1]

[Total: 6]

[Turn over

12 A nucleus of americium-241 has the nuclide notation shown.

$$^{241}_{95}\text{Am}$$

(a) (i) Determine the number of neutrons in a nucleus of americium-241.

number of neutrons = ... [1]

(ii) Determine the charge on a nucleus of americium-241.

charge = ... [2]

(b) Americium-241 decays by emitting α-particles.

Put a tick in the box next to each correct statement.

α-particles are electromagnetic waves.	☐
α-particles are fast-moving electrons.	☐
α-particles are helium nuclei.	☐
α-particles are stopped by a sheet of paper.	☐
α-particles can pass through 3 cm of aluminium.	☐

[2]

(c) Americium-241 has a half-life of 432 years.
A sample contains 16 mg of americium-241.

Calculate the time it takes until only 4.0 mg of americium-241 are left in the sample.

time = ... years [2]

[Total: 7]