



General Certificate of Secondary Education  
2017–2018

Centre Number

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Candidate Number

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## Science: Single Award

Unit 3 (Physics)

Foundation Tier

**MV18**

**[GSS31]**

**WEDNESDAY 23 MAY 2018, AFTERNOON**

### Time

1 hour, plus your additional time allowance.

### 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 on blank pages.**

Complete in black ink only.

Answer **all seven** questions.

### Information for Candidates

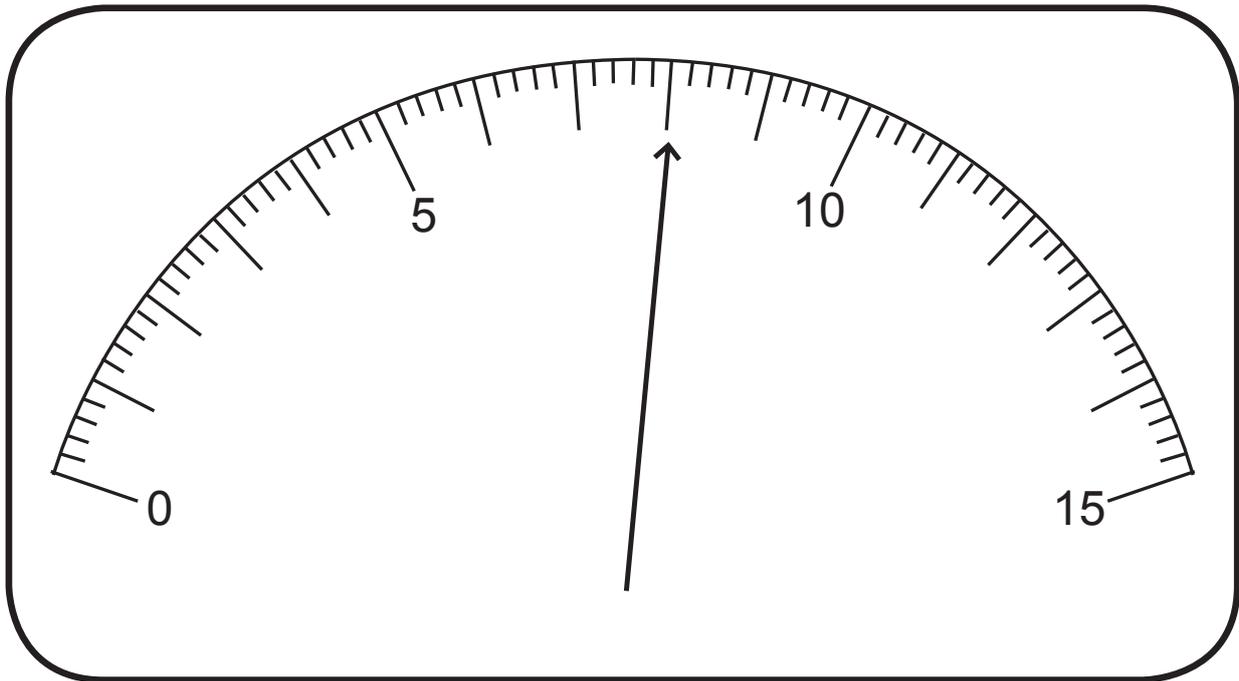
The total mark for this paper is 60.

Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in

Question **6(a)**.

- 1 (a) The diagram below shows a meter used to measure current in an electrical circuit.



- (i) What name is given to this type of meter?  
[1 mark]

Answer \_\_\_\_\_

- (ii) What is the reading on this meter? [1 mark]

Answer \_\_\_\_\_ A

(b) Given below are some electrical properties and units.  
Using lines, match each property to its correct unit.  
[2 marks]

**Property**

**Unit**

resistance

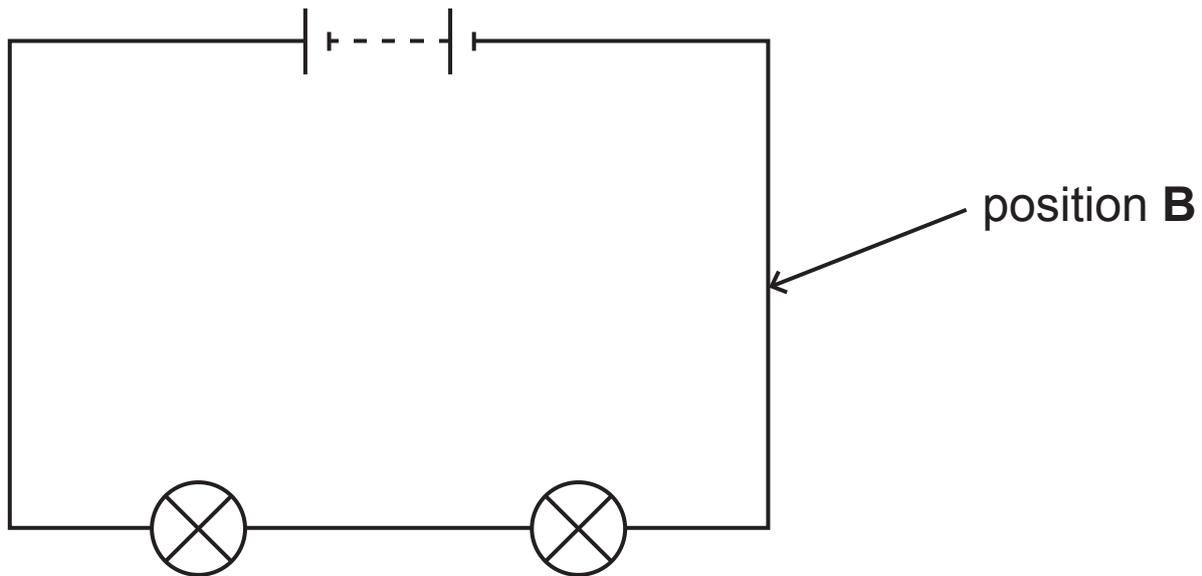
volt

joule

voltage

ohm

Shown below is a simple electrical circuit.



(c) Complete the sentences below. [2 marks]

Choose from:

**get brighter**

**short**

**get dimmer**

**parallel**

**stay the same**

**series**

In this circuit the bulbs are connected in

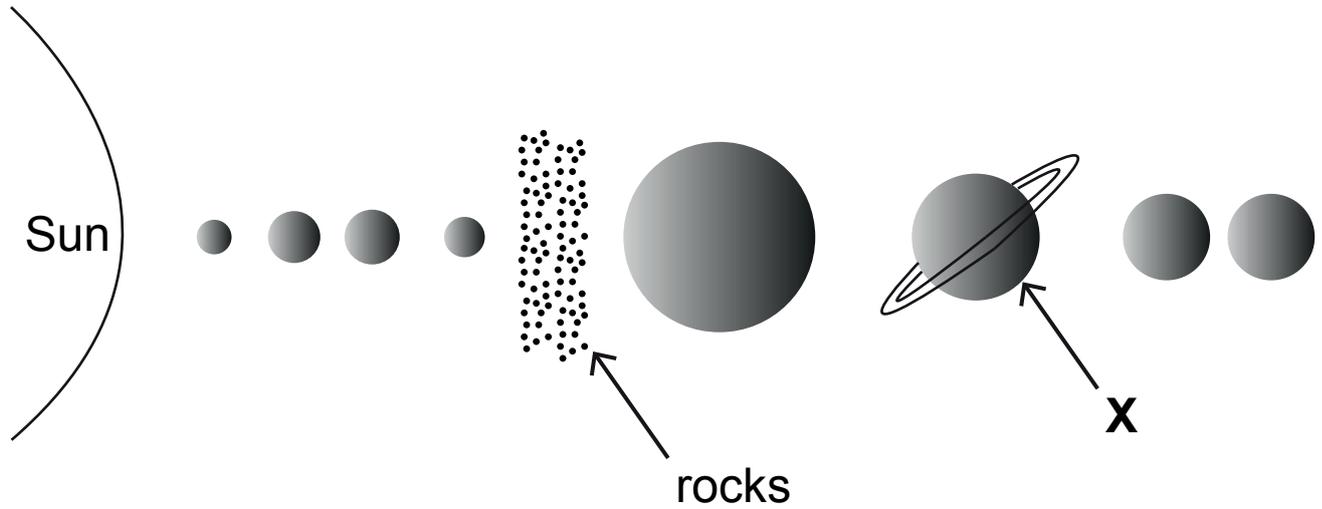
\_\_\_\_\_ .

If another bulb is added at position **B** the bulbs will

\_\_\_\_\_ .

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**(Questions continue overleaf)**

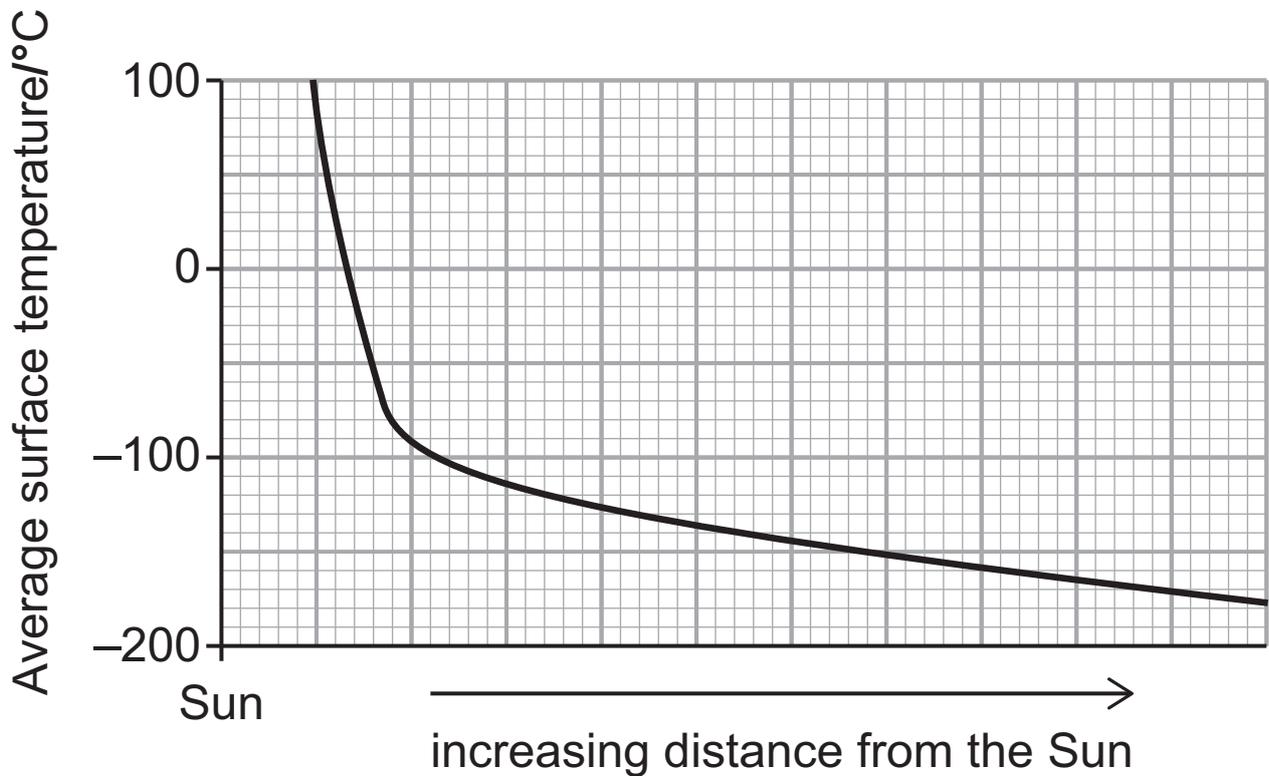
2 The diagram below shows our Solar System.



(a) Name the planet labelled **X**. [1 mark]

Answer \_\_\_\_\_

The graph below shows how the average surface temperature of some planets in our Solar System changes with their distance from the Sun.



(b) Complete the following sentence to give the trend shown by this graph. [1 mark]

As the distance from the Sun increases

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(c) Place a tick (✓) beside the statement that describes the movement, if any, of most of the galaxies in the Universe. [1 mark]

moving closer to each other

staying the same distance apart

moving away from each other

(d) Complete the sentences below. [2 marks]

Choose from:

**moon**

**star**

**galaxy**

**planet**

An object that orbits a planet is called a

---

An object that orbits a star is called a

---

The photograph below shows a crater formed millions of years ago when an object hit the Earth.



(e) Name the type of object which caused this crater.  
[1 mark]

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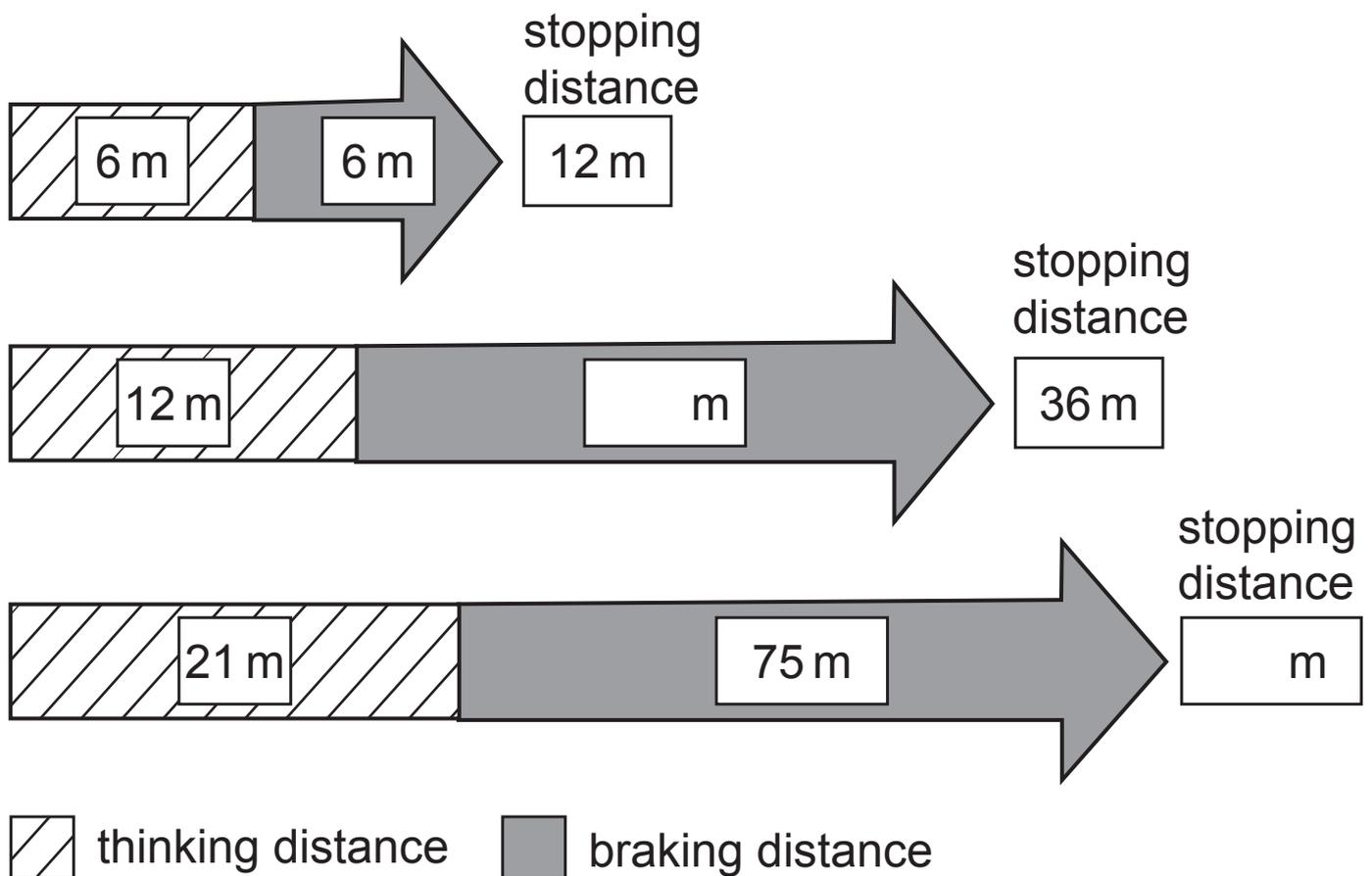
- 3 (a) The diagram below gives the stopping distances for a car travelling at different speeds.

Use the equation:

**thinking distance + braking distance = stopping distance**

to complete the diagram below. [2 marks]

There are **two** values to calculate.



The photograph below has been used to warn drivers about the dangers of driving when tired. Tiredness can slow a driver's reactions.



(b) Complete the table below by placing **one** tick (✓) in each row to give the effect, if any, of slower reactions.  
[3 marks]

	Decrease	No effect	Increase
reaction time			
thinking distance			
braking distance			

- (c) The table below shows how the blood alcohol content (BAC) in females is affected by body mass and number of alcoholic drinks.

		Blood alcohol content %		
		60 kg	80 kg	100 kg
Number of alcoholic drinks	Body mass			
	1	0.04	0.03	0.02
	2	0.08	0.06	0.05
	3	0.11	0.09	0.07
	4	0.15	0.11	0.09
	5	0.19	0.14	0.10

- (i) State the effect that increasing body mass has on blood alcohol content (BAC). [1 mark]

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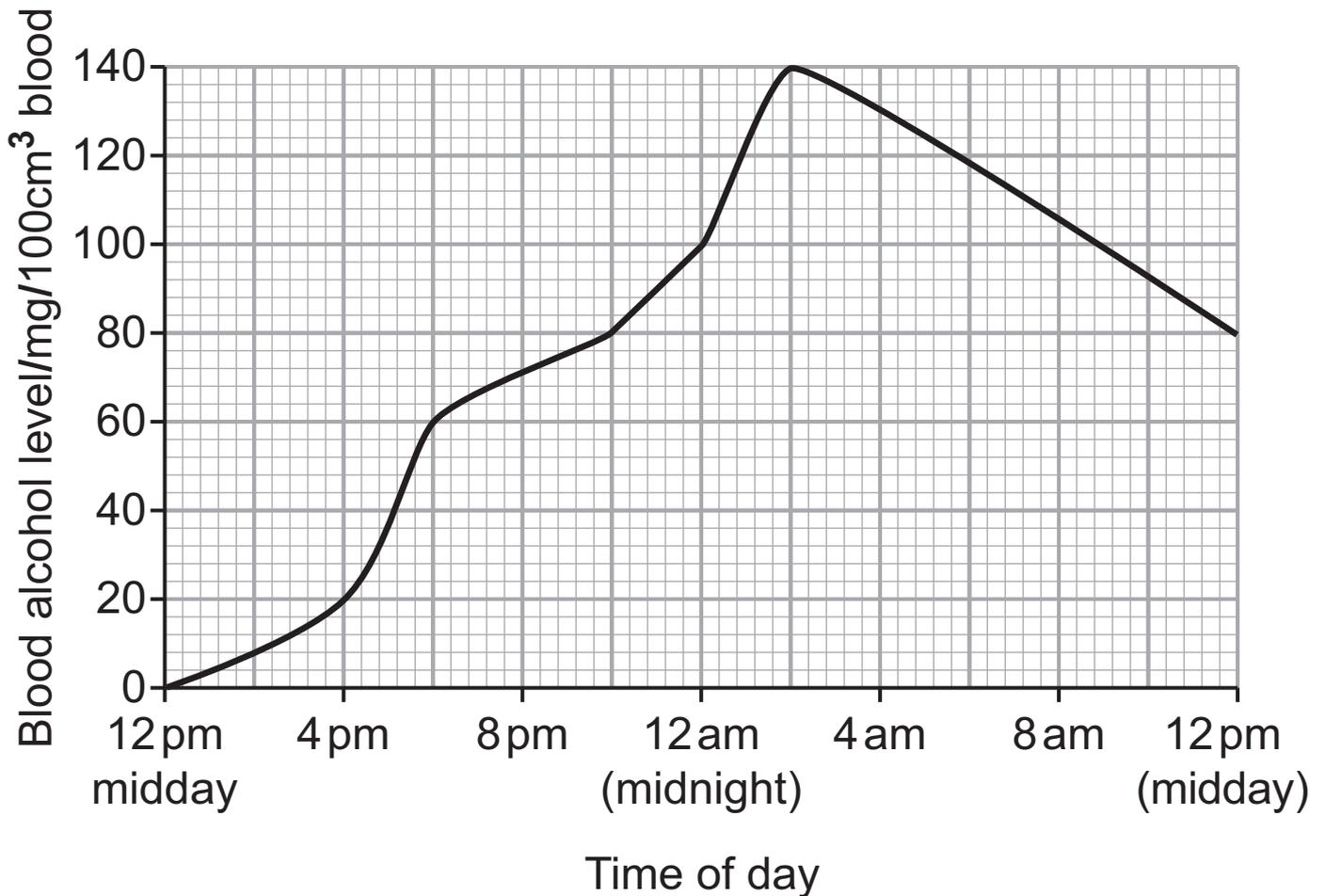
- (ii) Give **one** other conclusion that can be made from this data. [1 mark]

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- (d) Maureen started drinking alcohol at midday. The graph below shows how her blood alcohol level changed over the next 24 hours.



The legal limit to drive in the UK is a blood alcohol level of  $80 \text{ mg}/100 \text{ cm}^3$  blood.

- (i) At what time did Maureen first go over the legal limit for driving? [1 mark]

Answer \_\_\_\_\_

- (ii) Explain fully why Maureen should **not** drive at 8am the following day. [2 marks]

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- 4 (a) Complete the sentences below about waves.  
[2 marks]

Choose from:

**energy**

**longitudinal**

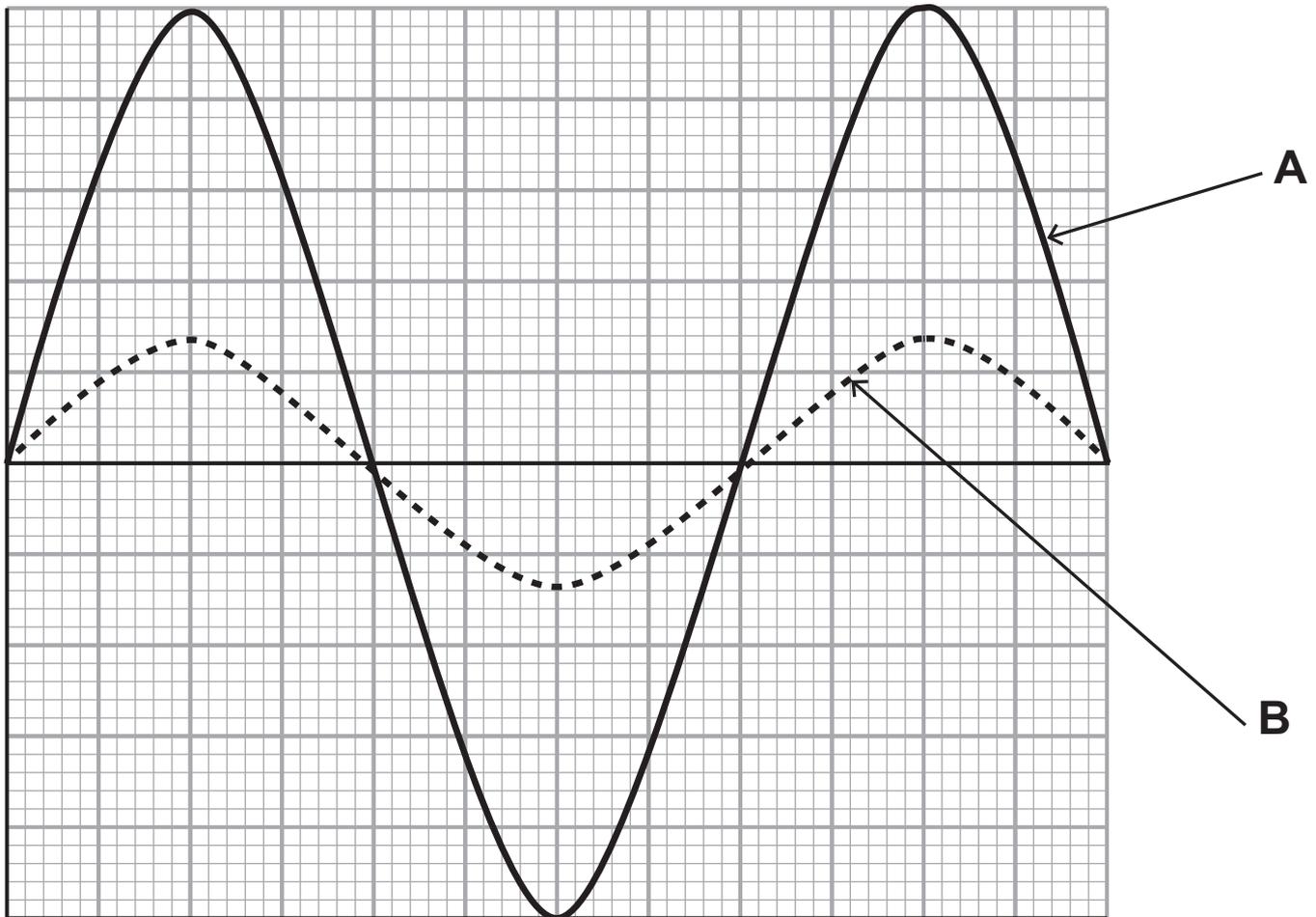
**vibrations**

**wavelength**

A wave is a series of \_\_\_\_\_ .

Waves carry \_\_\_\_\_ from one place to another.

The diagram below represents two waves **A** and **B**.



**(b)** Waves can be described by features such as amplitude, wavelength and frequency.

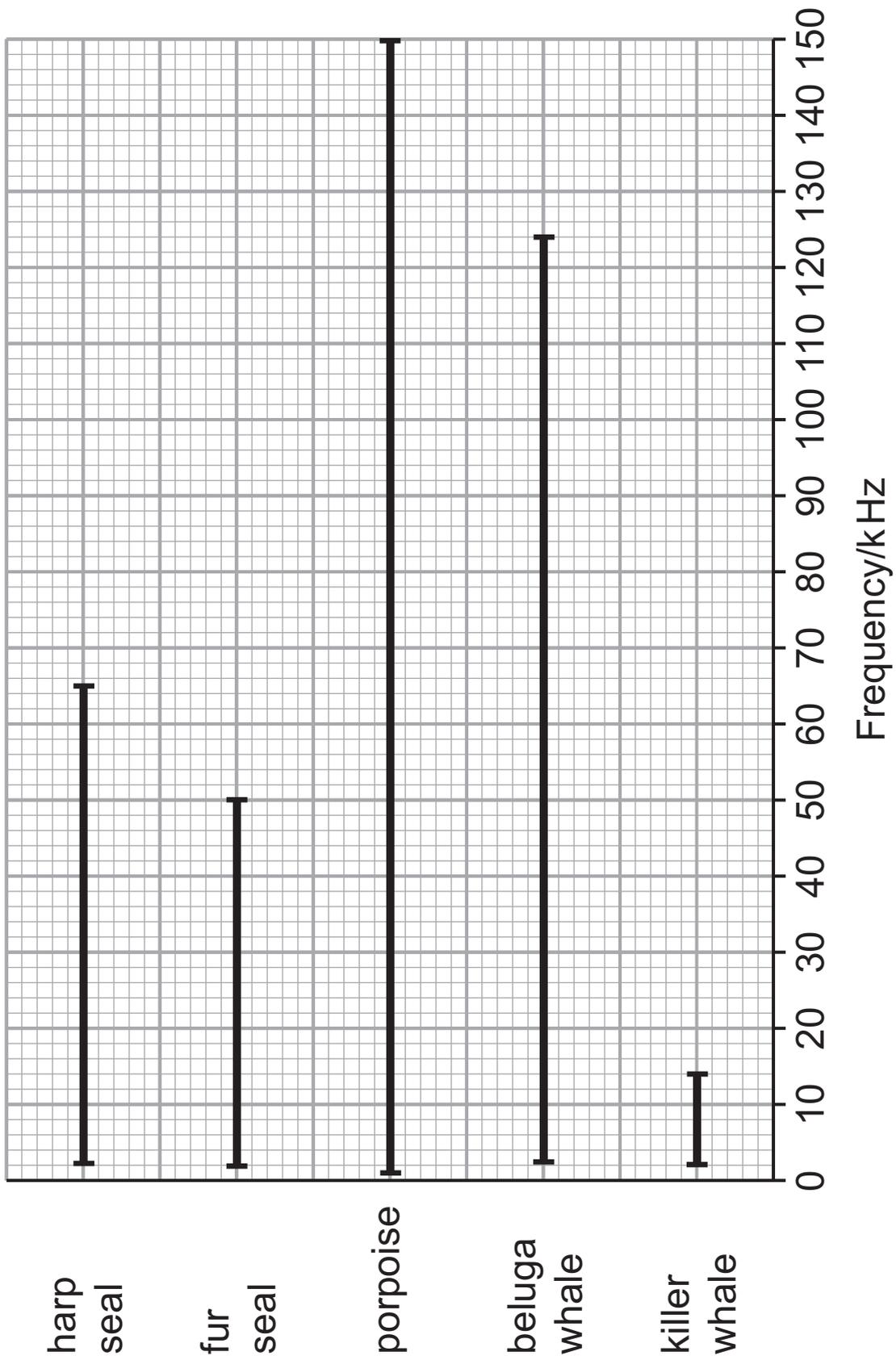
Give **one** feature of waves **A** and **B** which is:

[1 mark for each]

**(i)** the same. \_\_\_\_\_

**(ii)** different. \_\_\_\_\_

(c) The chart below shows the hearing range of different sea mammals.



- (i) How many of these mammals can hear ultrasound?  
[1 mark]

Answer \_\_\_\_\_

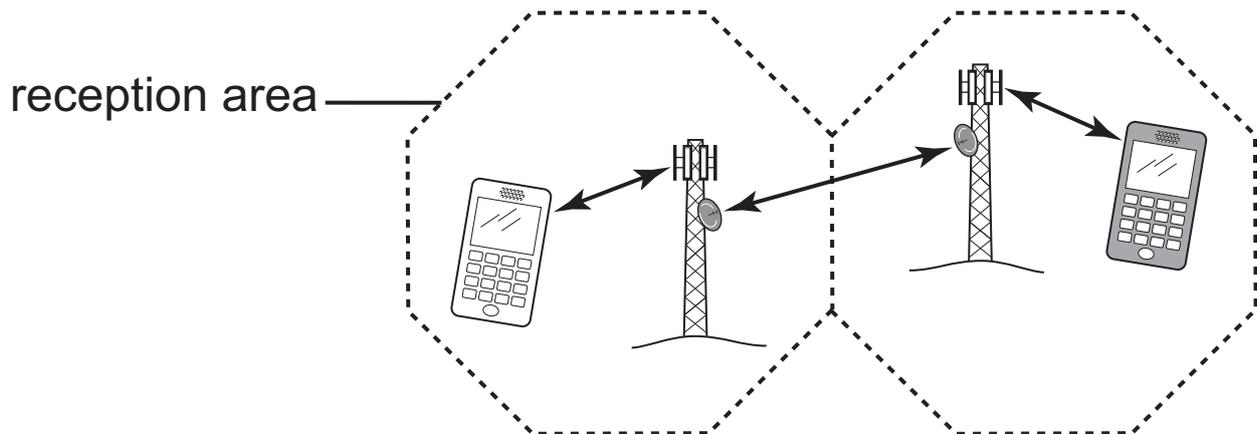
- (ii) The fur seal can hear up to 50 kHz. Give this value  
in Hertz (Hz). [1 mark]

Answer \_\_\_\_\_ Hz

- (d) What is the **lowest** frequency a human can hear?  
[1 mark]

Answer \_\_\_\_\_

(e) The diagram below shows how mobile phones transmit signals from one phone to another.



(i) Name the type of electromagnetic wave used to carry mobile phone signals. [1 mark]

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(ii) What name is given to the reception area around a phone mast? [1 mark]

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- (f) The table below shows the signal power at different distances from a mobile phone mast.

Distance/m	Power/W/m <sup>2</sup>
1	80.0
3	9.0
5	3.0
10	0.8
50	0.03

In the UK power levels above  $2 \text{ W/m}^2$  are considered to be a risk to health.

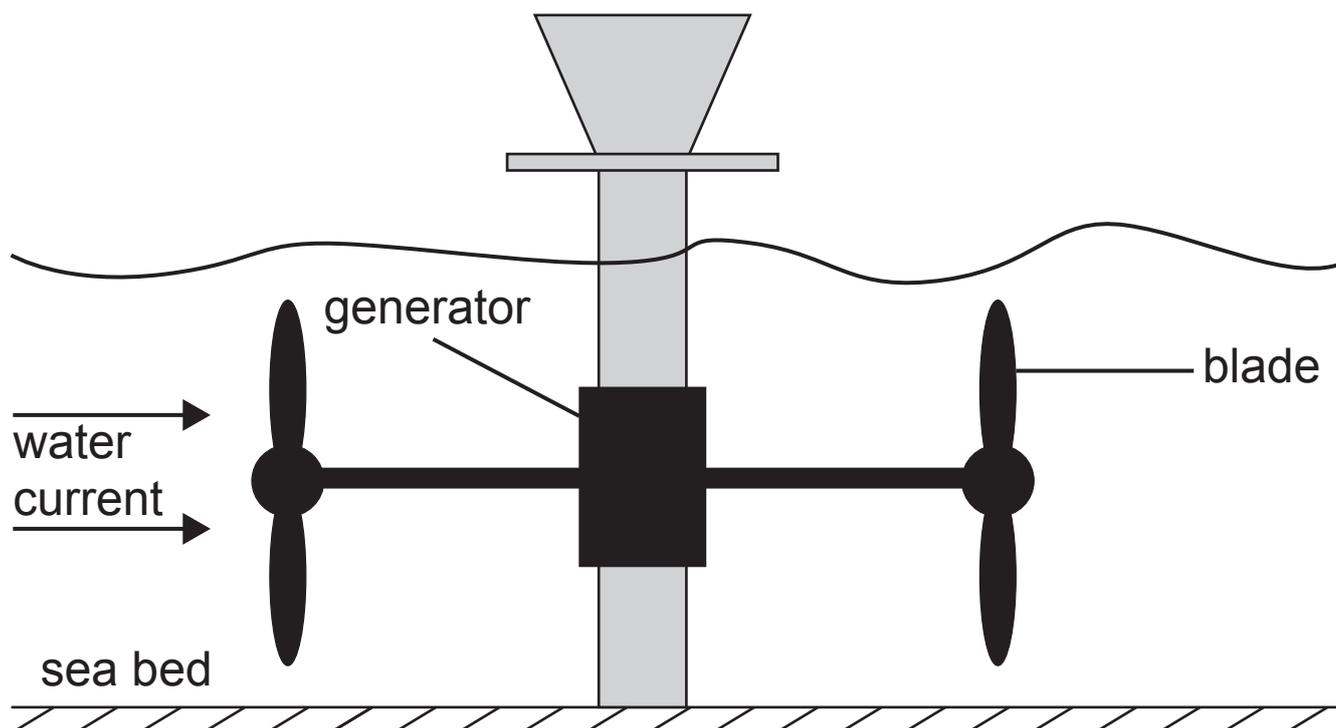
- (i) Use information from the table to suggest the closest distance you could live to a mobile phone mast to avoid these health risks. [1 mark]

Answer \_\_\_\_\_ m

- (ii) Name **one** health risk linked to the use of mobile phones. [1 mark]
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- 5 (a) The diagram below shows a tidal turbine which uses water currents to generate electricity.



- (i) Tidal energy is a form of renewable energy. What is meant by the term renewable energy? [1 mark]

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- (ii) Use the diagram and your knowledge to explain fully how water currents produce electricity in the generator. [3 marks]

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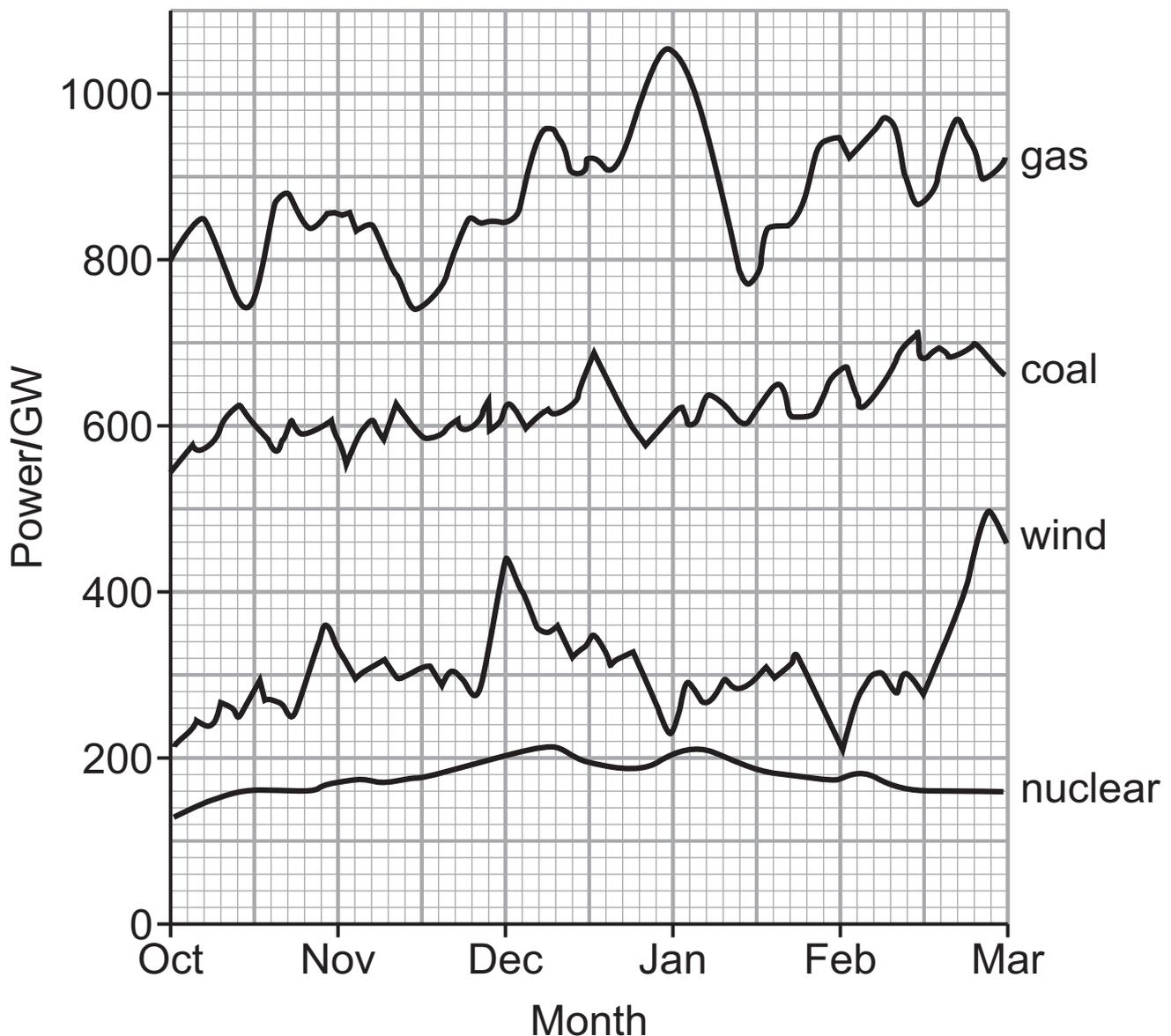
- (iii) Give **one** disadvantage of tidal turbines. [1 mark]

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(b) The graph below shows the power produced per day by different energy sources from October to March for part of the United Kingdom.



(i) Name the **two** fossil fuels shown in this graph.  
[1 mark]

\_\_\_\_\_

and \_\_\_\_\_

- (ii) Calculate the difference between the maximum and minimum power produced by **wind**. [2 marks]

(Show your working out.)

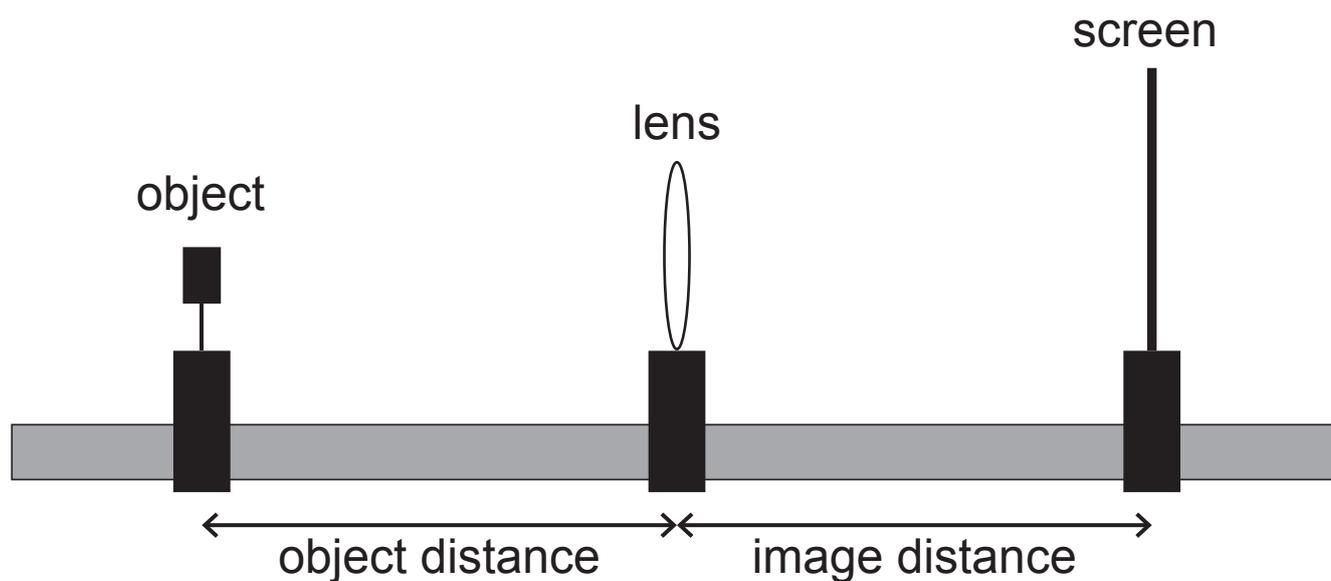
Answer \_\_\_\_\_ GW

- (iii) Suggest **one** reason why the power produced by wind varies so much. [1 mark]
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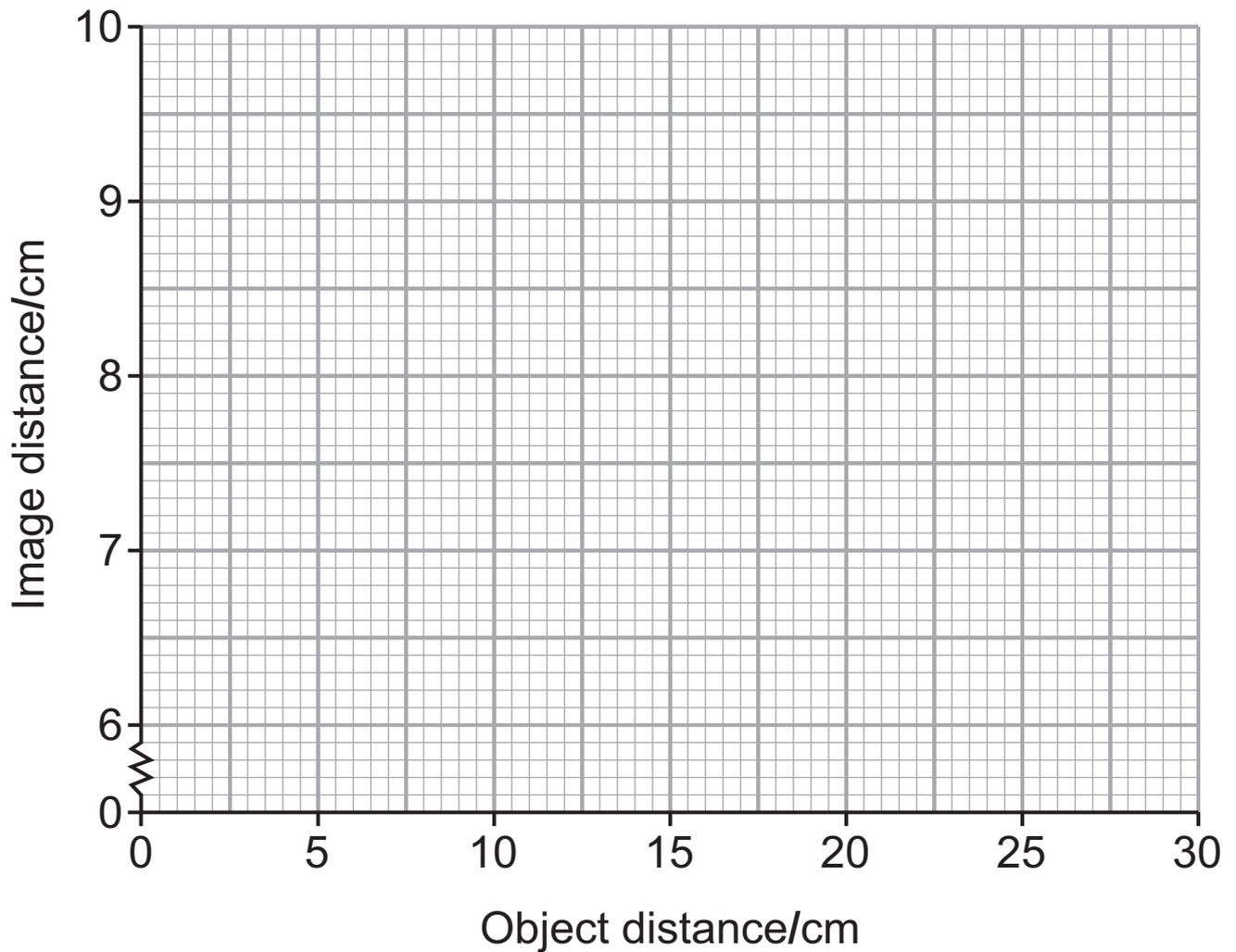
(b) A student used the apparatus below to investigate a lens.



She set the object distance at 10 cm from the lens and moved the screen until it showed a clear image. She repeated this with different object distances. Her results are shown below.

Object distance/cm	Image distance/cm
10	10.0
15	7.5
20	6.7
25	6.2
30	6.0

- (i) On the grid below plot and draw a line graph of these results. [3 marks]

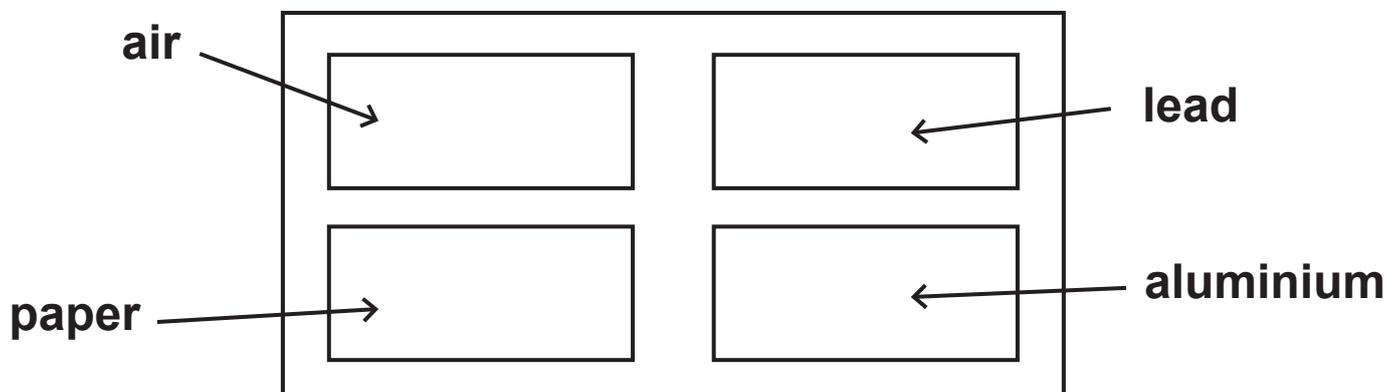


- (ii) State the trend shown by these results. [1 mark]

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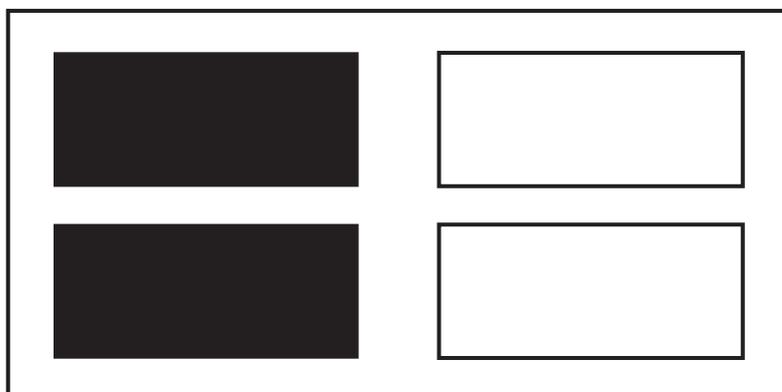
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- 7 (a) Scientists who work in nuclear power stations must wear a special badge. The badge consists of a radiation sensitive film covered by four different materials, as shown in the diagram. These materials may or may not stop the different types of radiation passing to the film.



The film turns black if any radiation reaches it by passing through the material.

Shown below is the badge worn by one of the scientists.



- (i) Use the information given to identify **one** type of radiation (**alpha**, **beta** or **gamma**) that was present. Explain your answer fully. [3 marks]

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- (ii) Some of the radiation present is background radiation. What is meant by the term background radiation? [1 mark]

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- (iii) Radon gas is a source of background radiation. Give one other source of **natural** background radiation. [1 mark]

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The table below shows the effect of radon gas on both smokers and non-smokers.

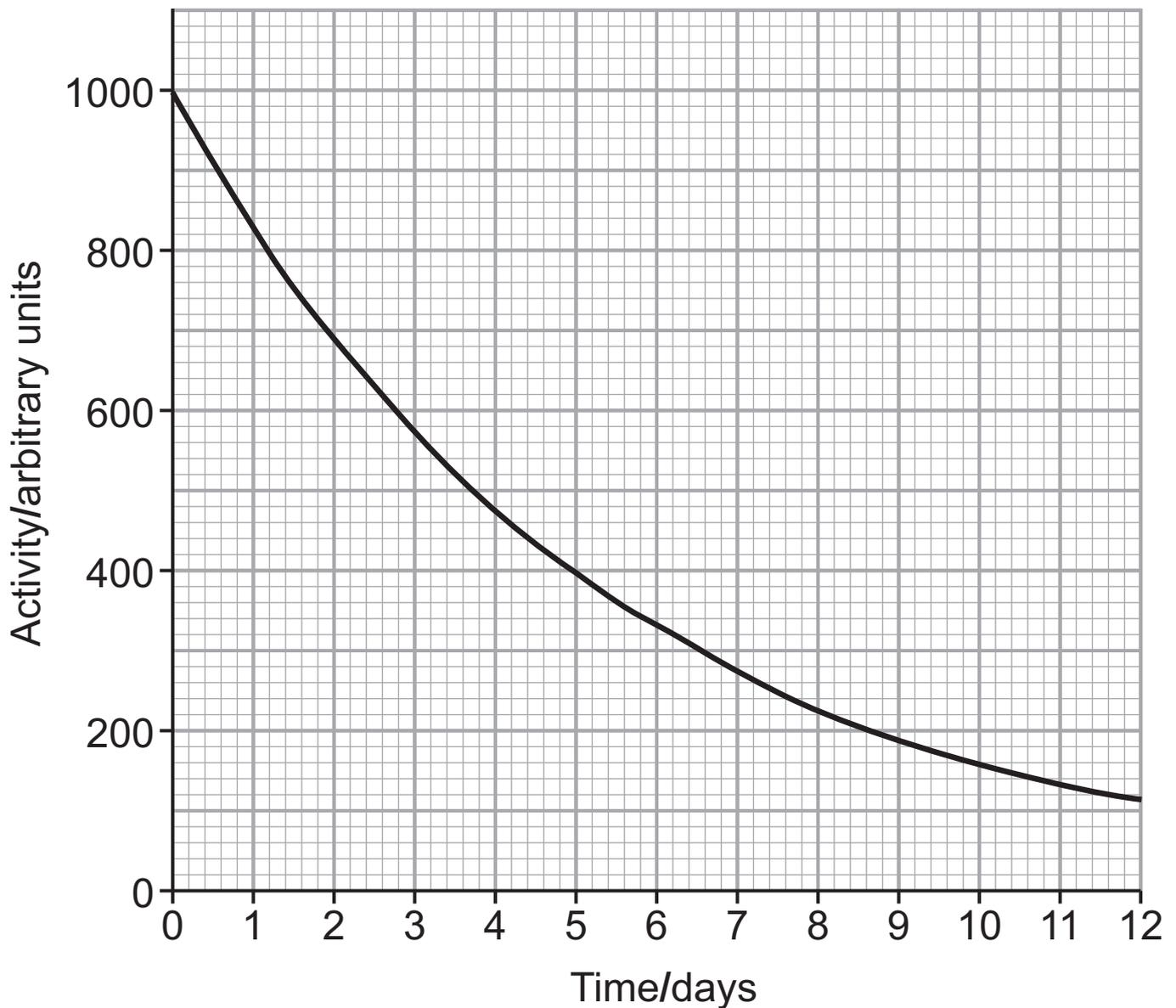
Indoor radon level Bq/m <sup>3</sup>	Chance of lung cancer/%	
	Non-smoker	Smoker
20	0.50	14.00
200	0.55	20.00
800	1.00	34.00

- (b) Give **one** conclusion that can be made from this information. [1 mark]

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The graph below shows how the radioactivity of radon-222 changes with time.



(c) Use the graph to find the half-life of radon-222.

[1 mark]

Answer \_\_\_\_\_ days

(d) Another radon source has a half-life of 1 minute. What fraction, if any, will be left after 2 minutes? [1 mark]

Circle the correct answer.

$\frac{1}{2}$        $\frac{1}{4}$        $\frac{1}{8}$       0

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**THIS IS THE END OF THE QUESTION PAPER**

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**SOURCES**

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Q3(b) . . . . © Contraband Collection / Alamy Stock Photo

Q4(e) . . . . © Graham-Cameron Illustration

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	

<b>Total Marks</b>	
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Examiner Number

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