



Rewarding Learning

General Certificate of Secondary Education
2019–2020

Centre Number

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Candidate Number

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Single Award Science: Physics

Unit 3

Foundation Tier



[GSA31]

GSA31

FRIDAY 28 FEBRUARY 2020, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer the questions in the spaces provided.

Do not write outside the boxed area on each page or on blank pages.

Complete in black ink only. **Do not write with a gel pen.**

Answer **all eleven** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 60.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question **11**.



- 1 (a) Shown below are two devices that convert energy. Complete the boxes to give the **main** energy change for each.

Choose from:

heat

electrical

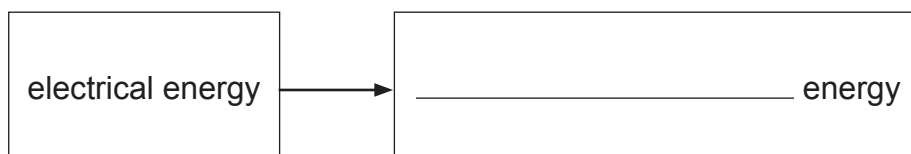
sound

light



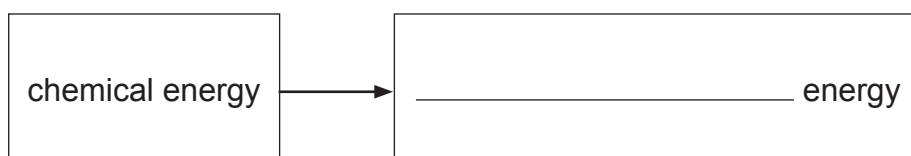
© Getty Images

electric iron



© Getty Images

battery



[2]

The table below gives some statements about energy sources.

- (b) Complete the table by using ticks (✓) to show which statements are correct.

Energy source	Is burned to release energy	Is renewable
coal		
hydroelectric		

[2]



(c) Complete the following sentences.

Choose from:

created

carried

transmitted

destroyed

The conservation of energy states that energy cannot

be _____ or _____.

It can only be changed from one form to another.

[1]



- 2 (a) The table below gives some information about the planets in our Solar System.

Planet	Distance from the Sun/ million km	Surface temperature/ °C	Gravity/ N/kg
Mercury	58	430	4
	108	470	9
Earth	150	22	10
	228	−23	4
Jupiter	778	−150	26
Saturn	1427	−180	11
Uranus	2870	−210	12
Neptune	4497	−220	12

- (i) Complete the table with the names of the two other planets in our Solar System. [2]

- (ii) Suggest why the Earth is warmer than Saturn.

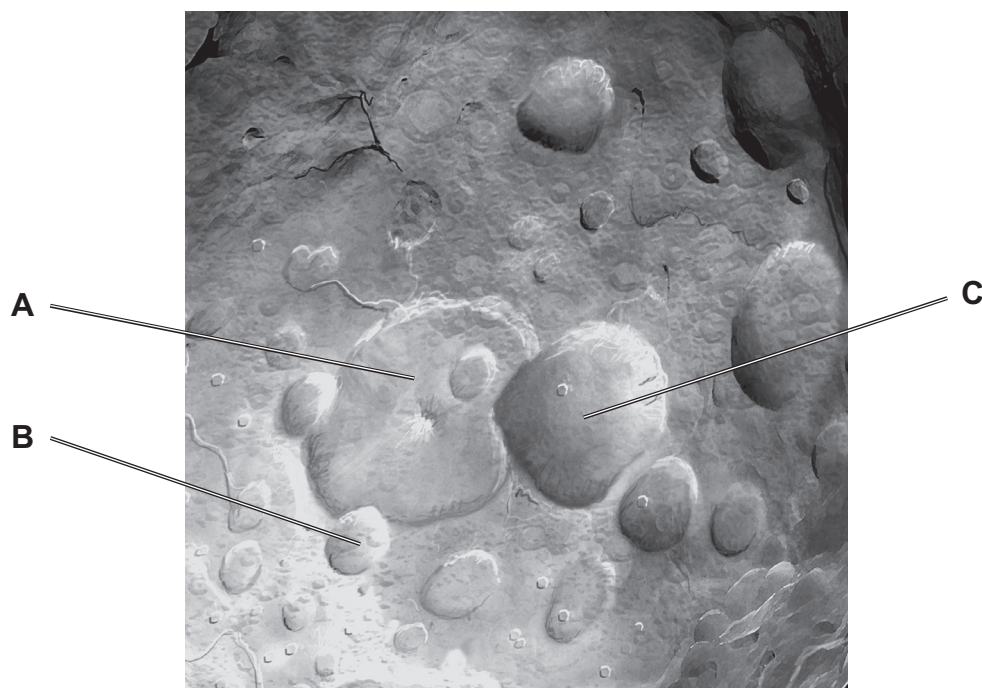
_____ [1]

- (iii) Name the planet on which your weight would be greatest.

_____ [1]



(b) The diagram below shows some craters on the moon.



© Mark Garlick / Science Photo Library

(i) Name the type of object which caused these craters.

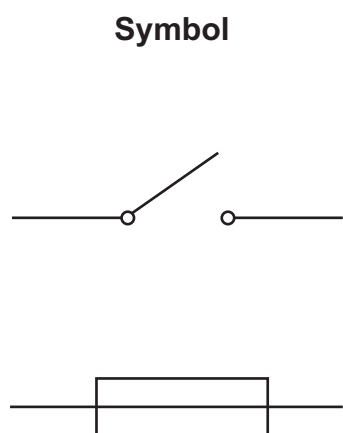
_____ [1]

(ii) Which crater **A**, **B** or **C** was produced first?

_____ [1]



- 3 (a) Below are some electrical symbols. Using lines, match each symbol with its name.



Name

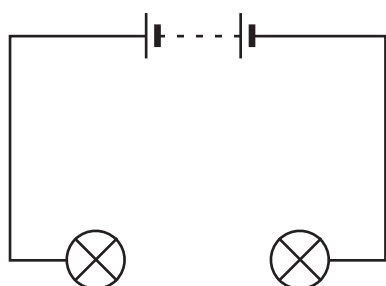
fuse

resistor

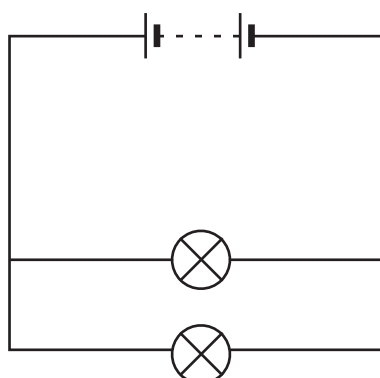
switch

[2]

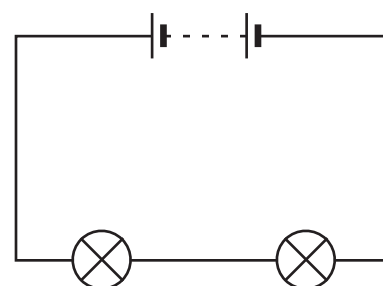
- (b) Shown below are three circuit diagrams, each with identical batteries and bulbs.



A



B



C

- (i) Which circuit **A**, **B** or **C** will have the brightest bulbs?

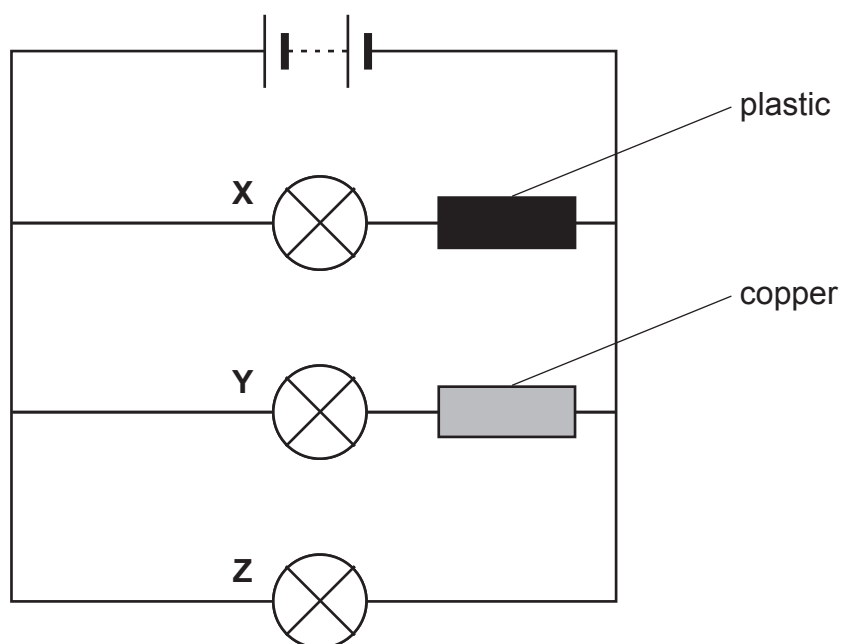
_____ [1]

- (ii) If one bulb is broken in circuit **B**, what will happen to the other bulb?

_____ [1]



A student connected the circuit below to test electrical conductivity.

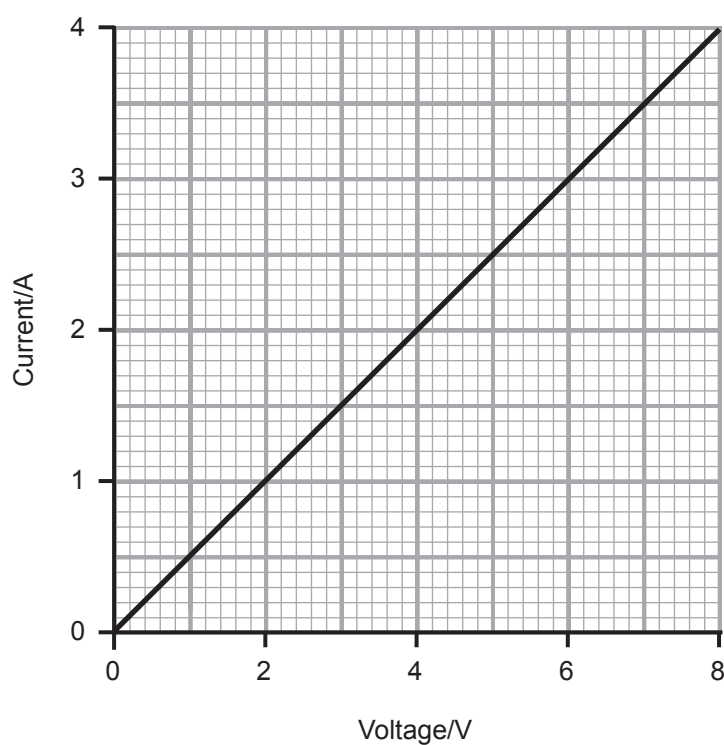


(c) Which bulb(s) **X**, **Y** or **Z** will be lit?

_____ [1]



(d) The graph below shows the current through and the voltage across a bulb.



(i) Complete the sentence below to give the trend shown in this graph.

As the voltage _____
 _____ [1]

(ii) Use the equation:

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

to calculate the resistance of this bulb when the voltage is 4 V.

(Show your working out.)

_____ Ω [2]



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(Questions continue overleaf)

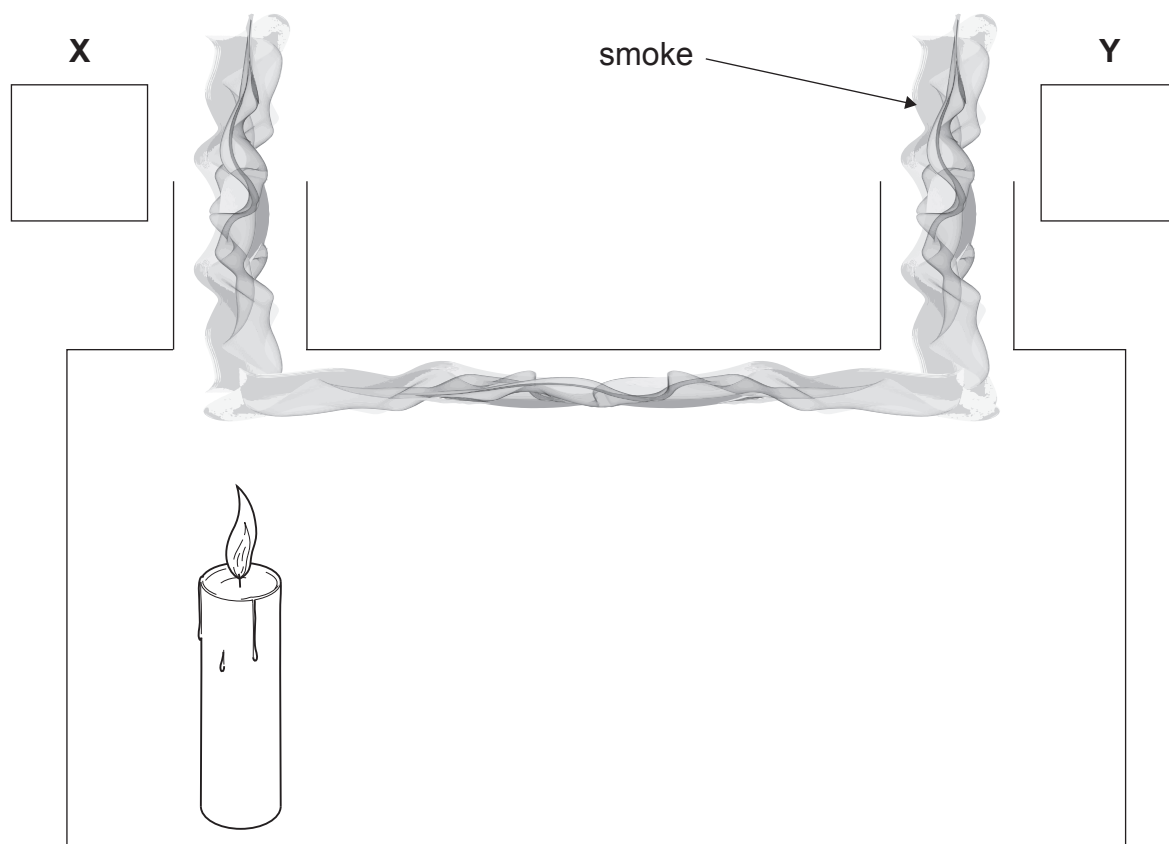
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[Turn over



28GSA3109

- 4 (a) The apparatus below can be used to show how heat moves through air.



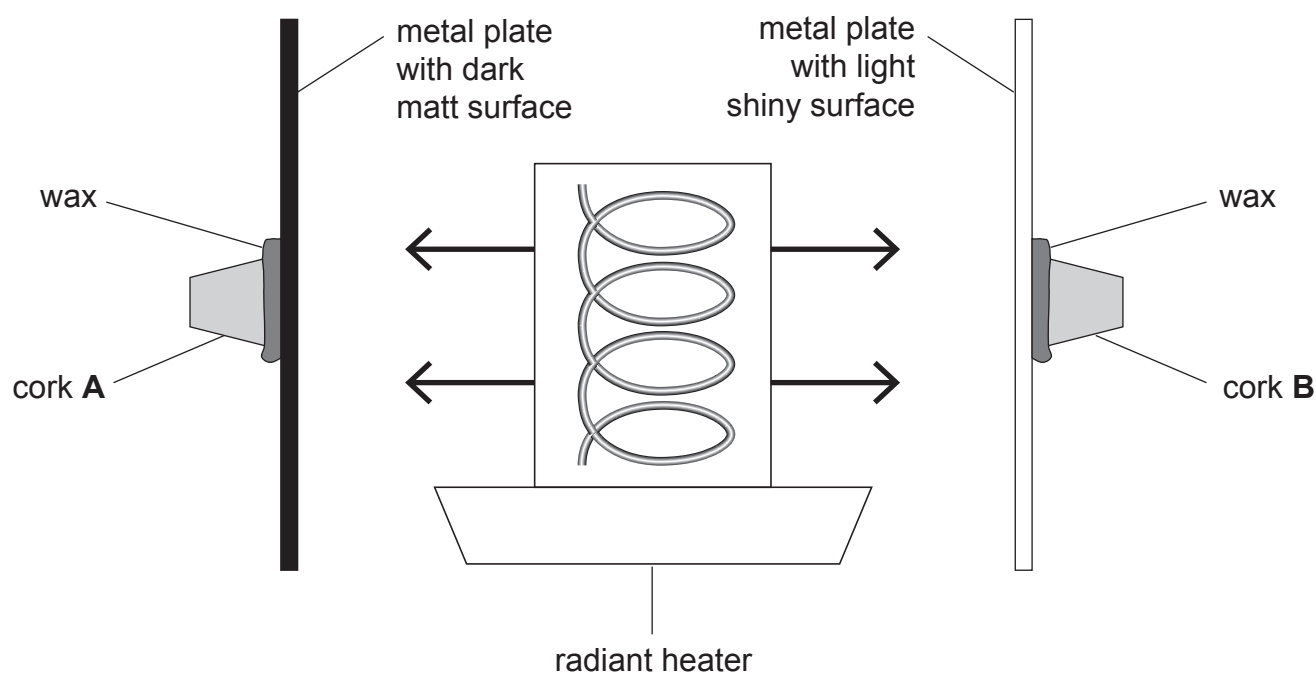
Source: Principal Examiner

- (i) Put **one** arrow in each box (**X** and **Y**) to show the direction the smoke is moving. [1]

- (ii) Name the method by which heat travels through air. [1]



(b) A student investigated heat transfer using the apparatus shown below.



Source: Principal Examiner

When the heat reaches the metal plate it travels through the plate to melt the wax.

(i) Name the method by which heat travels through the metal plates.

_____ [1]

(ii) Which cork (**A** or **B**) will fall first? Explain your answer.

_____ [1]

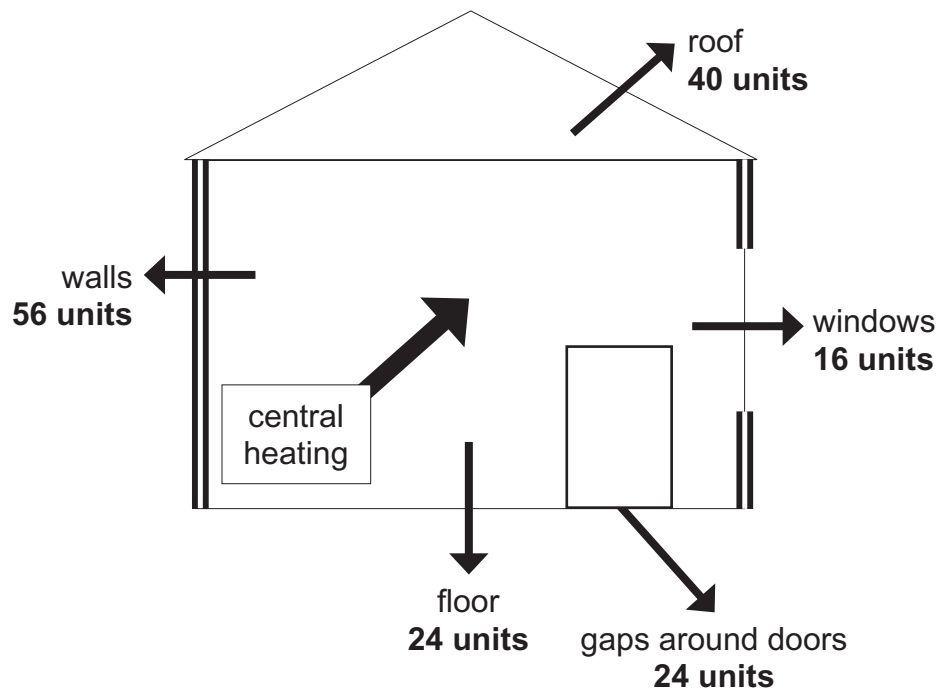
(iii) Give **one** thing the student must do to make sure this is a fair test.

_____ [1]

[Turn over



- 5 (a) The diagram below shows the number of units of heat lost through different parts of a house.



Source: Principal Examiner

The central heating system needs to replace the heat lost to keep the house at a constant temperature.

- (i) Calculate the number of units that the central heating must produce.

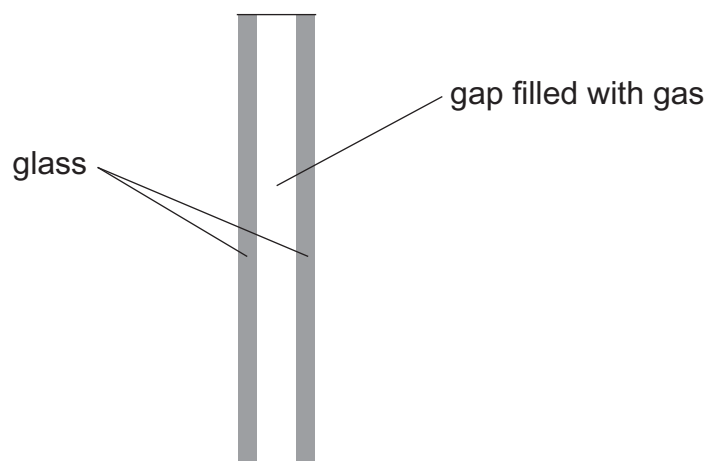
_____ units [1]

- (ii) Suggest **one** way that heat loss through gaps around doors could be reduced.

_____ [1]



(b) The diagram below shows a cross section through a double glazed window.



The table below gives the heat loss through different double glazed windows.

Gap size/ mm	Heat loss/W/m ² K	
	100% air in gap	10% air and 90% argon in gap
5	3.40	3.20
10	2.96	2.79
15	2.76	2.62

(i) Which gap size provides the best insulation?

_____ mm [1]

(ii) What effect, if any, does adding argon have on heat loss?

Circle the correct answer.

increased heat loss : reduced heat loss : no effect

[1]

[Turn over



- 6 The photograph below shows the electrical energy put in and the energy given out of a hairdryer.



© Science Photo Library

- (a) Calculate the amount of wasted energy.

_____ J [1]

- (b) It is important that electrical devices are efficient.

- (i) What is meant by the term **efficiency**?

Circle your answer.

how much energy is used

how much money it costs to run

how good it is at changing electrical energy into useful energy

[1]



(ii) Use the equation:

$$\text{efficiency} = \frac{\text{useful output energy}}{\text{total input energy}}$$

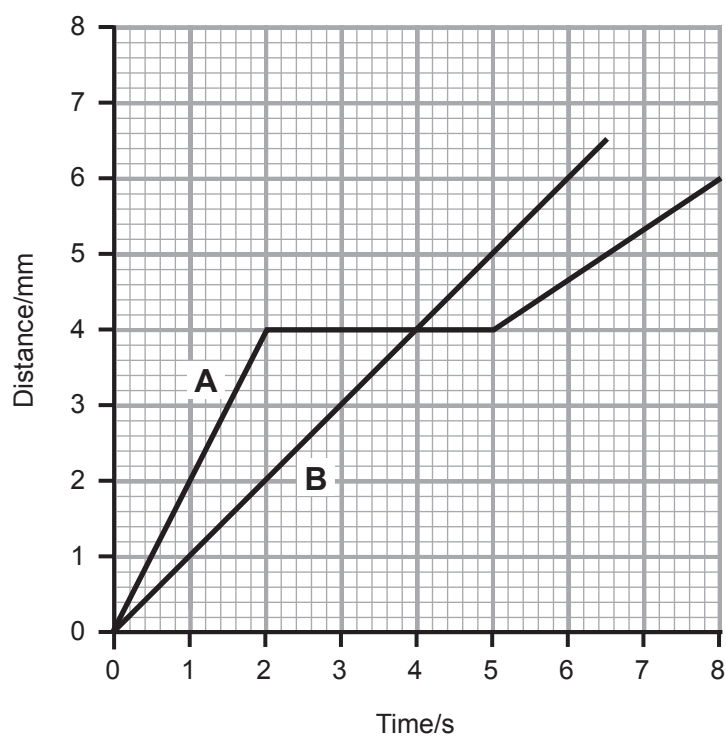
to calculate the efficiency of the hairdryer.

(Show your working out.)

_____ [2]



- 7 Shown below is a distance-time graph for two caterpillars, **A** and **B**, moving across a leaf.



- (a) At what time had the caterpillars travelled the same distance?

_____ s [1]

- (b) Caterpillar **B** stops after 6.5 seconds and remains stationary. Complete the distance-time graph for caterpillar **B** up to 8 seconds.

[1]



(c) Use the equation:

$$\text{average speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

to calculate the average speed of caterpillar **A** for its total journey.

(Show your working out.)

_____ mm/s [2]



- 8 The advert below was used to discourage drink-driving.



© Think! Road Safety Team, Department of Transport

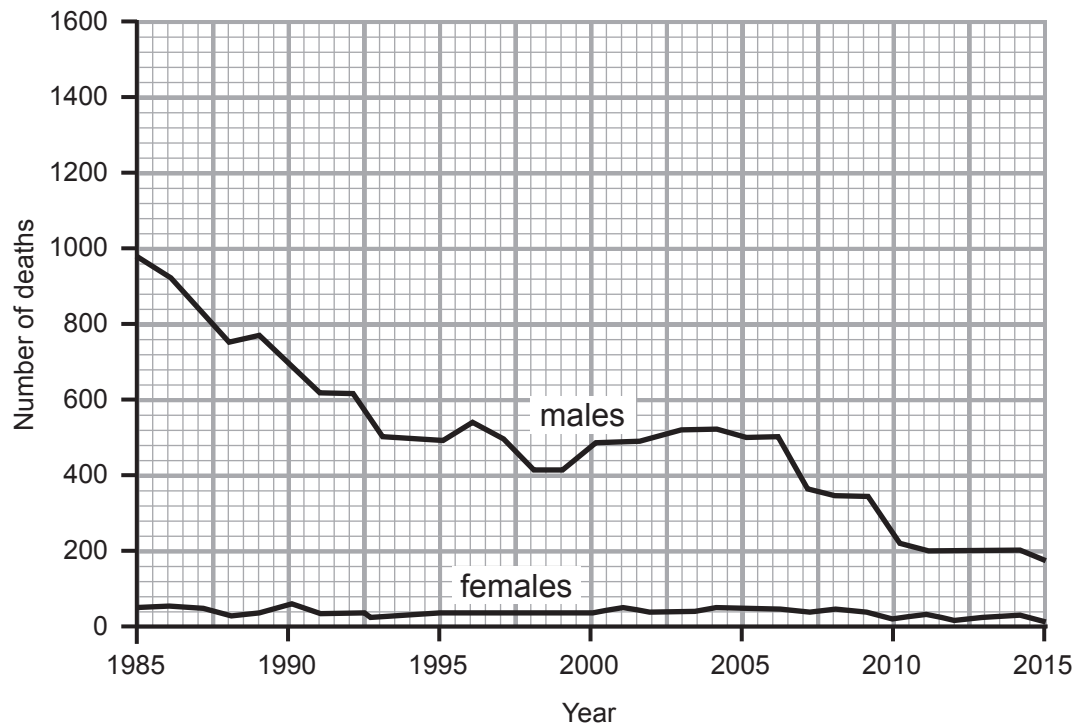
- (a) Complete the table below using a tick (✓) to show the effect, if any, of drinking alcohol on thinking, braking and stopping distances.

	increases	stays the same	decreases
Thinking distance			
Braking distance			
Stopping distance			

[3]



The graph below shows the number of deaths caused by accidents involving drink-driving in the UK.



(b) Give **two** conclusions that can be made from this graph.

1. _____

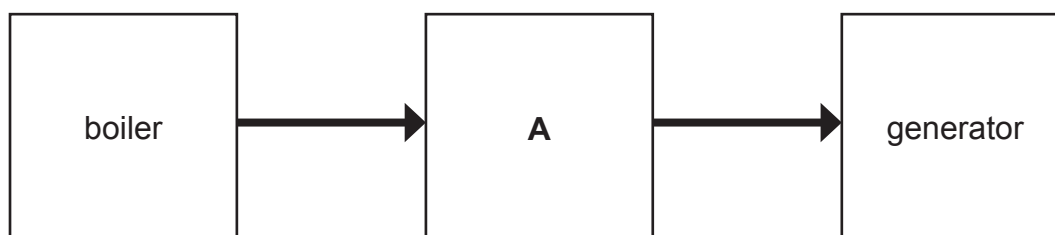
2. _____

_____ [2]

[Turn over



- 9 (a) The diagram below shows the parts of a coal-fired power station.



- (i) Name the part labelled **A**.

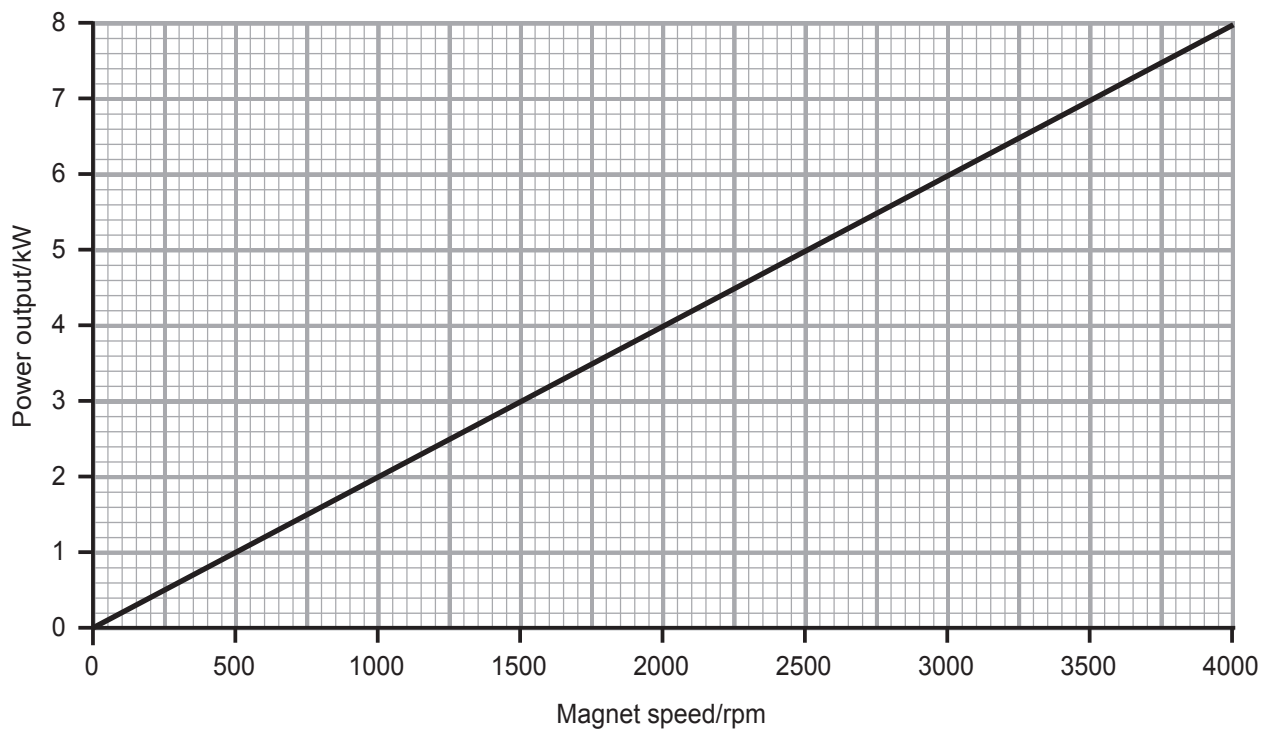
_____ [1]

- (ii) Complete the following sentence.

Coal is a fossil fuel; it takes _____ of years
to form. [1]



- (b) A generator produces electricity by having a magnet spin in a coil of wire. On the axes below draw the graph you would expect if a stronger magnet had been used.

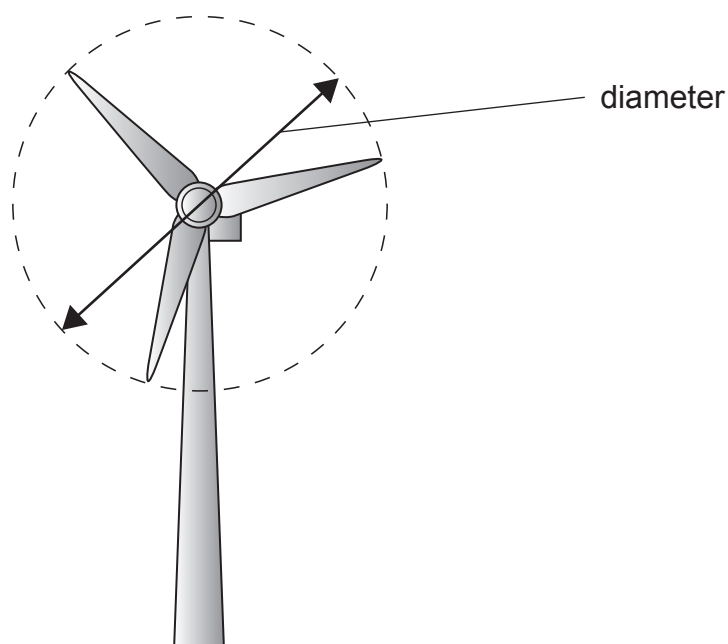


[2]

[Turn over]



(c) Electricity can also be produced by wind turbines.



Source: Principal Examiner

The table below shows how the electrical power output depends on the diameter of the blades and wind speed.

		Power output/W		
Blade diameter/m	Wind speed	5 m/s	10 m/s	15 m/s
2		50	400	1350
3		112	900	3040
4		200	1600	5400
5		310	2500	8500
6		440	3600	12 150



(i) Give **two** conclusions that can be made from the data opposite.

1. _____

2. _____

_____ [2]

(ii) Predict the power output of a 7 m diameter blade in a wind speed of 10 m/s.

_____ W [1]

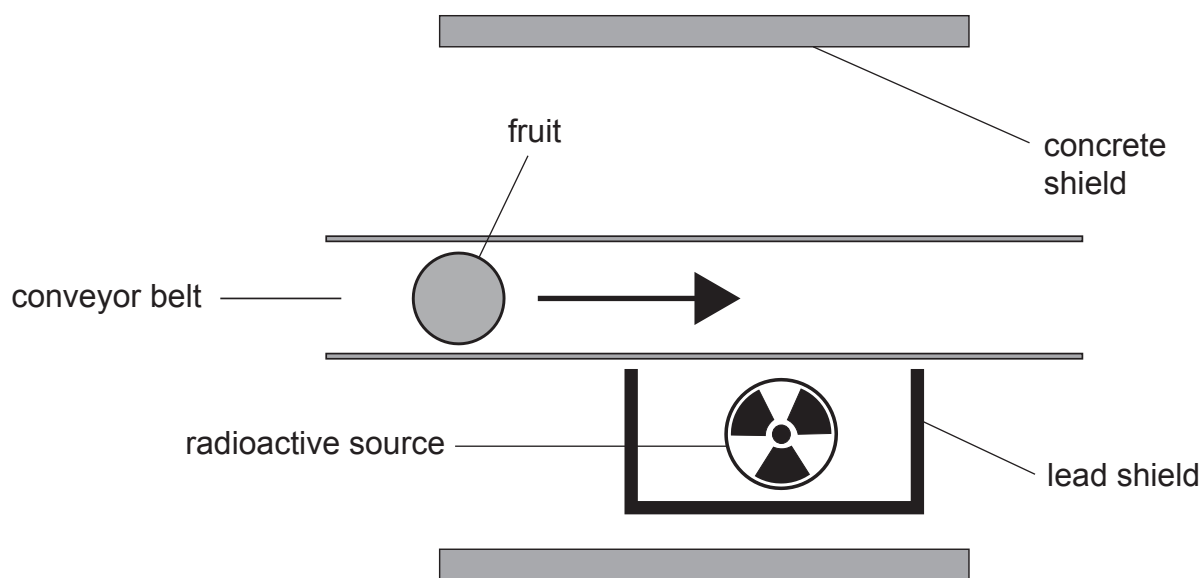
(iii) Explain why the Government wants to increase the use of wind turbines to generate electricity.

_____ [1]

[Turn over



10 In some countries fruit is irradiated with a radioactive source.



Source: Principal Examiner

(a) The table below gives some information about four radioactive sources.

Source	Type of radiation emitted	Half-life
A	alpha	78 minutes
B	beta	432 years
C	gamma	6 hours
D	gamma	5.26 years

(i) Which source **A**, **B**, **C** or **D** would be best to use to irradiate this fruit?
Explain your choice.

[2]



(ii) Explain fully why some fruit growers want to irradiate their fruit.

[2]

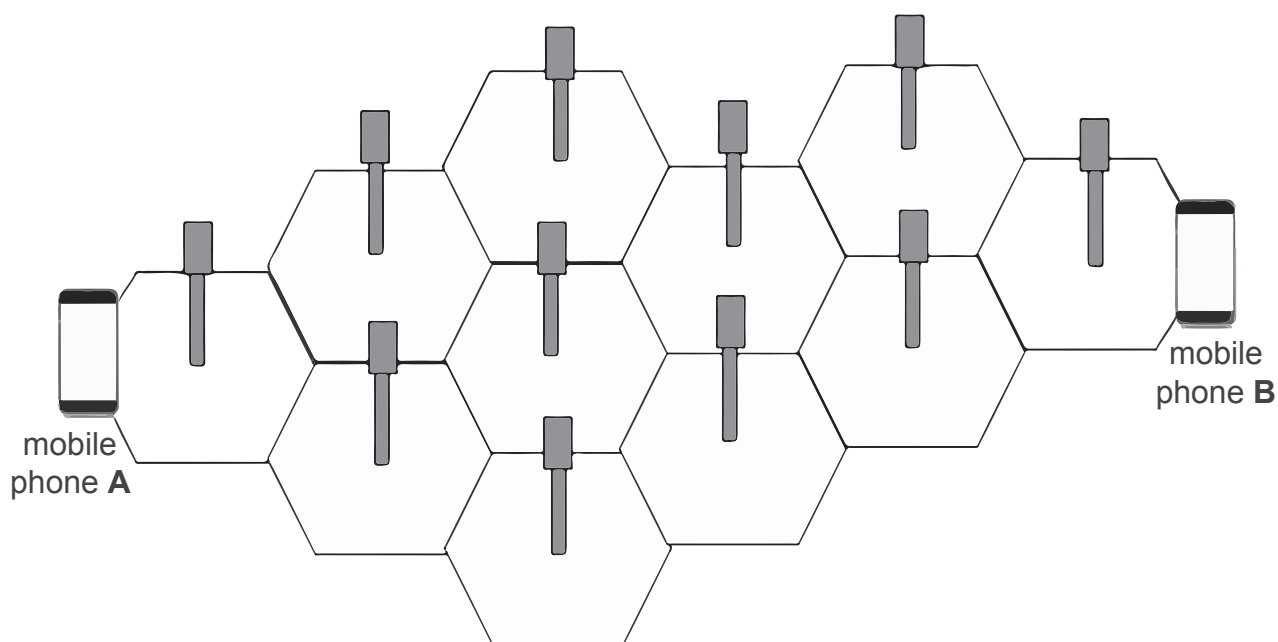
(b) Apart from irradiating fruit, give **one** other use for ionising radiation.

[1]

[Turn over



11 The diagram below shows a mobile phone network.



Source: Principal Examiner

Describe fully how a signal is transmitted from mobile phone **A** to mobile phone **B**.

Your answer should include:

- the type of electromagnetic wave used;
- the health risk of mobile phone use; and
- **two** ways that the risk can be reduced.

In this question you will be assessed on your written communication skills including the use of specialist scientific terms.





[6]

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Examiner Number

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