

**Surname** \_\_\_\_\_

**Other Names** \_\_\_\_\_

**Centre Number** \_\_\_\_\_

**Candidate Number** \_\_\_\_\_

**Candidate Signature** \_\_\_\_\_

**GCSE**

**COMBINED SCIENCE: TRILOGY**

**Foundation Tier**

**Physics Paper 1F**

**8464/P/1F**

**F**

**Wednesday 23 May 2018 Afternoon**

**Time allowed: 1 hour 15 minutes**

**At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.**

**[Turn over]**



**For this paper you must have:**

- **a ruler**
- **a scientific calculator**
- **the Physics Equations Sheet (enclosed).**

## **INSTRUCTIONS**

- **Use black ink or black ball-point pen.**
- **Answer ALL questions in the spaces provided.**
- **Do all rough work in this book.  
Cross through any work you do not want to be marked.**
- **In all calculations, show clearly how you work out your answer.**

## **INFORMATION**

- **The maximum mark for this paper is 70.**
- **The marks for questions are shown in brackets.**
- **You are expected to use a calculator where appropriate.**
- **You are reminded of the need for good English and clear presentation in your answers.**

**DO NOT TURN OVER UNTIL TOLD  
TO DO SO**



**0 1**

**There are many different energy resources.**

**0 1 . 1**

**Which TWO energy resources are renewable? [2 marks]**

**Tick TWO boxes.**

**Biofuel**

**Coal**

**Gas**

**Geothermal**

**Nuclear fuel**

**0 1 . 2** Some non-renewable energy resources are more reliable than others.

**Which statement correctly describes a reliable resource?  
[1 mark]**

**Tick ONE box.**

**It does not burn fuel.**

**It is predictable.**

**It will never run out.**

**It is cheap to use.**

**[Turn over]**



**01.3** FIGURE 1, on page 7, shows a wind farm.

**The total power output of the wind farm is 19.6 MW**

**All of the wind turbines have the same power output.**

**What is the power output of ONE wind turbine? [1 mark]**

**Tick ONE box.**

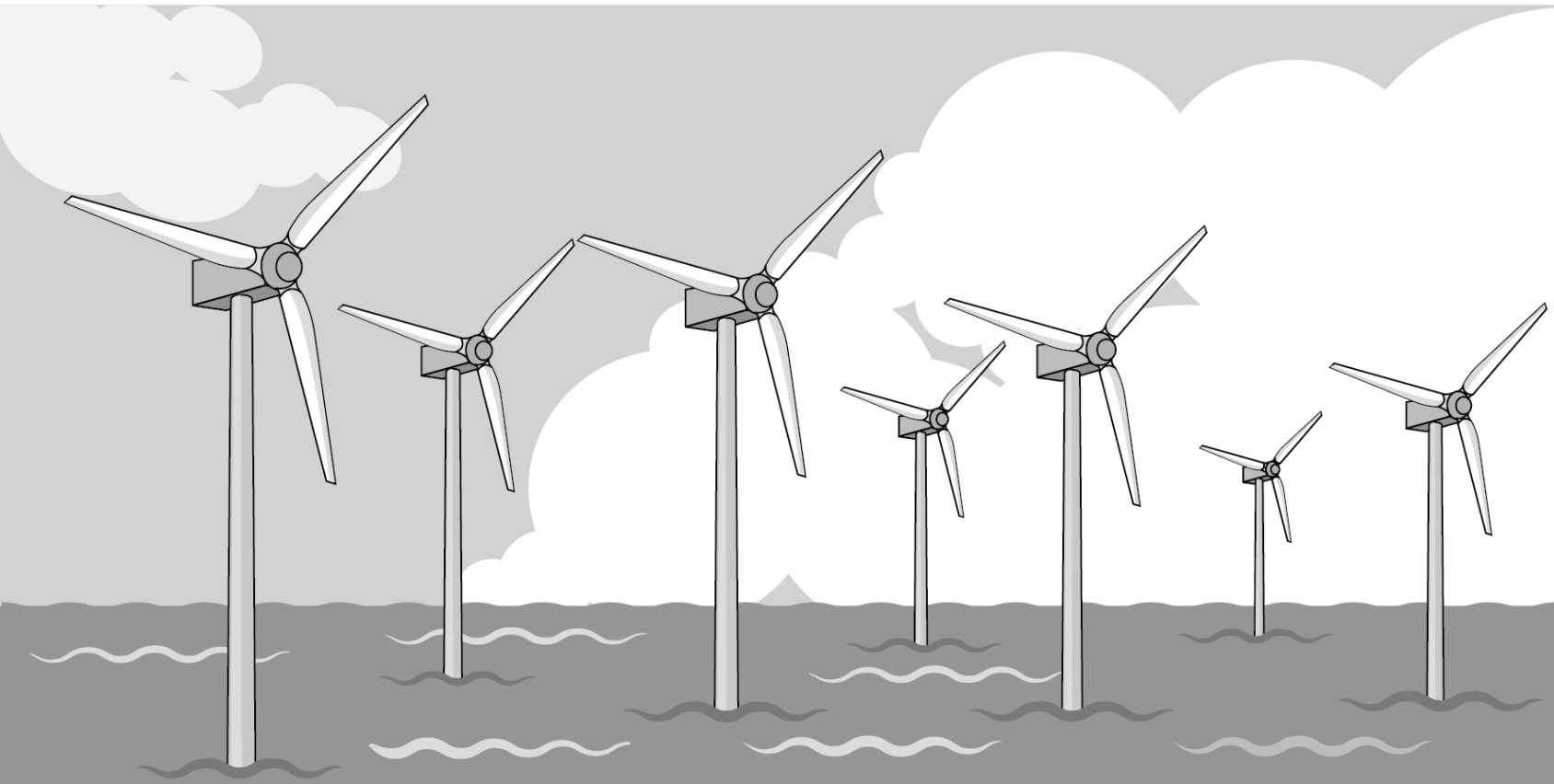
**2.7 MW**

**2.8 MW**

**2.9 MW**

**3.2 MW**

**3.3 MW**

**FIGURE 1**

**0 1 . 4** Give TWO reasons why people might NOT like having wind turbines near their homes.  
[2 marks]

1

---

2

---

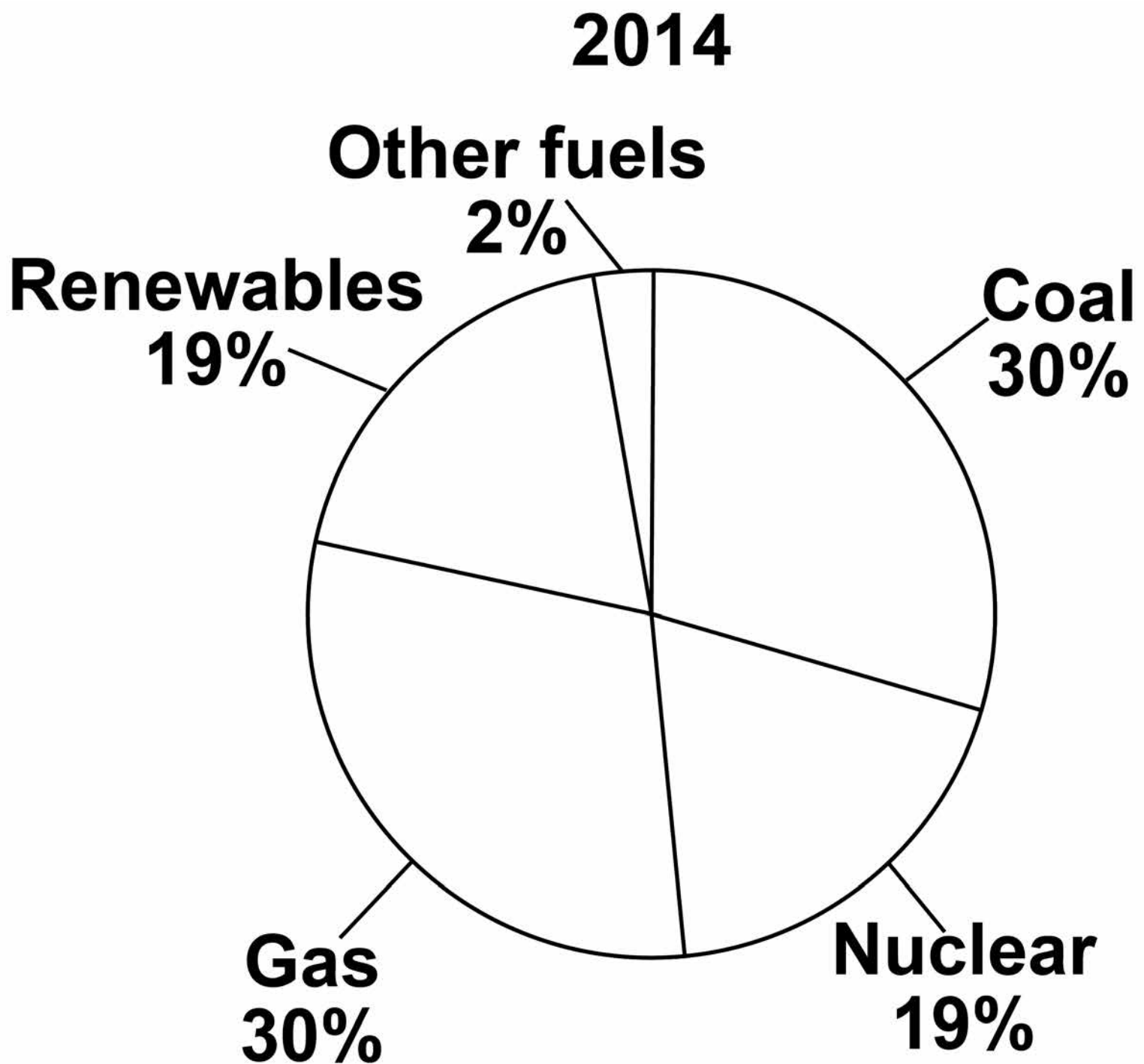
---

**[Turn over]**

**01.5** FIGURE 2, below and on page 9, shows the electricity generated by different energy resources in the UK.

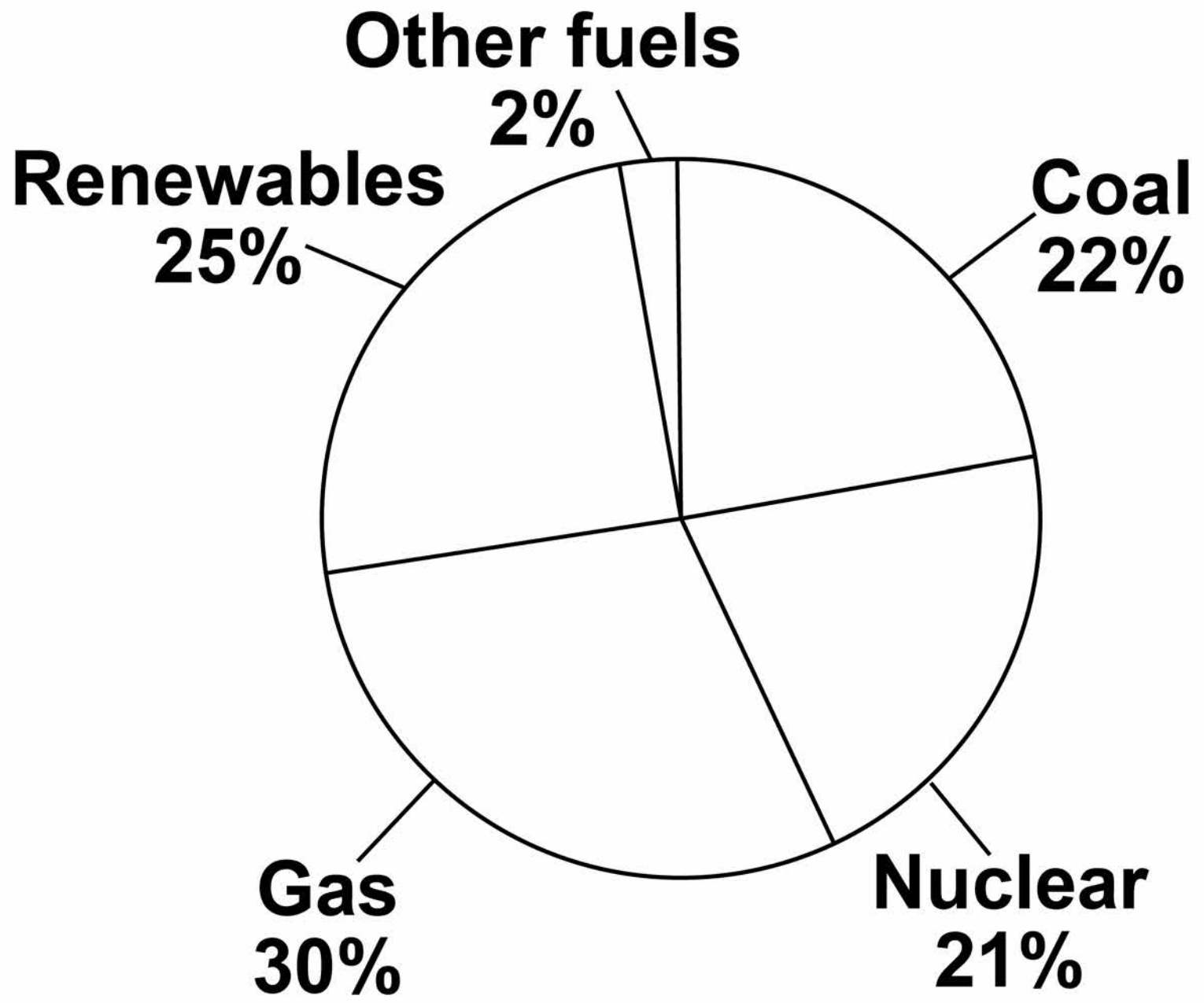
The total amount of electricity generated was the same in 2014 and in 2015

**FIGURE 2**





2015



[Turn over]

**BLANK PAGE**



**There are changes in the amounts of different energy resources used between 2014 and 2015**

**Explain the environmental impacts of the changes. [4 marks]**

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

**[Turn over]**



**0 2**

**FIGURE 3 shows a mobile phone being recharged by a portable power source.**

### **FIGURE 3**



**02.1** Why does the battery in the phone need recharging?  
[1 mark]

**Tick ONE box.**

**The store of chemical energy in the battery has reduced.**

**The store of thermal energy in the battery has reduced.**

**The store of kinetic energy in the battery has reduced.**

**The store of gravitational energy in the battery has reduced.**

**[Turn over]**



**0 2 . 2** The power source provides a current of 1.86 A at a potential difference of 3.90 V

**Calculate the power of the power source.**

**Use the equation:**

**power**  
**= potential difference × current**

**Choose the correct unit from the list. [3 marks]**

**C**

**J**

**W**

---

---

---

---

---

---

---

---

**Power =** \_\_\_\_\_

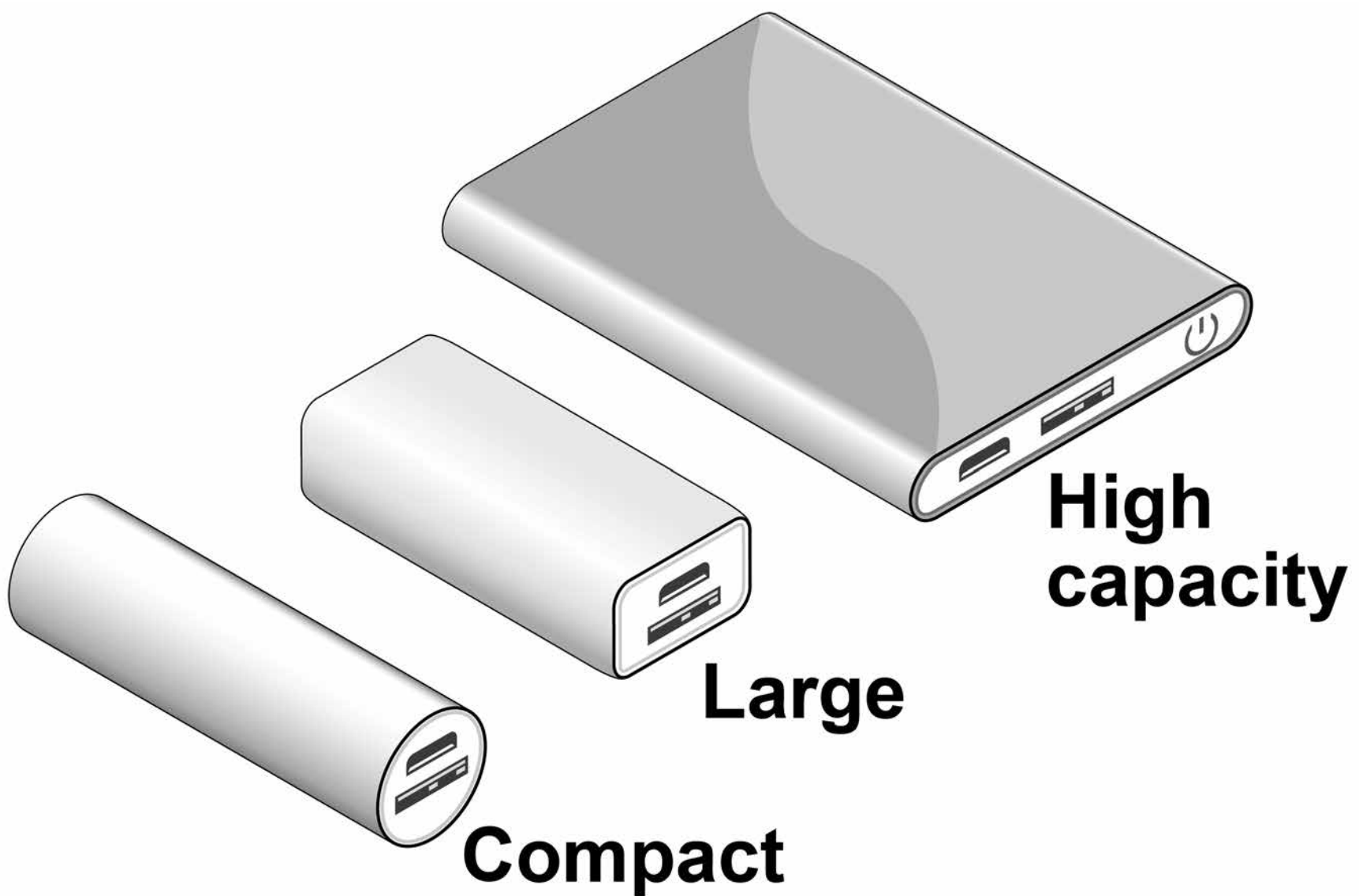
**Unit** \_\_\_\_\_

**[Turn over]**

**02.3** A student needs a new power source.

**FIGURE 4** shows three different sized power sources.

**FIGURE 4**





**BLANK PAGE**

**[Turn over]**



**TABLE 1** gives data about the different power sources.

**TABLE 1**

<b>Power source</b>	<b>Number of charges</b>	<b>Mass in grams</b>
<b>Compact</b>	<b>1</b>	<b>100</b>
<b>Large</b>	<b>5</b>	<b>200</b>
<b>High capacity</b>	<b>10</b>	<b>600</b>

**The student chose the large power source.**

**Suggest why the student chose the large power source. [4 marks]**

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

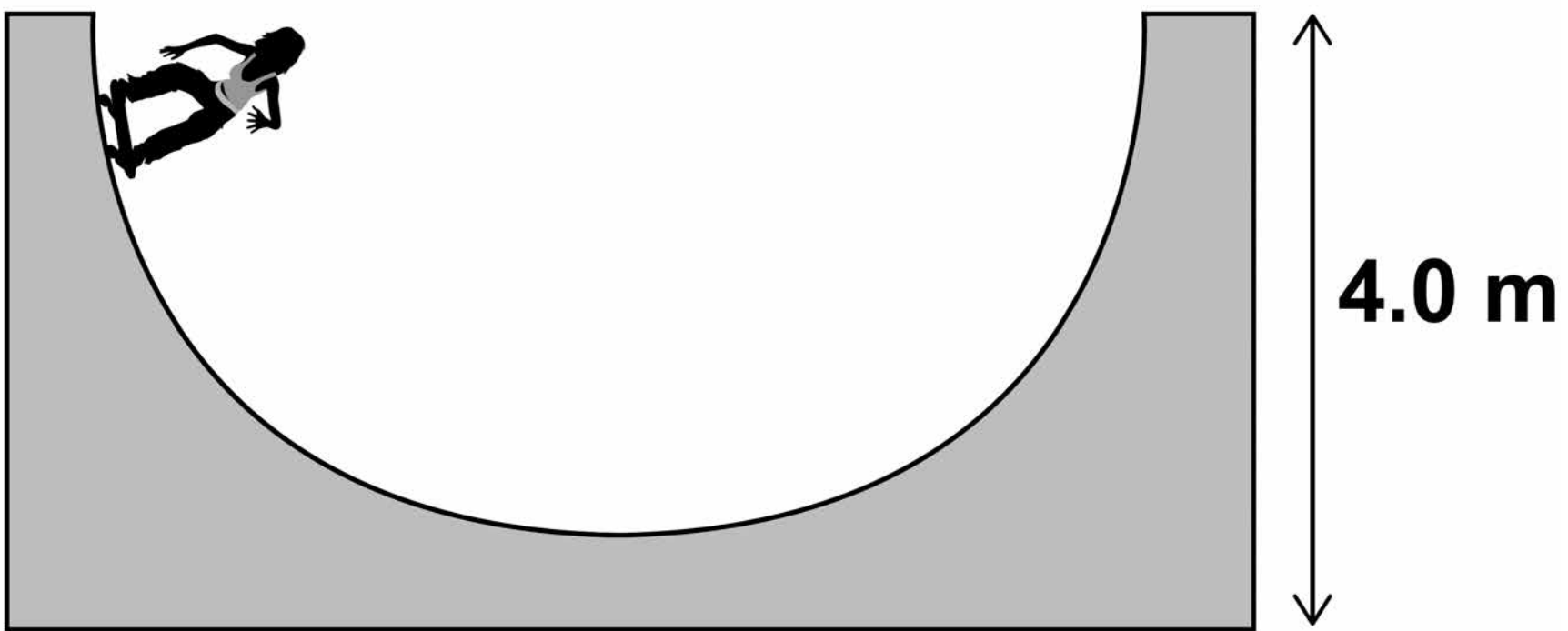
---

**[Turn over]**

8
---

**03**

**FIGURE 5** shows a girl skateboarding on a semi-circular ramp. The girl has a mass of 50 kg

**FIGURE 5**

**0 3 . 1** Calculate the gravitational potential energy (g.p.e.) of the girl at the top of the ramp.

**Use the equation:**

**g.p.e. = mass × gravitational field strength × height**

**gravitational field strength = 9.8 N/kg [2 marks]**

---

---

---

**g.p.e. = \_\_\_\_\_ J**

**[Turn over]**



**BLANK PAGE**



**03.2** The girl has a speed of 7 m/s at the bottom of the ramp.

**Calculate the kinetic energy of the girl at the bottom of the ramp.**

**Use the equation:**

$$\begin{aligned} \text{kinetic energy} \\ = 0.5 \times \text{mass} \times (\text{speed})^2 \end{aligned}$$

**[2 marks]**

---

---

---

**Kinetic energy = \_\_\_\_\_ J**

**[Turn over]**

**03.3** Not all of the g.p.e. has been transferred to kinetic energy.

**Which TWO statements explain why? [2 marks]**

**Tick TWO boxes.**

**Some energy is wasted.**

**The mass of the girl is too low.**

**The ramp is not high enough.**

**The g.p.e. of the girl is not zero.**

**The speed of the girl is too great.**



**0 3 . 4** Explain how lubricating the wheels of the skateboard can increase the speed of the girl.

**Use ideas about energy in your explanation. [3 marks]**

---

---

---

---

---

---

---

---

---

---

---

**9**

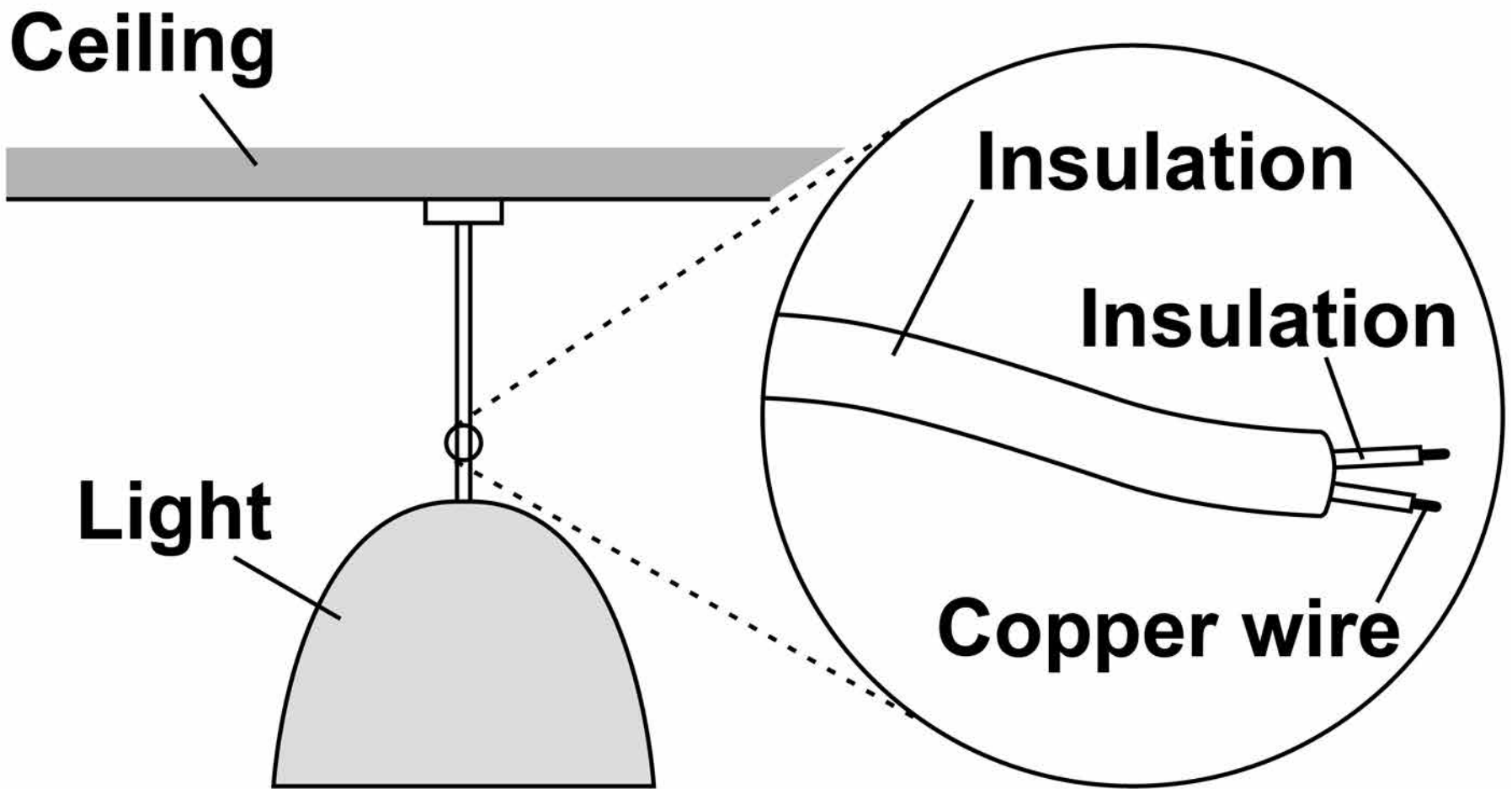
**[Turn over]**



**0 4** Some ceiling lights in the home are connected to the mains by a two-core cable.

**FIGURE 6** shows a ceiling light.

**FIGURE 6**



**0 4 . 1** Suggest why some ceiling lights do NOT have an earth wire. [2 marks]

---

---

---

---

---

**0 4 . 2** Write down the equation that links charge flow, current and time. [1 mark]

---

**0 4 . 3** There is a current of 2.95 A in one of the copper wires for 60 seconds.

**Calculate the charge flow through the wire.**

**Use your equation from question 04.2 [2 marks]**

---

---

---

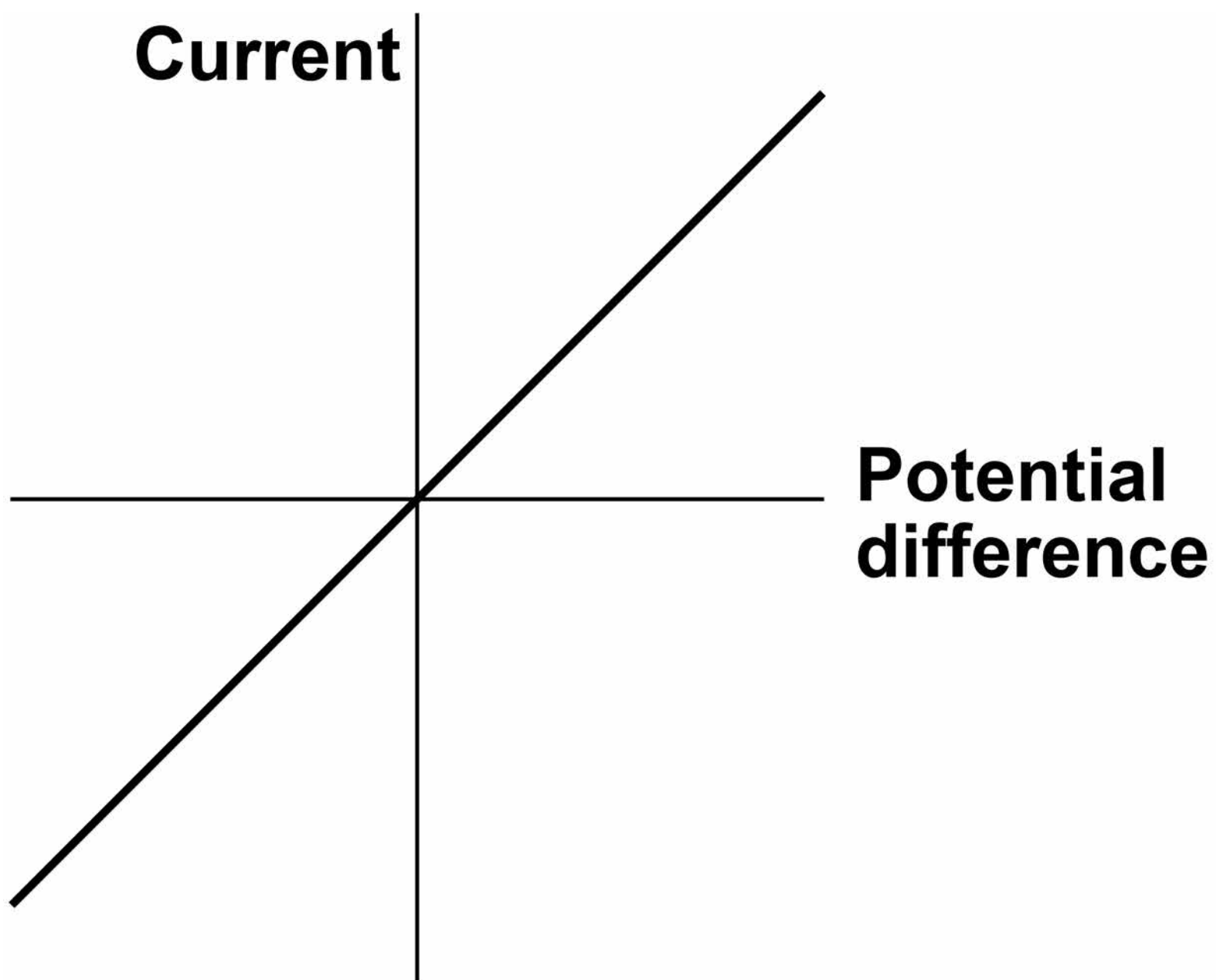
**Charge flow = \_\_\_\_\_ C**

**[Turn over]**



**04.4** FIGURE 7 shows a current potential difference graph for a piece of copper wire.

**FIGURE 7**



**Draw another line on FIGURE 7 for a wire with a different resistance.  
[2 marks]**

**Some fuses have a thin piece of copper that melts if the current is too large.**

**04.5 Draw the circuit symbol for a fuse. [1 mark]**

**[Turn over]**



**04.6** Describe how the movement of the copper particles in the wire changes when copper melts.  
**[2 marks]**

---

---

---

---

---

---

---

**0 4 . 7** Old copper wires are melted when they are recycled.

**Calculate the energy needed to melt 500 kg of copper at its melting point.**

**Specific latent heat of fusion of copper = 200 kJ/kg**

**Use the Physics Equations Sheet. [3 marks]**

---

---

---

**Energy = \_\_\_\_\_ J**

<b>13</b>

**[Turn over]**



0	5
---	---

**Radioactive nuclei can emit alpha, beta or gamma radiation.**

0	5	.	1
---	---	---	---

**Which type of radiation is the most penetrating? [1 mark]**

**Tick ONE box.**

**Alpha ( $\alpha$ )**

**Beta ( $\beta$ )**

**Gamma ( $\gamma$ )**



**0 5 . 2** Which type of radiation is the most ionising? [1 mark]

**Tick ONE box.**

**Alpha ( $\alpha$ )**

**Beta ( $\beta$ )**

**Gamma ( $\gamma$ )**

**0 5 . 3** Which type of radiation has the longest range in air? [1 mark]

**Tick ONE box.**

**Alpha ( $\alpha$ )**

**Beta ( $\beta$ )**

**Gamma ( $\gamma$ )**

**[Turn over]**

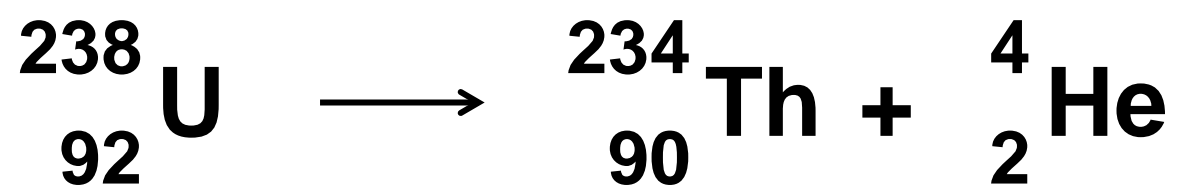


When radioactive isotopes in the Earth's crust decay they release energy.

The decay causes the heating of rocks in the crust.

**05.4** FIGURE 8 shows the decay of uranium-238 (U-238) into thorium-234 (Th-234).

### FIGURE 8



**Complete TABLE 2 to show the number of neutrons and protons in the nuclei.  
[2 marks]**

**TABLE 2**

<b>Isotope</b>	<b>Number of neutrons</b>	<b>Number of protons</b>
<b>uranium-238</b>	<b>146</b>	
<b>thorium-234</b>		<b>90</b>

**[Turn over]**

**05.5** Geothermal power stations pump water through heated rocks.

The temperature of the water increases from 20 °C to its boiling point of 100 °C

Calculate the change in thermal energy when the mass of water heated is 150 kg

Specific heat capacity  
= 4 200 J/kg °C

Use the Physics Equations Sheet. [3 marks]

---

---

---

---

---

---

---

---

**Change in thermal energy =**  
\_\_\_\_\_ **J**

**[Turn over]**

<b>8</b>

**0 6**

**FIGURE 9, on page 39, shows two models of the atom.**

**0 6 . 1**

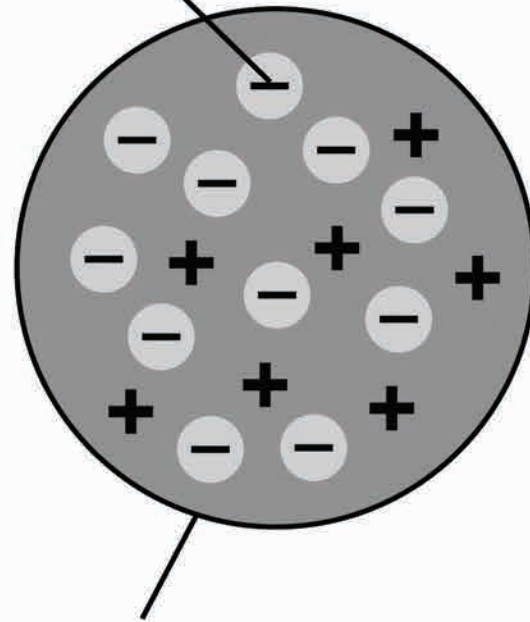
**Write the labels on FIGURE 9**

**Choose the answers from the list. [4 marks]**

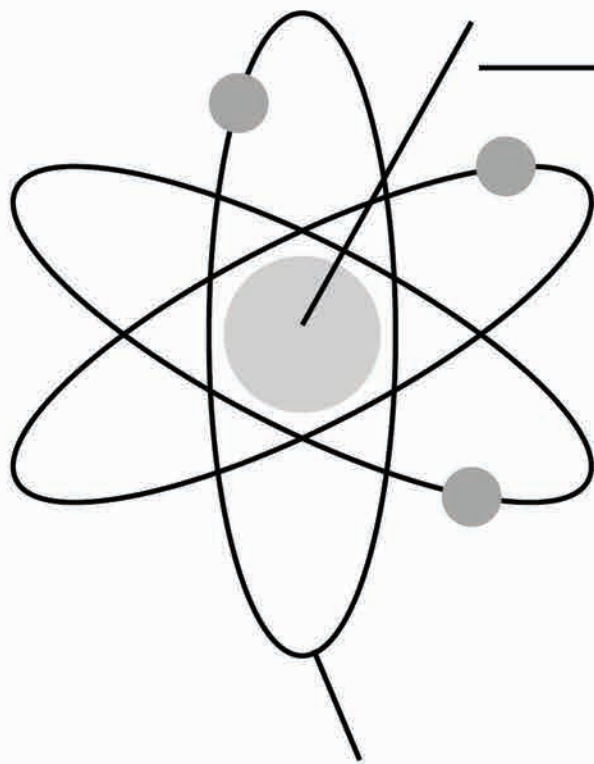
**atom****neutron****electron****orbit****nucleus****proton**

# FIGURE 9

## Plum pudding model



## Nuclear model



[Turn over]



**06.2** Explain why the total positive charge in every atom of an element is always the same.  
**[2 marks]**

---

---

---

---

---

---

---

---



**06.3** The results from the alpha particle scattering experiment led to the nuclear model.

Alpha particles were fired at a thin film of gold at a speed of 7% of the speed of light.

Determine the speed of the alpha particles.

Speed of light = 300 000 000 m/s  
[2 marks]

---

---

---

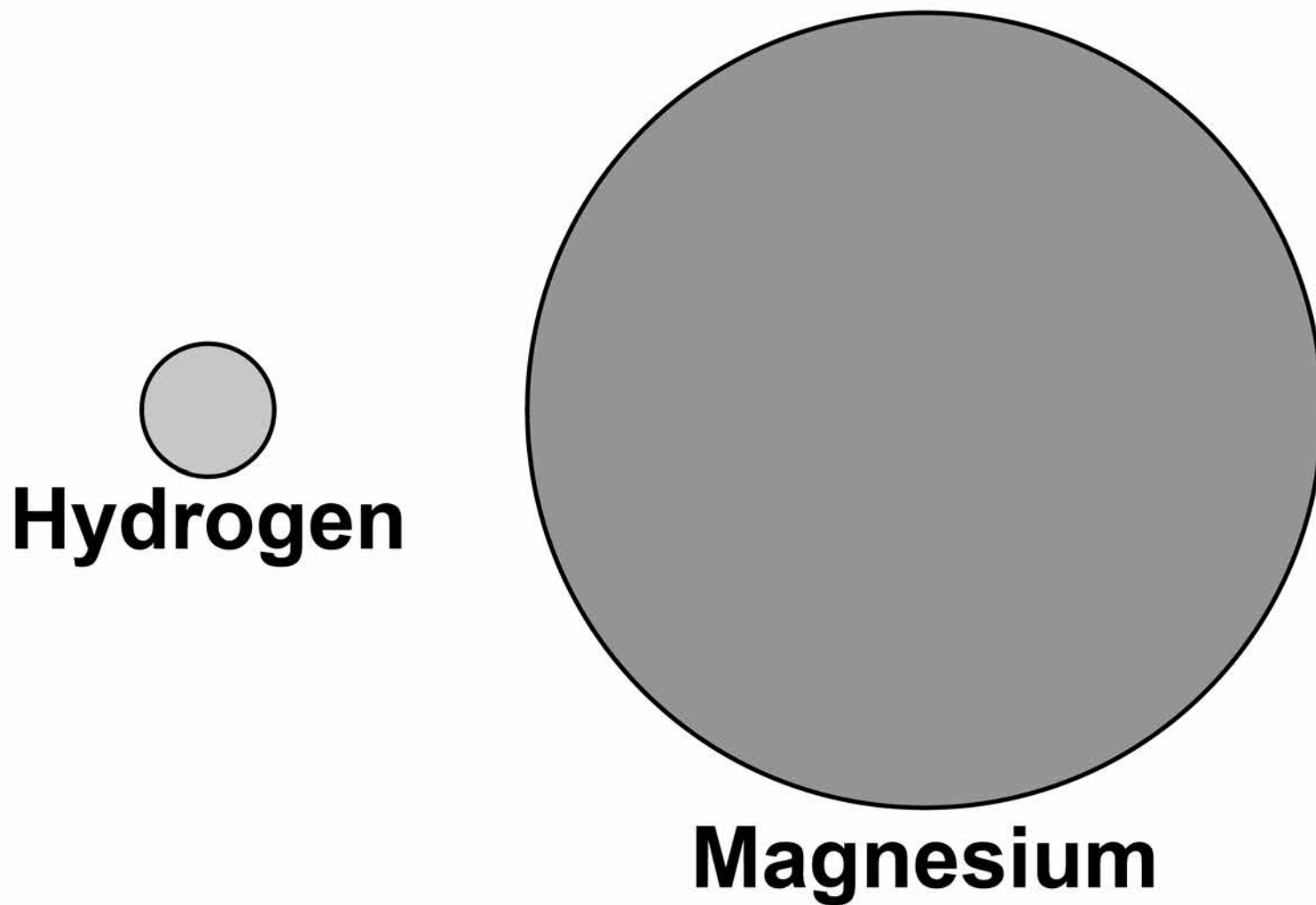
Speed = \_\_\_\_\_ m/s

[Turn over]



**06.4** FIGURE 10 shows two atoms represented as solid spheres.

**FIGURE 10**



**43**

**A hydrogen atom has a radius of  $2.5 \times 10^{-11}$  m**

**Determine the radius of a magnesium atom. [2 marks]**

**Take the radius of the atoms as measured on FIGURE 10 to be:**

**Hydrogen atom 6 mm**

**Magnesium atom 36 mm**

---

---

---

**Radius = \_\_\_\_\_ m**

<b>10</b>

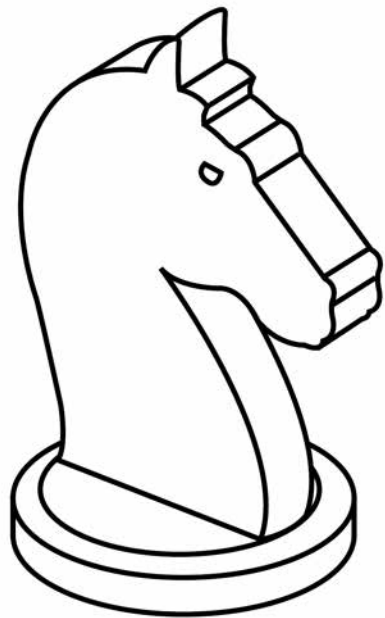
**[Turn over]**



0	7
---	---

**A student wanted to determine the density of the irregular shaped object shown in FIGURE 11**

**FIGURE 11**



0	7	.	1
---	---	---	---

**Plan an experiment that would allow the student to determine the density of the object.**

**[6 marks]**

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

**[Turn over]**



**07.2** Another student did a similar experiment.

He determined the density of five common plastic materials.

TABLE 3 shows the results.

TABLE 3

<b>Plastic material</b>	<b>Density in kg/m<sup>3</sup></b>
<b>Acrylic</b>	<b>1200</b>
<b>Nylon</b>	<b>1000</b>
<b>Polyester</b>	<b>1380</b>
<b>Polystyrene</b>	<b>1040</b>
<b>PVC</b>	<b>1100</b>



**BLANK PAGE**

**[Turn over]**



**FIGURE 12, on page 49, shows the results plotted in a bar chart.**

**Complete FIGURE 12**

**You should:**

- **Write the correct scale on the y-axis.**
- **Draw the bars for polyester, polystyrene and PVC.**

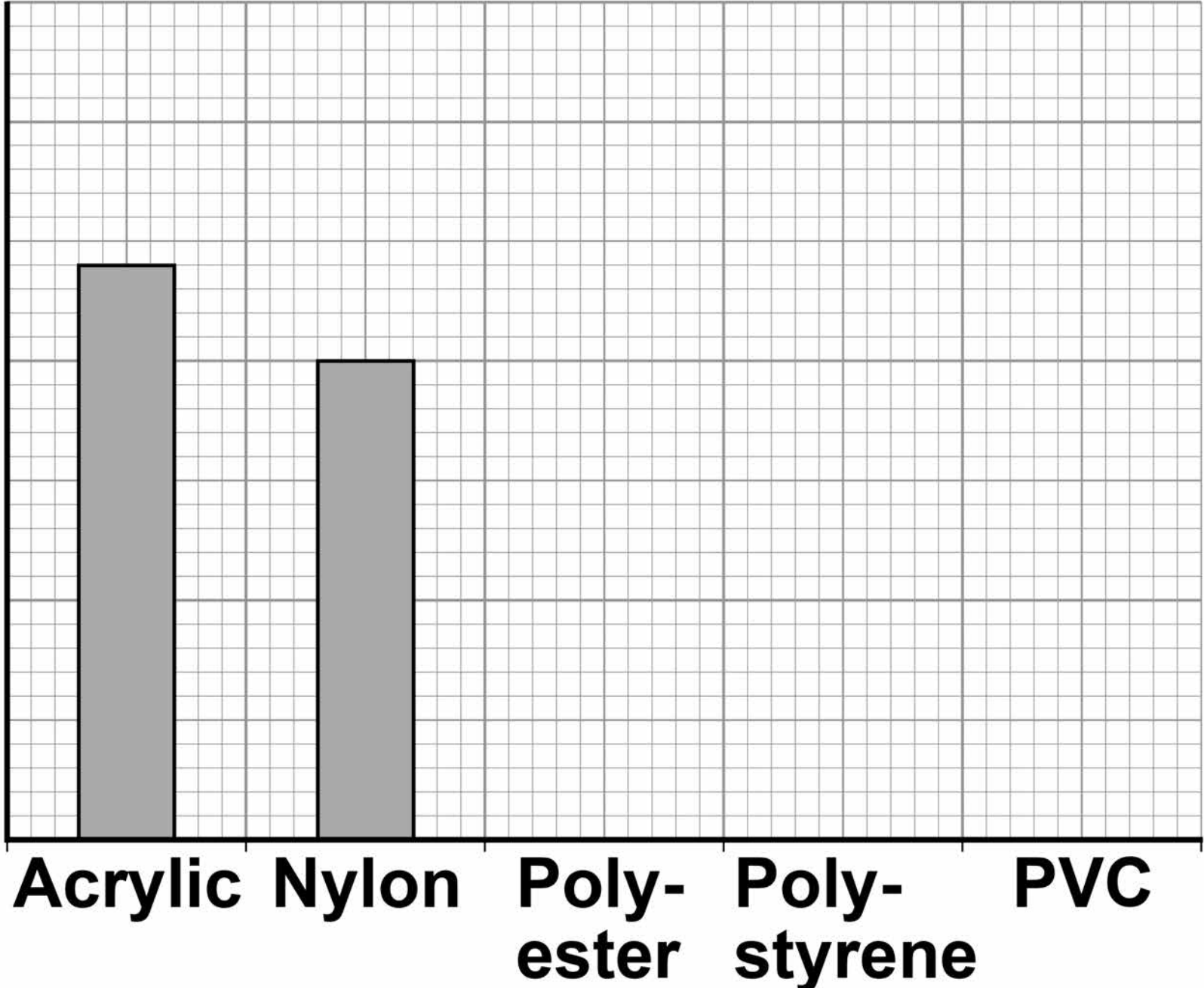
**[4 marks]**





**FIGURE 12**

**Density  
in kg/m<sup>3</sup>**



**[Turn over]**



**07.3** The student is given a piece of a different plastic material.

The student determined the density of the material three times.

TABLE 4 shows the results.

TABLE 4

	Density in $\text{kg/m}^3$
1	960
2	1120
3	1040

**Determine the uncertainty in the student's results. [2 marks]**

---

---

---

**Uncertainty = \_\_\_\_\_ kg/m<sup>3</sup>**

<b>12</b>

**END OF QUESTIONS**

**There are no questions printed on this page**

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
<b>TOTAL</b>	

### Copyright information

For confidentiality purposes, from the November 2015 examination series, acknowledgements of third party copyright material will be published in a separate booklet rather than including them on the examination paper or support materials. This booklet is published after each examination series and is available for free download from [www.aqa.org.uk](http://www.aqa.org.uk) after the live examination series.

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders may have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements. If you have any queries please contact the Copyright Team, AQA, Stag Hill House, Guildford, GU2 7XJ.

Copyright © 2018 AQA and its licensors. All rights reserved.

**IB/M/Jun18/IK/8464/P/1F/E3**

