



General Certificate of Secondary Education  
2022–2023

Centre Number

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Candidate Number

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# Single Award Science: Physics

Unit 3  
Foundation Tier



[GSA31]

\*GSA31\*

**THURSDAY 25 MAY 2023, 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.

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\*32GSA3101\*

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

Planet	Distance from the Sun /km ( $\times 10^6$ )	Surface temperature /°C
Mercury	58	430
<b>X</b>	108	470
Earth	150	22
<b>Y</b>	228	-23
Jupiter	778	-150
Saturn	1427	-180
Uranus	2870	-210
Neptune	4497	-220

- (i) Name the planets labelled **X** and **Y** in the table.

**X** \_\_\_\_\_ **Y** \_\_\_\_\_ [2]

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

\_\_\_\_\_ [1]

- (b) Our Solar System consists of many different objects. Put the following objects in order of size, starting with the largest.

Earth

Comet

Sun

Moon

\_\_\_\_\_ largest  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ smallest

[2]



The photograph below shows the Barringer crater in Arizona.



(c) Name the type of object which collided with Earth to make this crater.

[1]

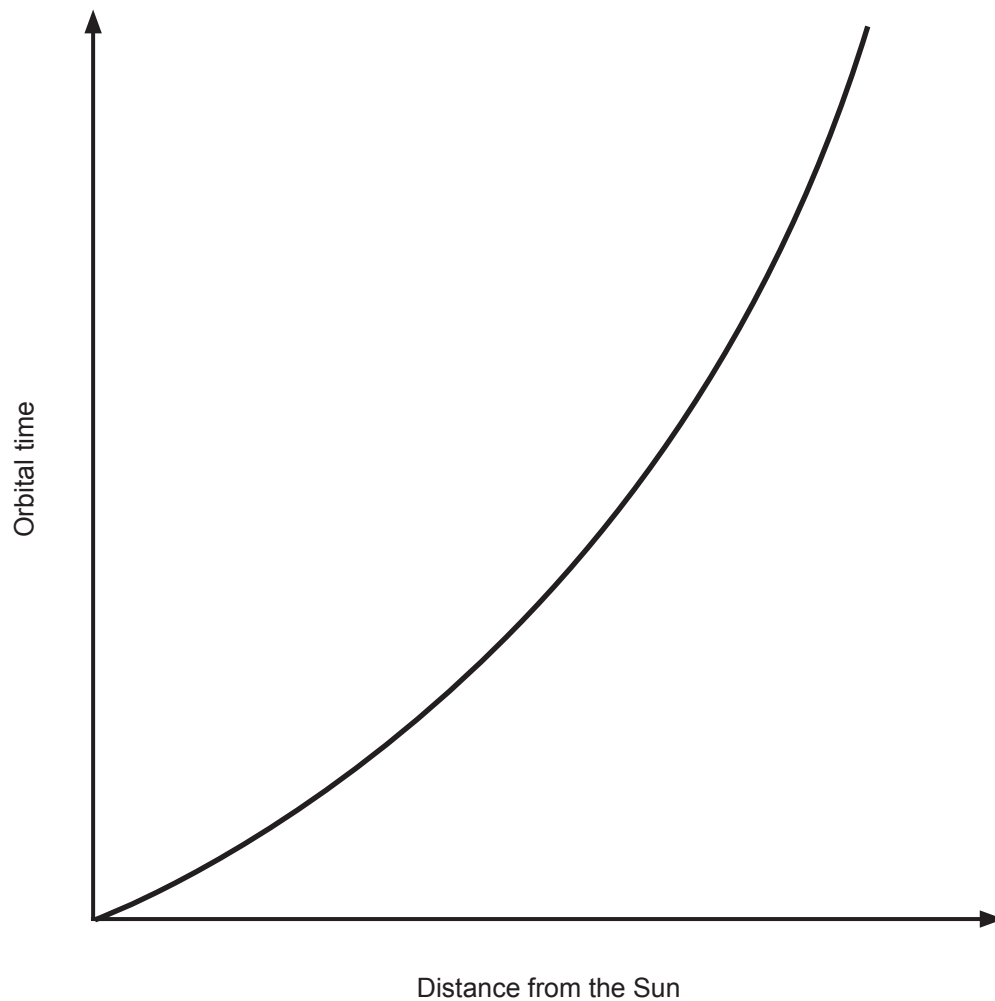
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\*32GSA3103\*

- (d) The graph below shows how the orbital time for a planet depends on its distance from the Sun.



- (i) Complete the following sentence to describe the trend shown by this graph.

As the distance from the Sun \_\_\_\_\_  
\_\_\_\_\_ [1]

- (ii) Name the force that keeps the planets in their orbits around the Sun.

\_\_\_\_\_ [1]



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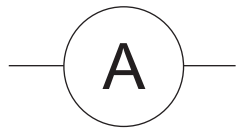
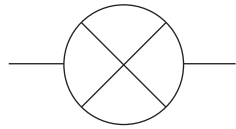

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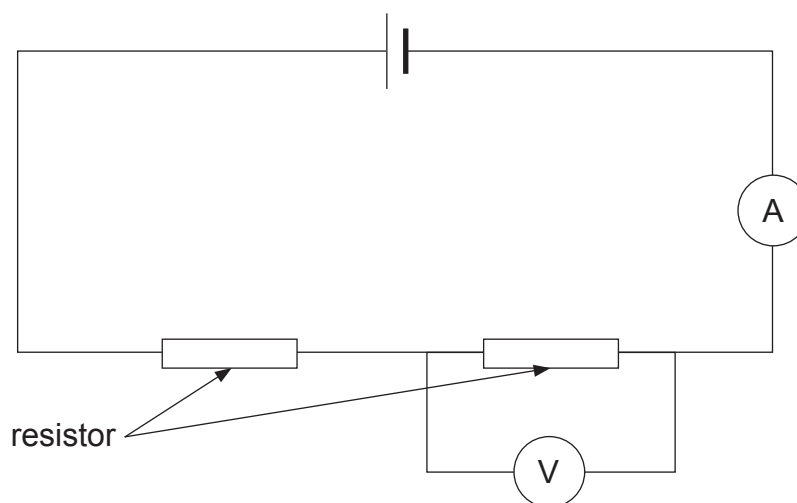
\*32GSA3105\*

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

Symbol	Name
	<div>cell</div>
	<div>ammeter</div>
	<div>bulb</div>

[2]

- (b) The diagram below shows an electrical circuit.



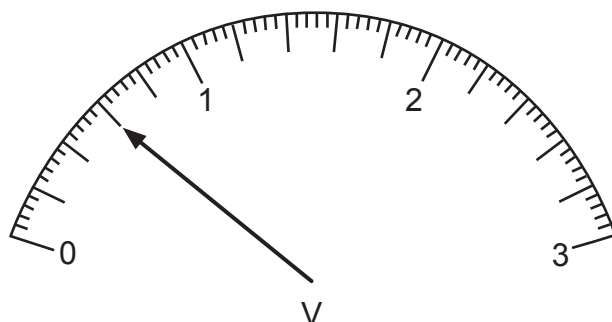
- (i) Complete the following sentence.

In this circuit the resistors are connected in \_\_\_\_\_  
with each other.

[1]



Shown below is the scale on the meter used to measure the voltage across one of the resistors.



(ii) Name this type of meter.

\_\_\_\_\_ [1]

(iii) What is the reading on this meter?

\_\_\_\_\_ V [1]

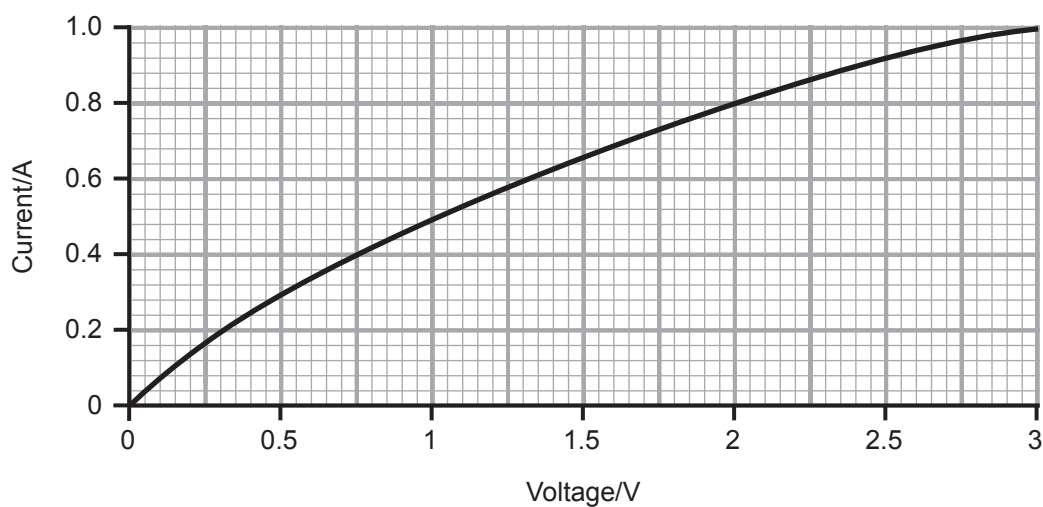
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\*32GSA3107\*

- (c) The graph below shows how the current through a bulb changes as the voltage increases.



- (i) Use the graph to find the current when the voltage is 2 V.

\_\_\_\_\_ A [1]

- (ii) Use the equation:

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

to calculate the resistance of the bulb when the voltage is 2 V.

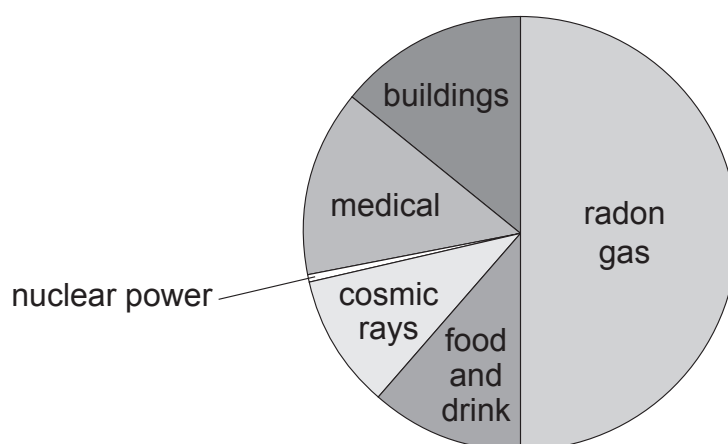
(Show your working out.)

\_\_\_\_\_  $\Omega$  [2]





- 3 The pie chart below shows the sources of radiation that are always around us.



- (a) Complete the following sentence.

Choose from:

**background**

**foreground**

**surround**

The radiation always around us is called \_\_\_\_\_ . [1]

- (b) From the pie chart above, name **one** natural source of radiation.

\_\_\_\_\_ [1]

- (c) There are three types of radiation: alpha, beta and gamma.

- (i) Which type of radiation travels furthest through air?

\_\_\_\_\_ [1]

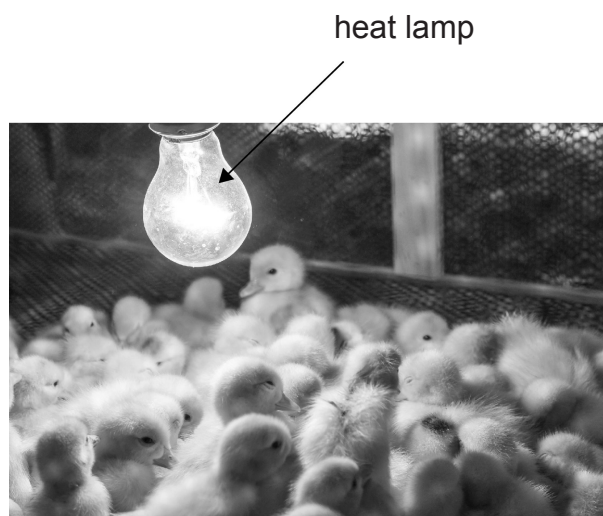
- (ii) Which type of radiation is stopped by a thin sheet of paper?

\_\_\_\_\_ [1]

[Turn over



- 4 A heat lamp is used to keep newly hatched chicks warm as shown below.



The heat lamp has an efficiency of 90%.

- (a) Place a tick (✓) in the box beside the statement that describes the term **efficient**.

How much energy a device uses.

☐

How good a device is at changing energy into useful energy.

☐

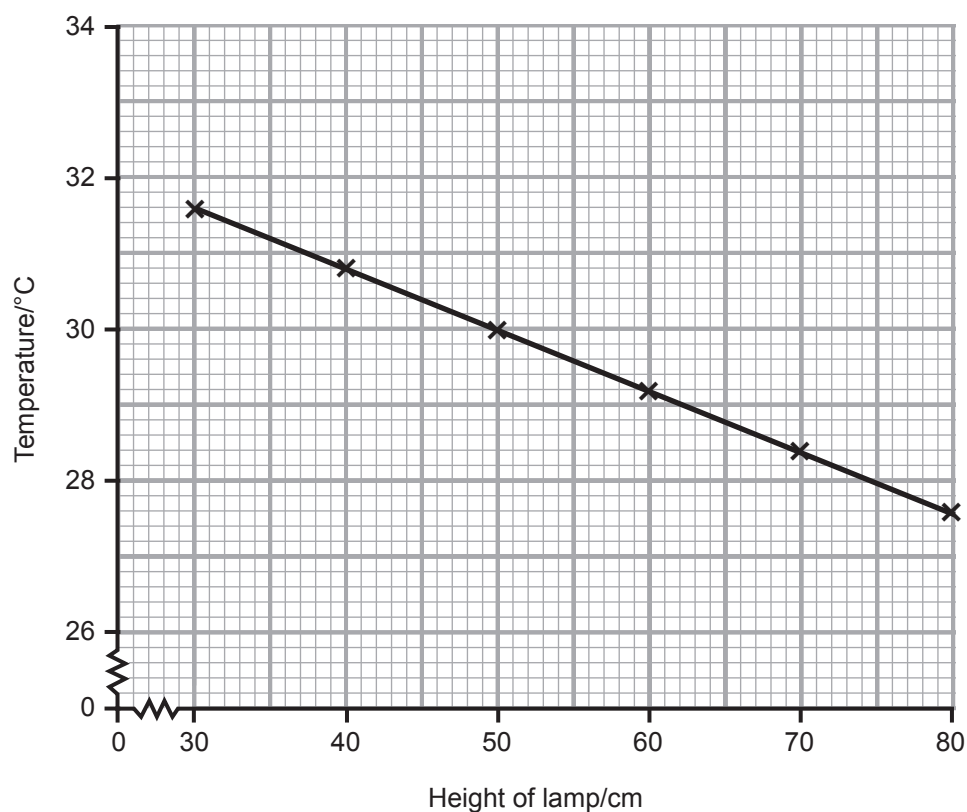
How much it costs to run a device.

☐

[1]



- (b) The temperature surrounding the chicks depends on the height of the lamp as shown in the graph below.



- (i) Give the trend shown by this graph.

\_\_\_\_\_

\_\_\_\_\_ [1]

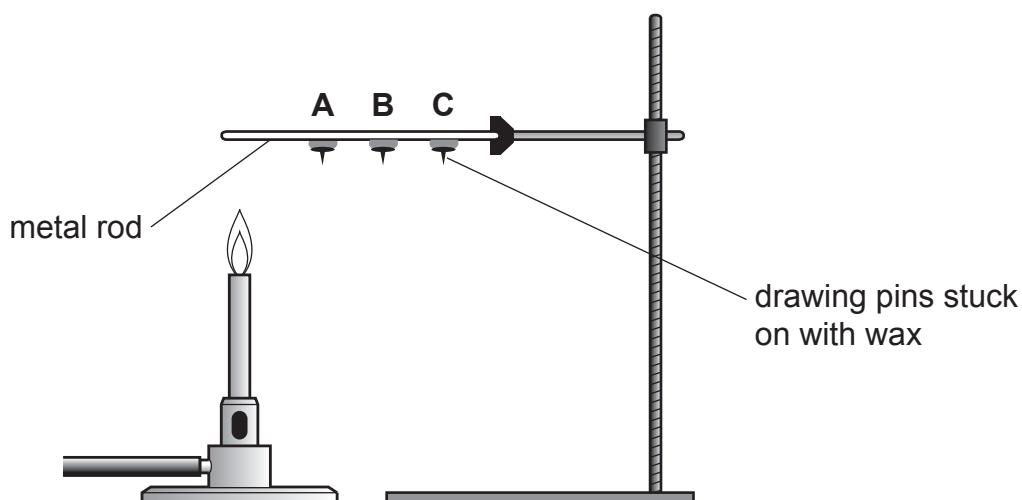
- (ii) A two-week old chick needs to be kept at a temperature of  $29^{\circ}\text{C}$ .  
Use the graph to find the height that the lamp should be placed at to give a temperature of  $29^{\circ}\text{C}$ .

\_\_\_\_\_ cm [1]

[Turn over



- 5 (a) The diagram below shows the apparatus used to investigate the heat transfer through a metal rod.



- (i) Which pin **A**, **B** or **C** will fall first?

\_\_\_\_\_ [1]

- (ii) Name the heat transfer method that carries heat through the rod.

\_\_\_\_\_ [1]

- (iii) Why is wax used to stick the drawing pins to the rod?

\_\_\_\_\_ [1]

- (iv) Complete the following sentence.

Choose from

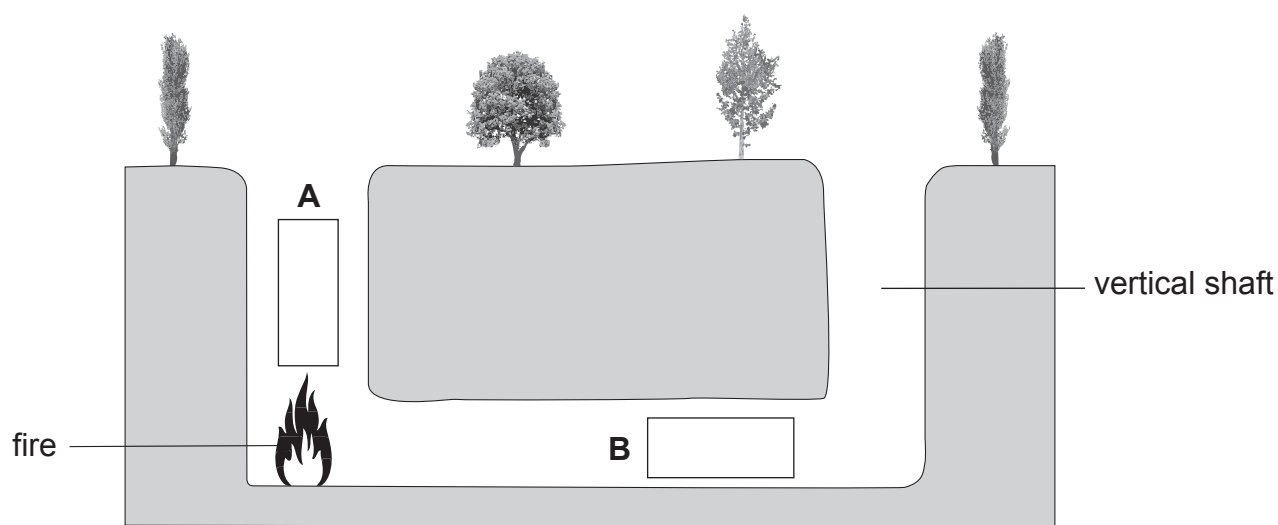
**less**                      :                      **the same**                      :                      **more**

If a glass rod is used instead of a metal rod, the drawing pins will take

\_\_\_\_\_ time to fall off. [1]



- (b) In the past underground mines were ventilated by having two vertical shafts with a fire at the bottom of one of them as shown in the diagram below.



- (i) Draw one arrow in each box (**A** and **B**) to show the direction in which air will be moving. [1]

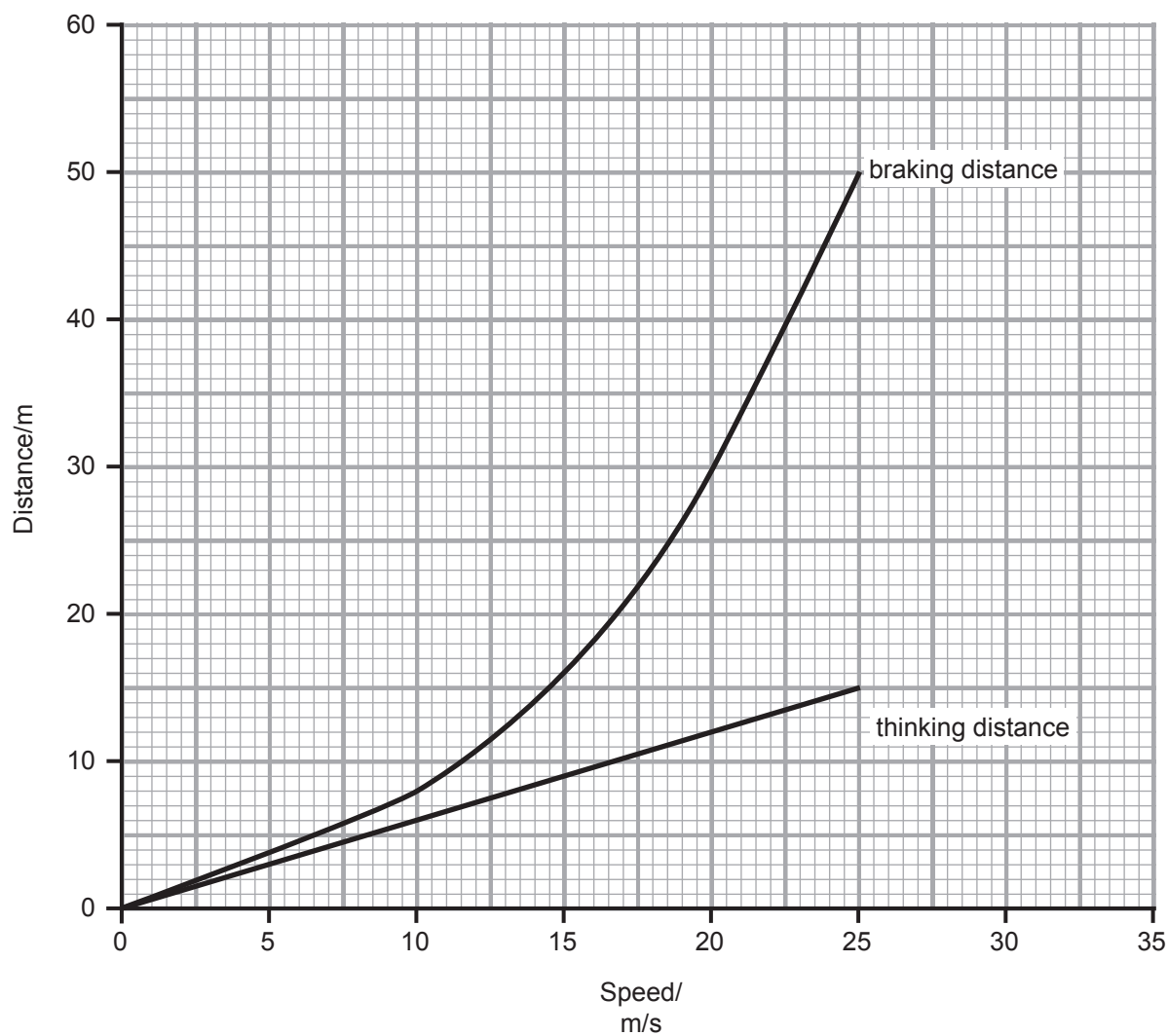
- (ii) Name the type of heat transfer that moves air through this underground mine.

\_\_\_\_\_ [1]

[Turn over]



- 6 (a) The graph below shows how the braking distance and the thinking distance change as the speed of a car increases.



- (i) Use the graph and the equation:

$$\text{stopping distance} = \text{thinking distance} + \text{braking distance}$$

to calculate the stopping distance at a speed of 15 m/s.

(Show your working out.)

\_\_\_\_\_ m [2]

- (ii) Use the graph to predict the thinking distance at a speed of 35 m/s.

\_\_\_\_\_ m [1]

[Turn over



- (b) Complete the table below by placing **one** tick (✓) in each row to give the effect, if any, of driving on a wet road compared to a dry road.

	Decrease	No effect	Increase
thinking distance			
braking distance			

[2]

The table below shows the effect that speed cameras had on the percentage of vehicles caught being driven above the speed limit.

	Percentage of vehicles exceeding the speed limit	
Speed limit/mph	Before cameras introduced	After cameras introduced
30	40	8.0
40	26	4.0
50	38	0.4

- (c) At which speed limit was the introduction of speed cameras the most effective?

\_\_\_\_\_ mph [1]

- (d) Apart from speed cameras, give **one** other traffic calming measure.

\_\_\_\_\_ [1]





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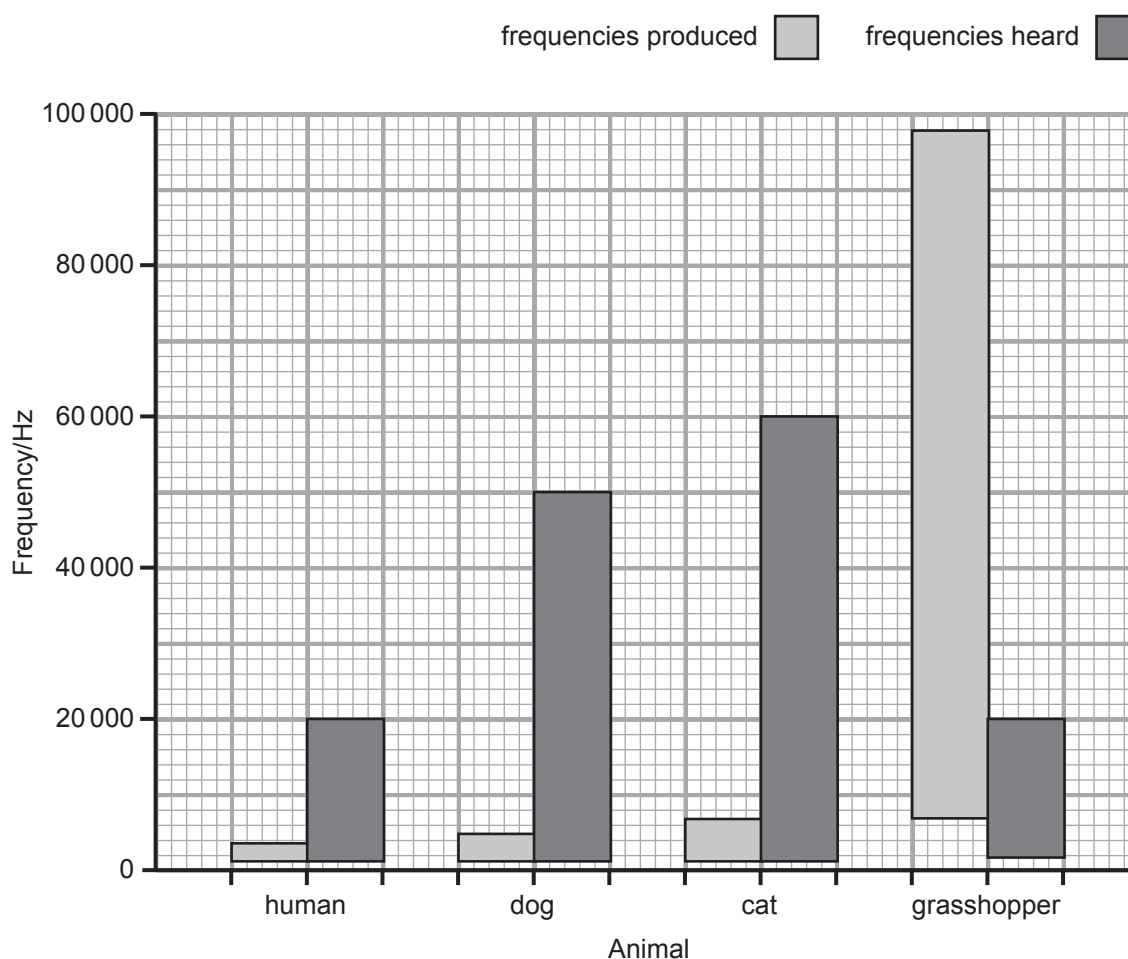
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\*32GSA3117\*

- 7 (a) The bar graph below shows the range of sound frequencies that some animals can produce and hear.



Use information from the graph to answer the following questions.

- (i) Which animal can **hear** sounds over the largest range of frequencies?

\_\_\_\_\_ [1]

- (ii) Which animal produces sounds that it **cannot** hear?

\_\_\_\_\_ [1]

- (iii) How many animals can hear ultrasound?

\_\_\_\_\_ [1]



(b) What type of wave is sound?

Choose from:

**converse**

**transverse**

**longitudinal**

[1]

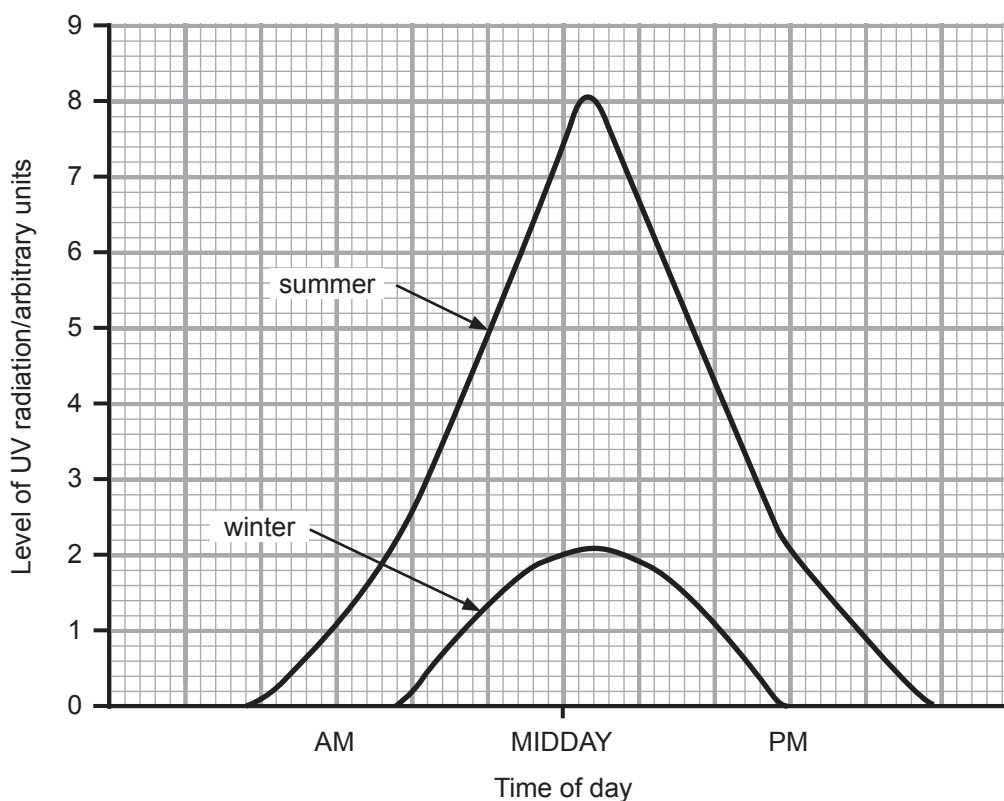
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\*32GSA3119\*

- 8 The graph below shows how the level of ultraviolet (UV) radiation from the Sun changed during a typical summer and winter day.



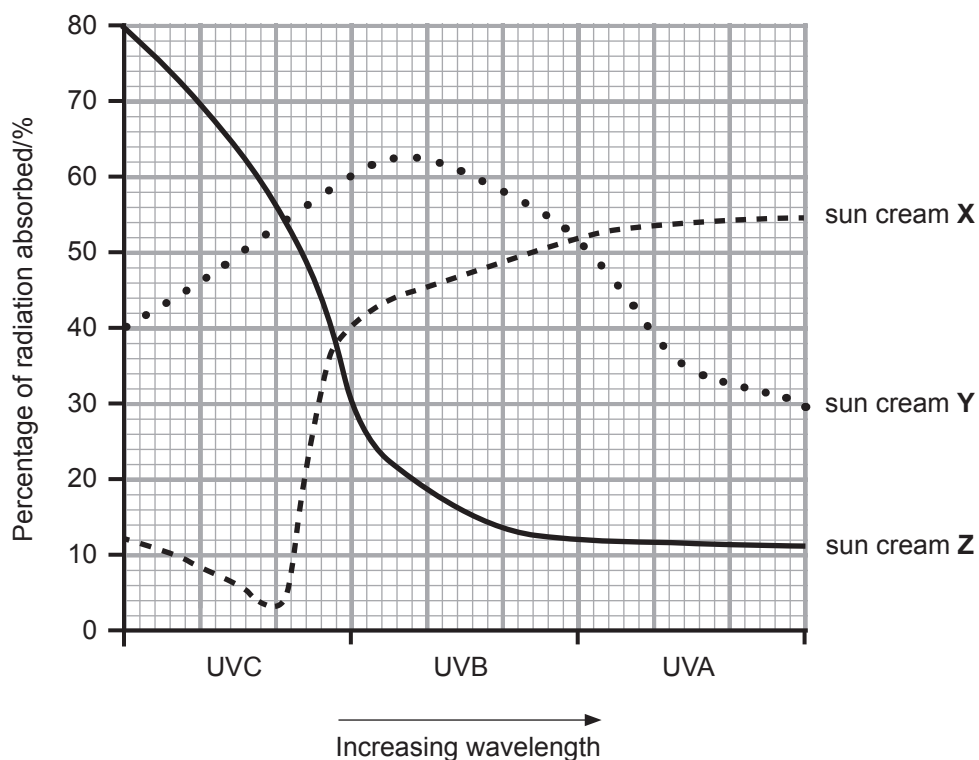
Skin needs to be protected by sun cream when the level of UV radiation goes above **3** arbitrary units.

- (a) Use information from the graph to suggest why sun cream sales are less in winter.

\_\_\_\_\_ [1]



- (b) Ultraviolet radiation is made up of UVA, UVB and UVC. The graph below shows the percentage of these UV radiations absorbed by different sun creams.



UVB causes the greatest amount of sunburn.

- (i) Which sun cream **X**, **Y** or **Z** would be most useful in trying to avoid sunburn?

\_\_\_\_\_ [1]

- (ii) Apart from sunburn, give **one** harmful effect that ultraviolet radiation can have on humans.

\_\_\_\_\_  
 \_\_\_\_\_ [1]

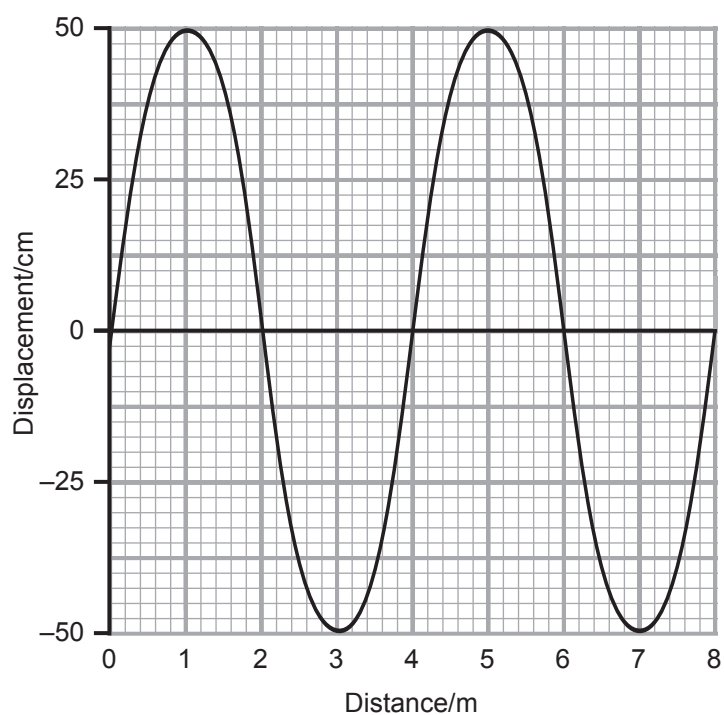
- (c) Give **one** useful application of ultraviolet radiation.

\_\_\_\_\_ [1]

[Turn over



9 The diagram below represents a water wave.



(a) What are the wavelength and amplitude of this water wave?

wavelength \_\_\_\_\_ m

amplitude \_\_\_\_\_ cm [2]





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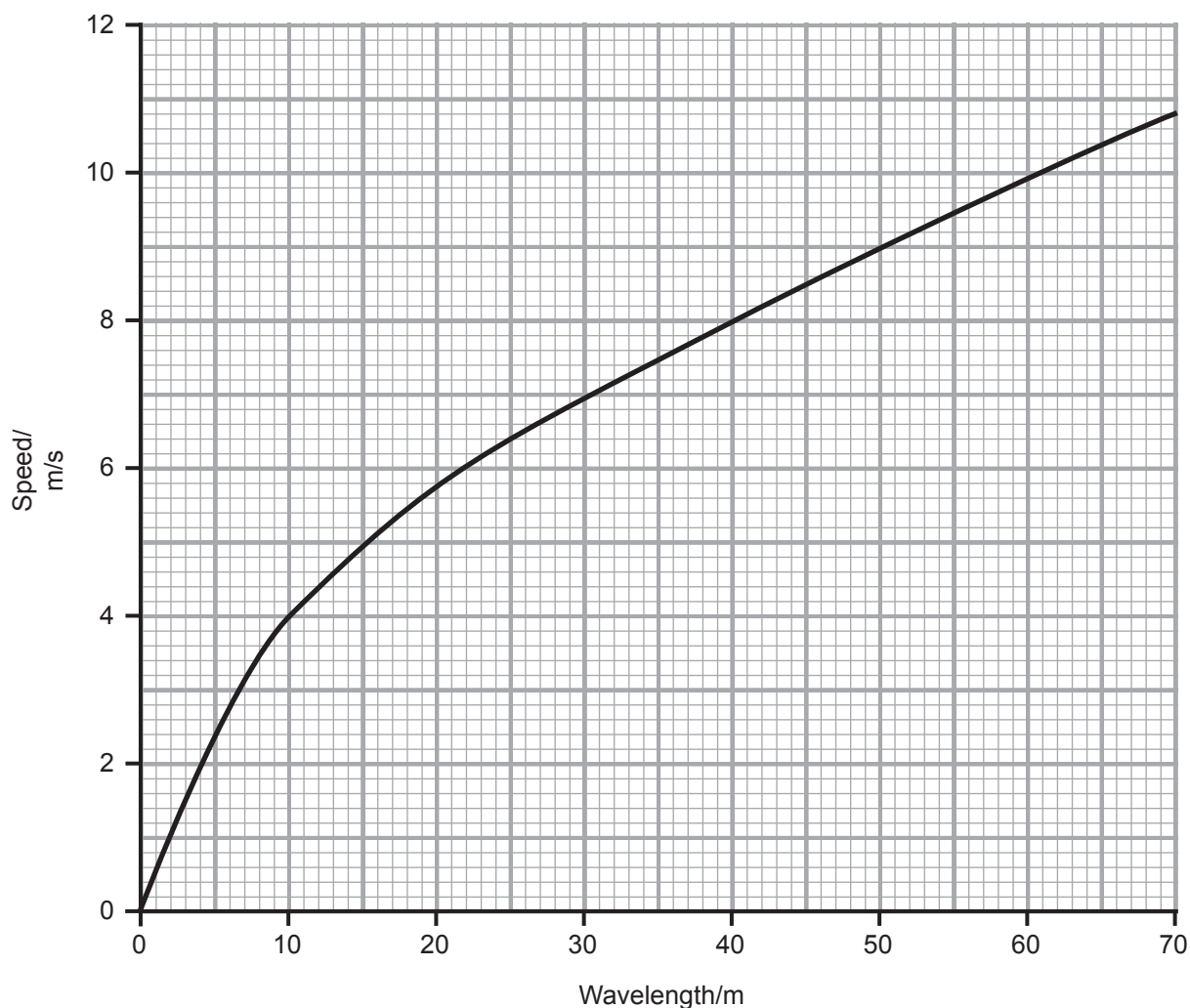
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\*32GSA3123\*

- (b) The graph below shows how the speed of a deep ocean wave depends on its wavelength.



- (i) Calculate how many times faster a wave with a wavelength of 40 m travels compared to a wave with a wavelength of 10 m.

\_\_\_\_\_ [1]





(ii) Use the equation:

$$\text{frequency} = \frac{\text{wave speed}}{\text{wavelength}}$$

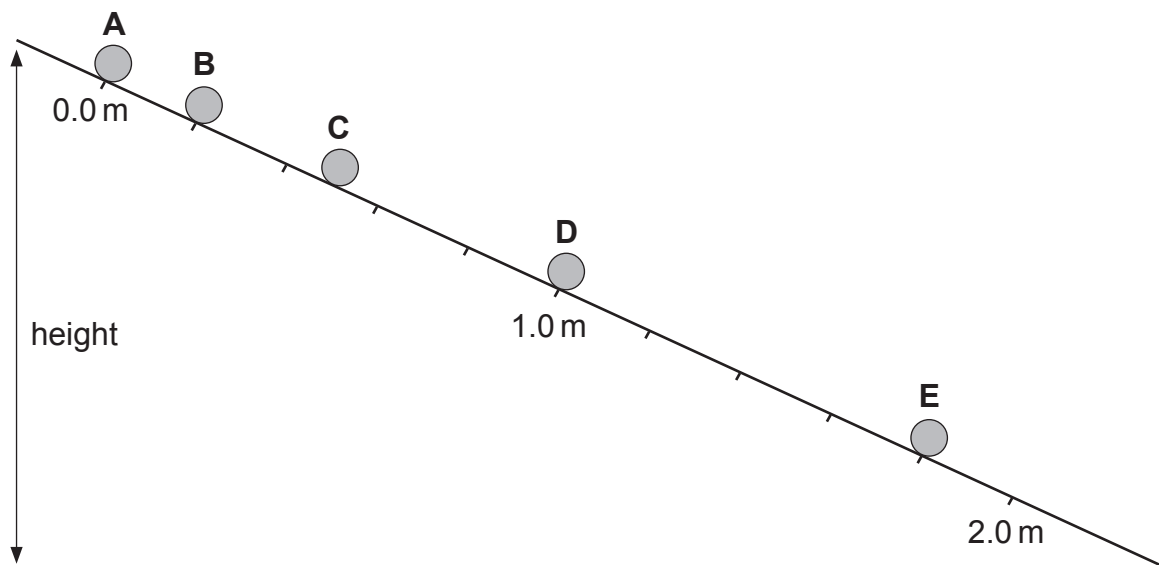
to calculate the frequency of a wave with a wavelength of 50 m.

(Show your working out.)

\_\_\_\_\_ Hz [2]



- 10 (a) The diagram below shows five positions of a ball (**A**, **B**, **C**, **D** and **E**) as it rolls down a slope.



- (i) What is the distance travelled by the ball from **A** to **E**?

\_\_\_\_\_ m [1]

It takes 0.5 s for the ball to roll between each position.

- (ii) What is the time taken for the ball to roll from **A** to **E**?

\_\_\_\_\_ s [1]

- (b) Use the equation:

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

to calculate the average speed as the ball rolled from **A** to **E**.

\_\_\_\_\_ m/s [1]



(c) Explain how the diagram shows that the ball is accelerating.

\_\_\_\_\_ [1]

(d) What change, if any, would there be in the average speed of the ball if the height of the slope was reduced?

\_\_\_\_\_ [1]

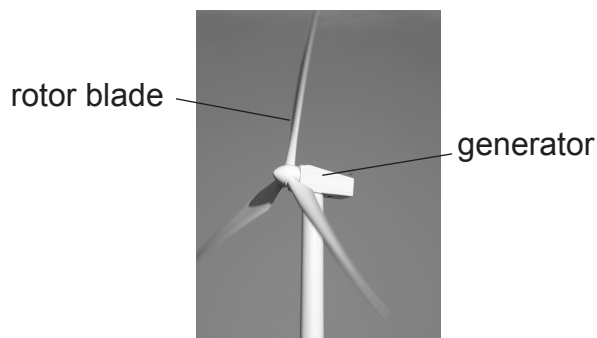
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\*32GSA3127\*

- 11 Electricity can be generated using a wind turbine. Wind is an example of a renewable source.



Describe why there is a recent increase in the use of renewable sources for generating electricity.

Your answer should include:

- a definition of a renewable source;
- **two** other examples of renewable sources;
- a description of how the **generator** on a wind turbine produces electricity; and
- **one** disadvantage of generating electricity from wind.

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

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[6]

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