Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2017–2018

Science: Single Award

Unit 3 (Physics)

Foundation Tier

ML

[GSS31]

WEDNESDAY 23 MAY 2018, AFTERNOON

TIME

1 hour, plus your additional time allowance.

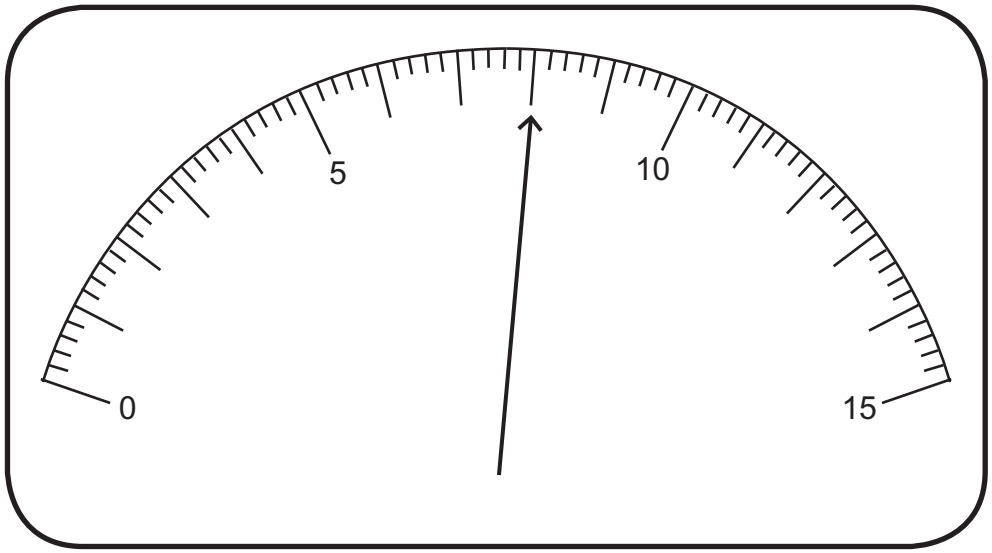
INSTRUCTIONS TO CANDIDATES

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 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 seven** 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 **6(a)**.

1 **(a)** Look at the diagram below. It shows a meter used to measure current in an electrical circuit.



(i) What is this type of meter called?

Answer _____ [1]

(ii) What is the reading on this meter?

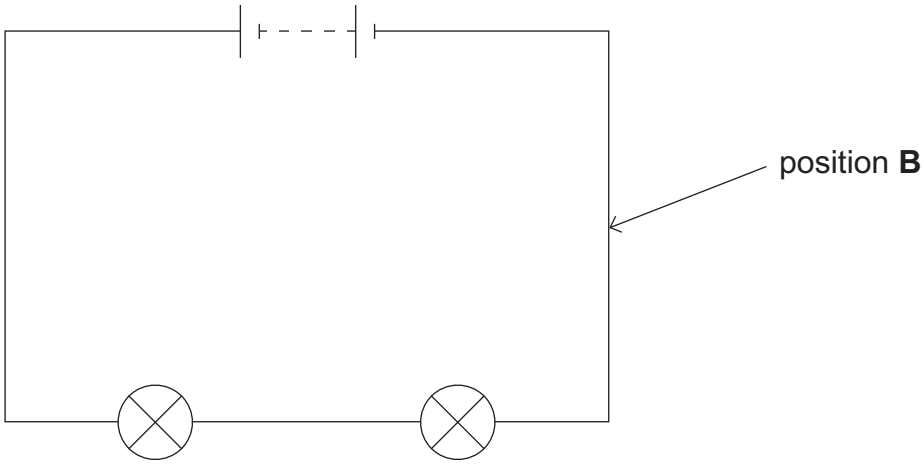
Answer _____ A [1]

(b) Look at the electrical properties and units below. Use lines to match each property to its correct unit.

Property	Unit
resistance	volt
voltage	joule
	ohm

[2]

Look at the diagram below. It shows a simple electrical circuit.



(c) Complete the sentences below.

Choose from:

get brighter : short : get dimmer

parallel : stay the same : series

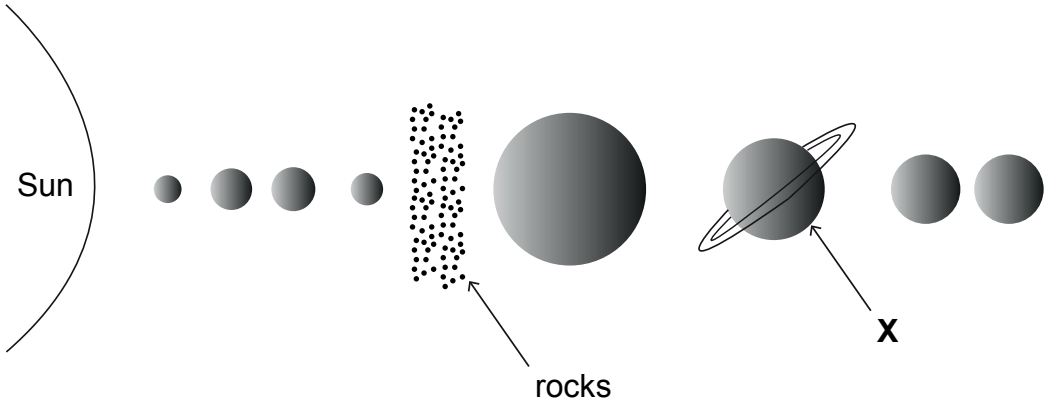
In this circuit the bulbs are connected in _____.

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

[2]

[Turn over

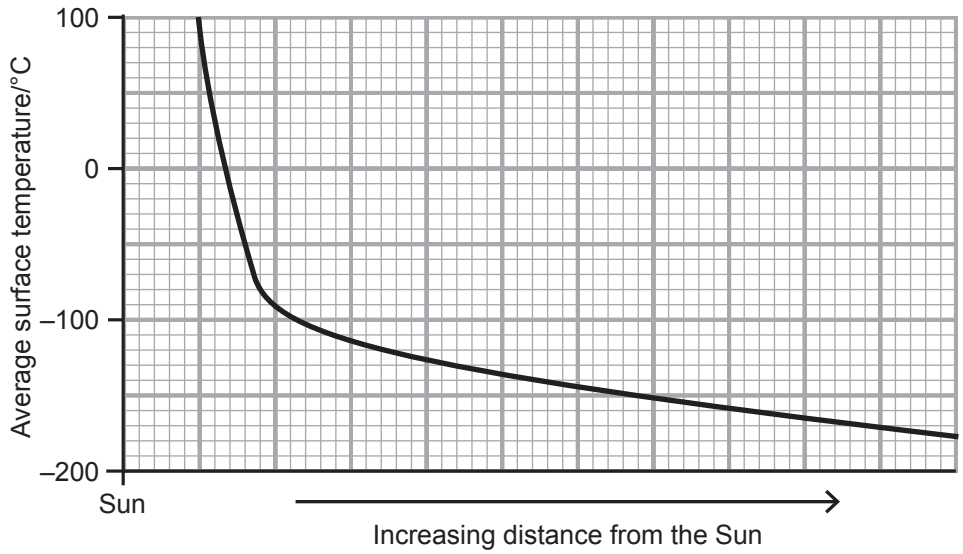
2 The diagram below shows our Solar System.



(a) Name the planet labelled **X**.

Answer _____ [1]

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.

As the distance from the Sun increases _____

_____ [1]

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

moving closer to each other ☐

staying the same distance apart ☐

moving away from each other ☐ [1]

[Turn over

(d) Complete the sentences below.

Choose from:

moon **star** **galaxy** **planet**

An object that orbits a planet is called a _____.

An object that orbits a star is called a _____. [2]

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

© David Parker / Science Photo Library

(e) Name the type of object which caused this crater.

_____ [1]

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(Questions continue overleaf)

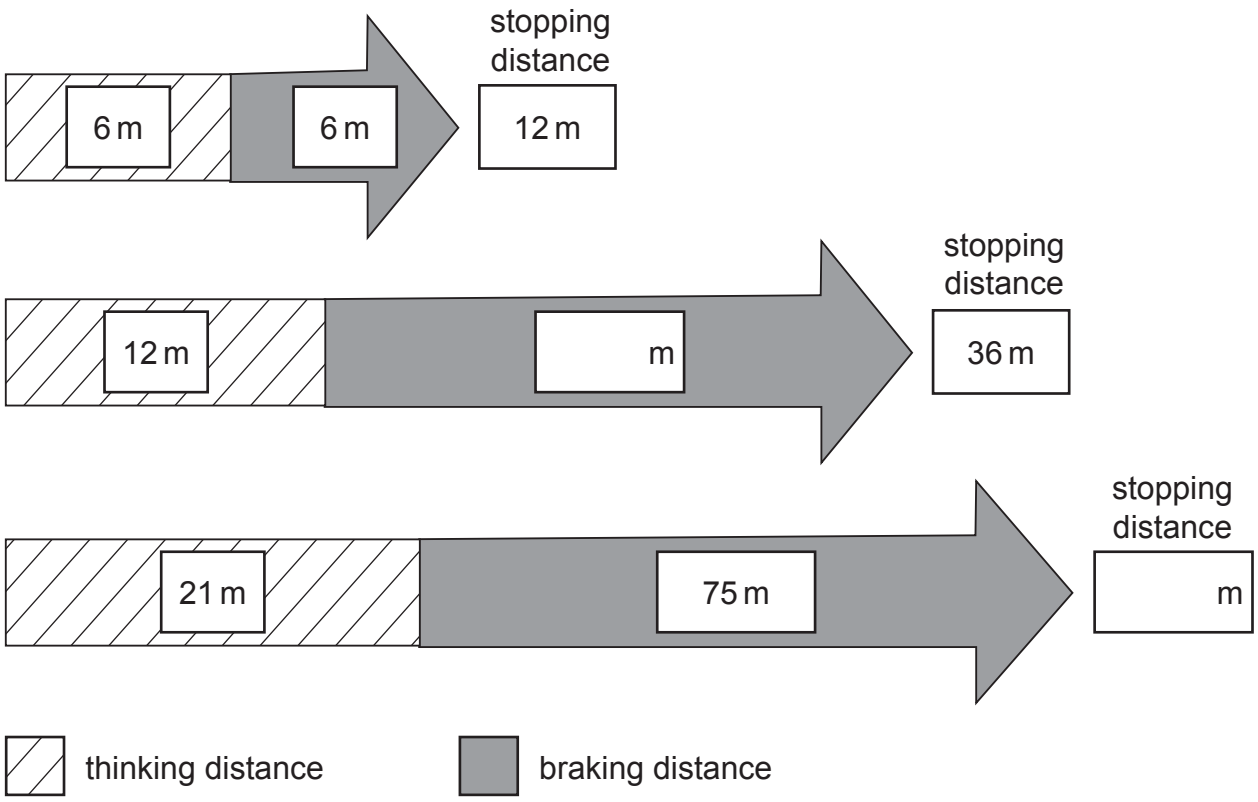
3 **(a)** The diagram below gives the stopping distances for a car travelling at different speeds.

Use the equation:

thinking distance + braking distance = stopping distance

to complete the diagram below.

There are **two** values to calculate.



[2]

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

© Contraband Collection / Alamy Stock Photo

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

	Decrease	**No effect**	**Increase**
reaction time			
thinking distance			
braking distance			

[3]

[Turn over

(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 /%		
Body mass / Number of alcoholic drinks	**60 kg**	**80 kg**	**100 kg**
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) What effect does increasing body mass have on blood alcohol content (BAC)?

_____

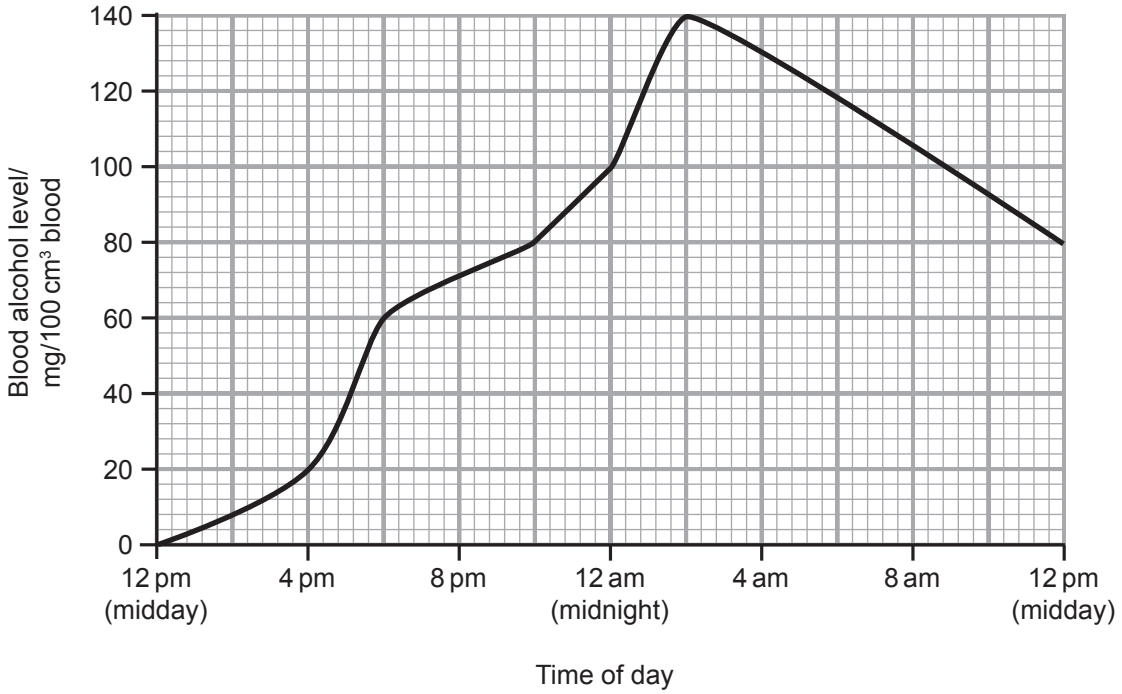
_____ [1]

(ii) Write down **one** other conclusion that can be made from this data.

_____

_____ [1]

(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 for driving in the UK is a blood alcohol level of 80 mg/100 cm^3 blood.

(i) At what time did Maureen first go over the legal limit for driving?

Answer _____ [1]

(ii) Explain fully why Maureen should **not** drive at 8 am the following day.

_____

_____

_____ [2]

[Turn over

4 **(a)** Complete the sentences below about waves.

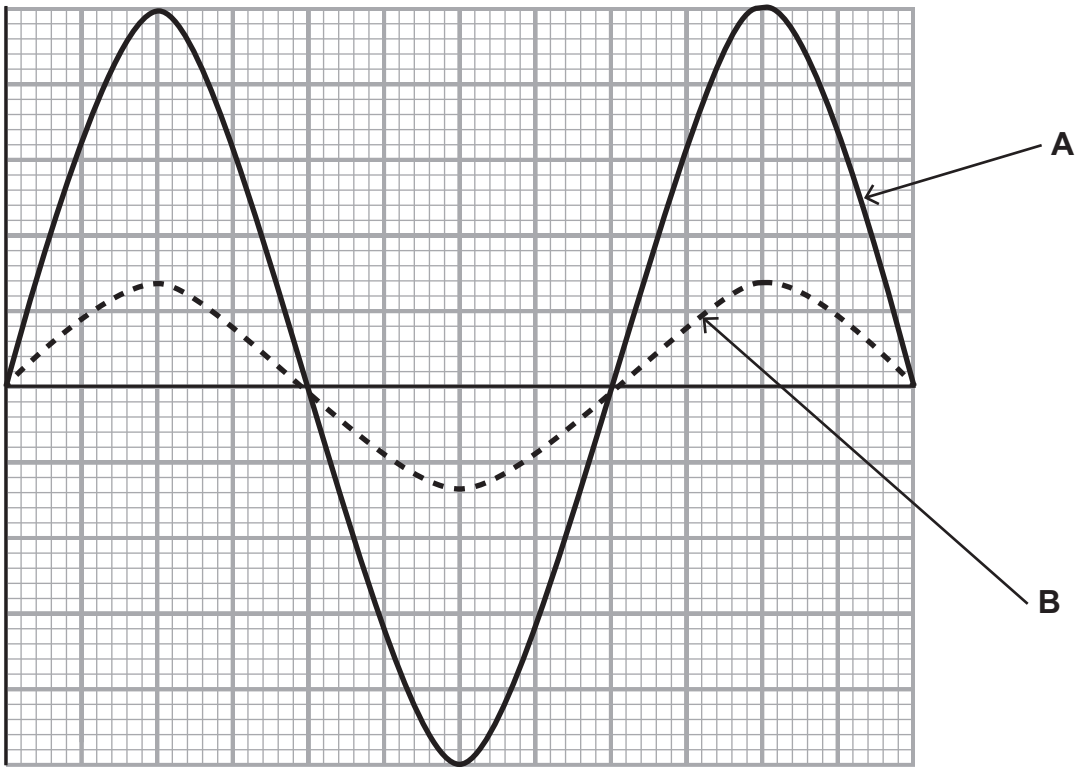
Choose from:

energy **longitudinal** **vibrations** **wavelength**

A wave is a series of _____.

Waves carry _____ from one place to another. [2]

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



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

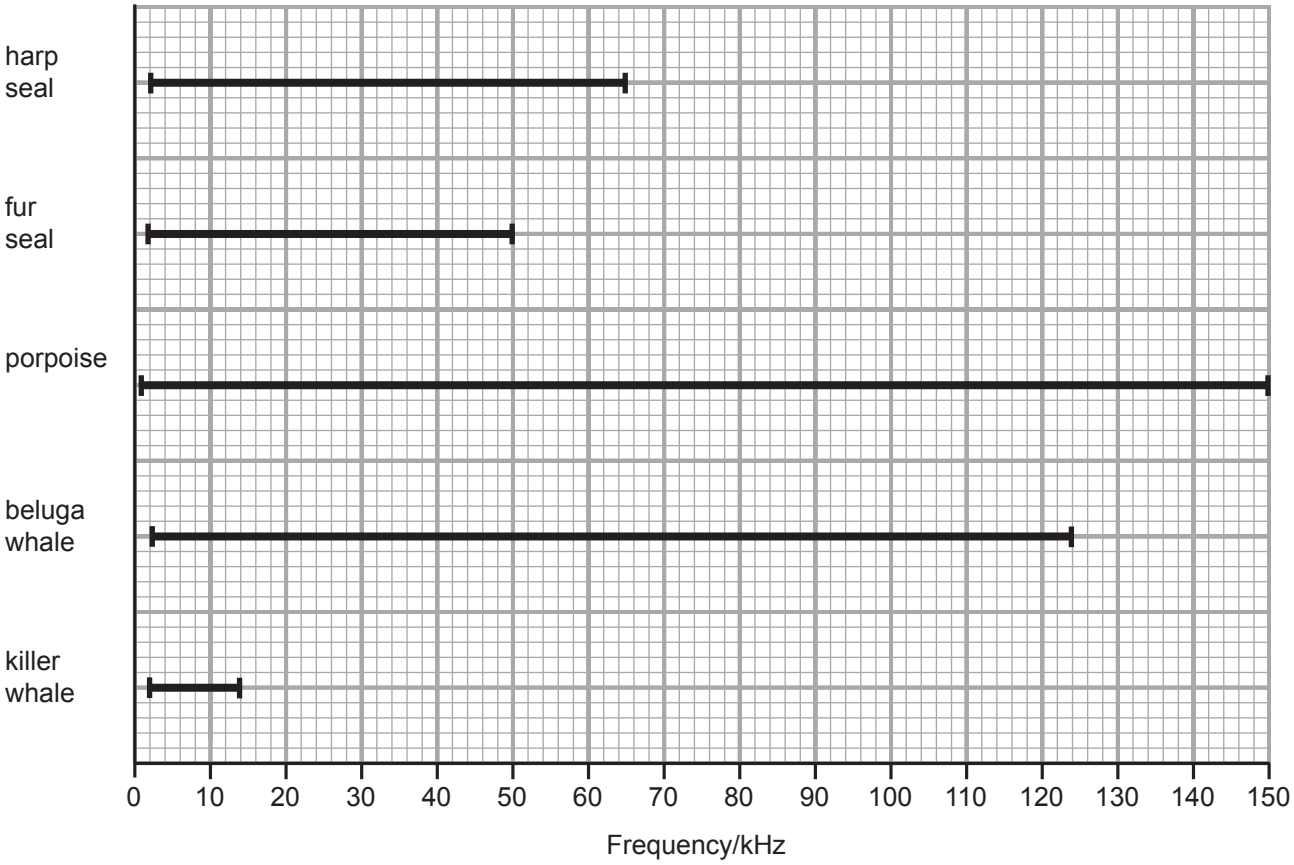
Give **one** feature of waves **A** and **B** which is the same.

(i) _____ [1]

Give **one** feature of waves **A** and **B** which is different.

(ii) _____ [1]

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



(i) How many of these mammals can hear ultrasound?

Answer _____ [1]

(ii) The fur seal can hear up to 50 kHz. Give this value in Hertz (Hz).

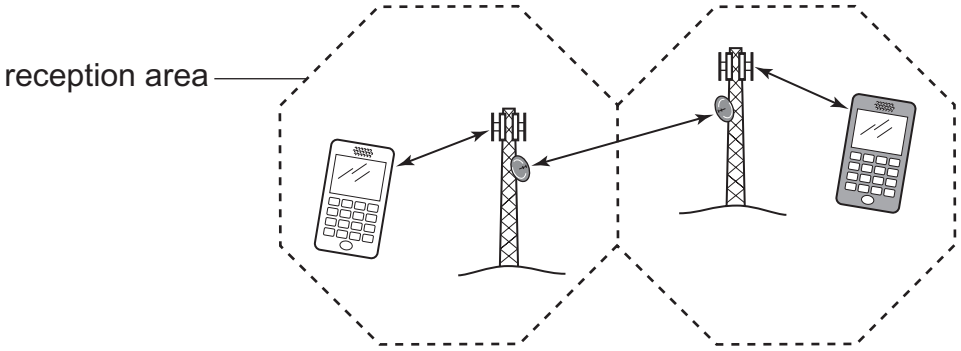
Answer _____ Hz [1]

(d) What is the **lowest** frequency a human can hear?

Answer _____ [1]

[Turn over

(e) Look at the diagram below. It shows how mobile phones transmit signals from one phone to another.



(i) What is the name of the type of electromagnetic wave used to carry mobile phone signals?

_____ [1]

(ii) What is the name of the reception area around a phone mast?

_____ [1]

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

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

In the UK power levels above 2 W/m^2 are thought to be a health risk.

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

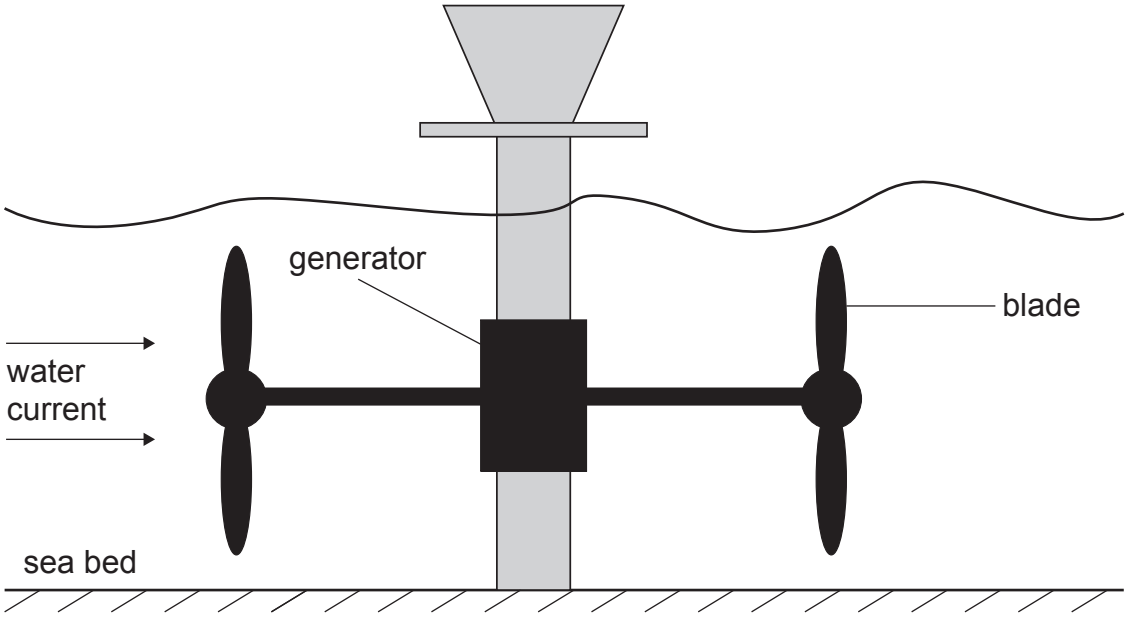
Answer _____ m [1]

(ii) Write down **one** health risk linked to the use of mobile phones.

_____ [1]

[Turn over

5 **(a)** Look at the diagram below. It shows a tidal turbine which uses water currents to generate electricity.



(i) Tidal energy is a form of renewable energy. What is meant by **renewable energy**?

_____ [1]

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

_____

_____

_____

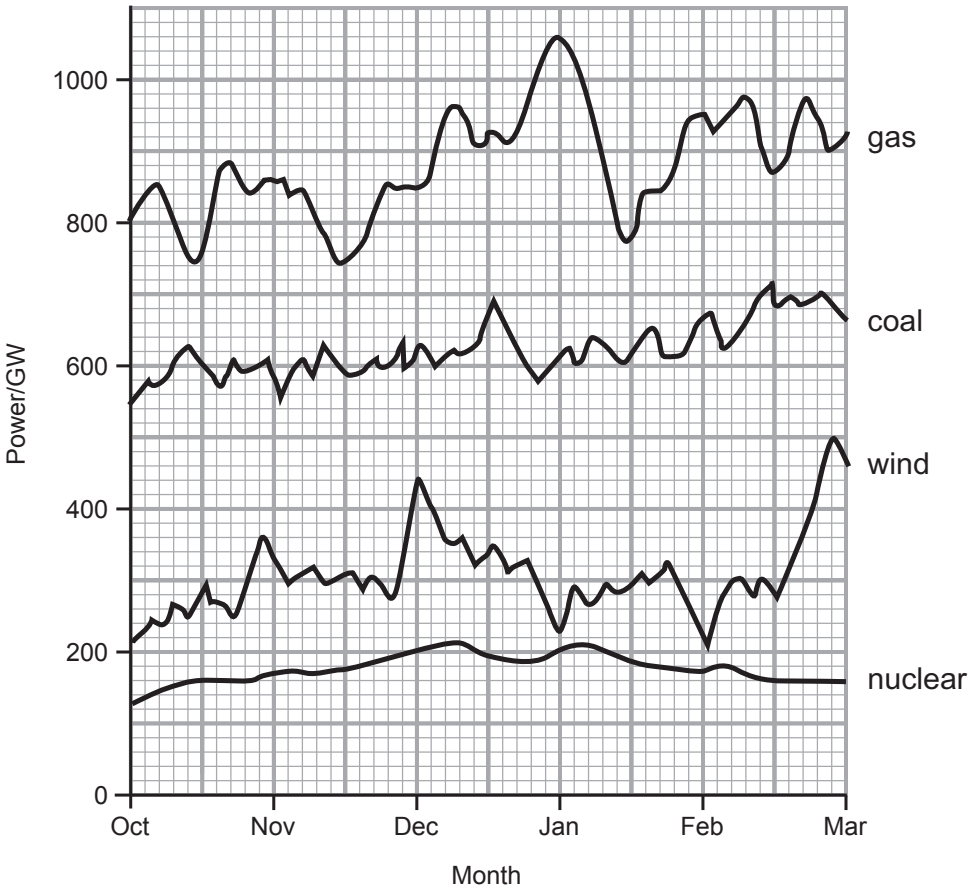
_____ [3]

(iii) Write down **one** disadvantage of tidal turbines.

_____

_____ [1]

(b) Look at the graph below. It 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.

_____ and _____ [1]

(ii) Calculate the difference between the maximum and minimum power produced by **wind**.

Show your working out.

Answer _____ GW [2]

(iii) Write down **one** reason why the power produced by wind varies so much.

_____ [1]

[Turn over

6 **(a)** Long sight is a common eye defect.
Explain fully what causes a person to be long sighted.

Your answer should include:
- the names of the parts of the eye involved
- the effect on a person's vision
- how to correct long sight

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

[6]

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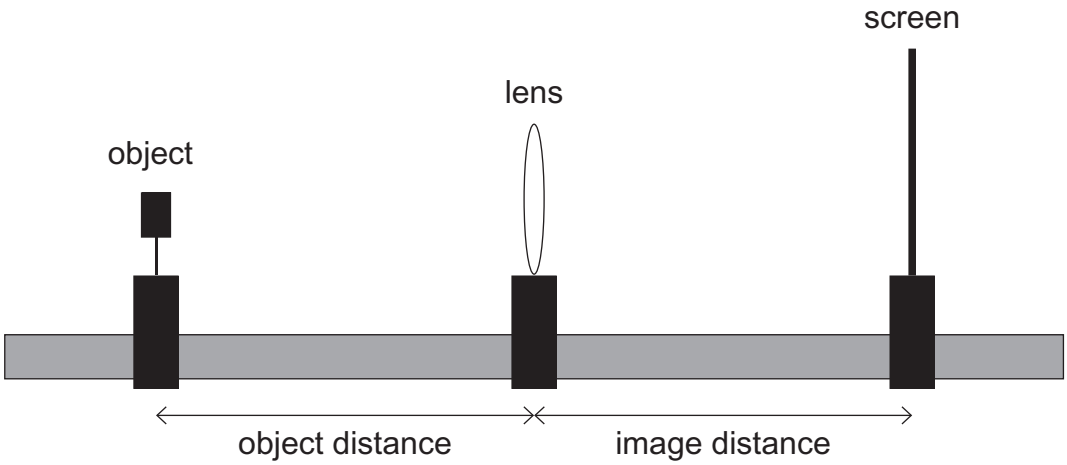
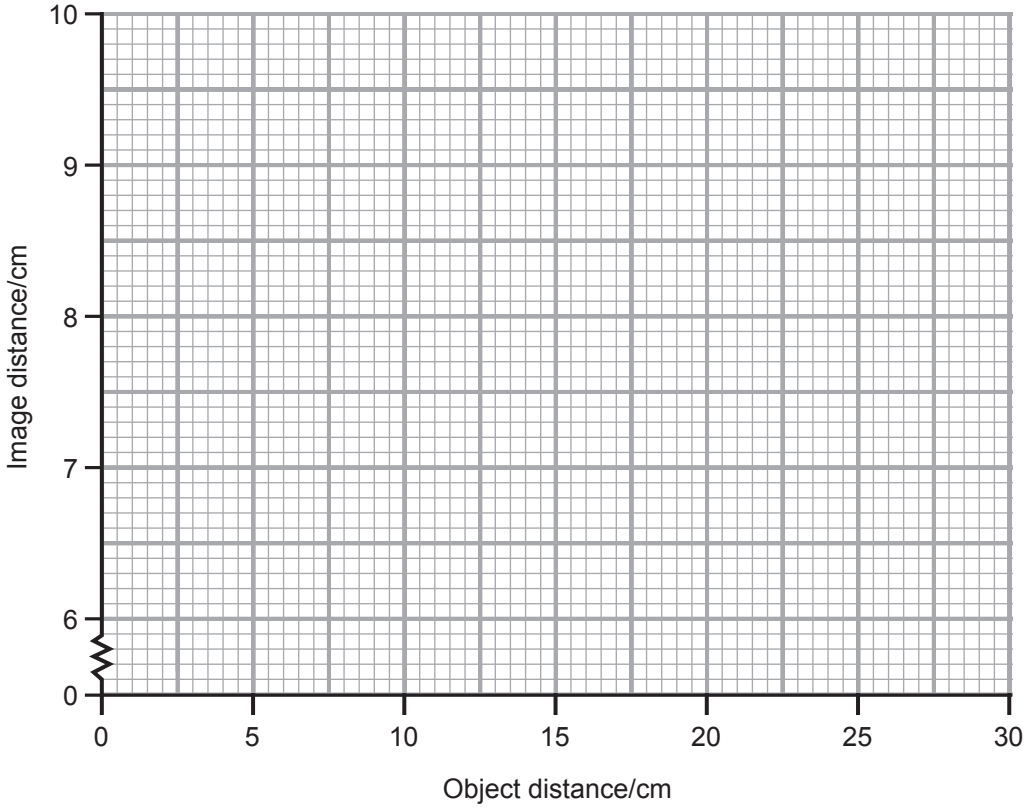
(b) A student used the apparatus below to investigate a lens.



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) Plot and draw a line graph of these results on the grid below.



[3]

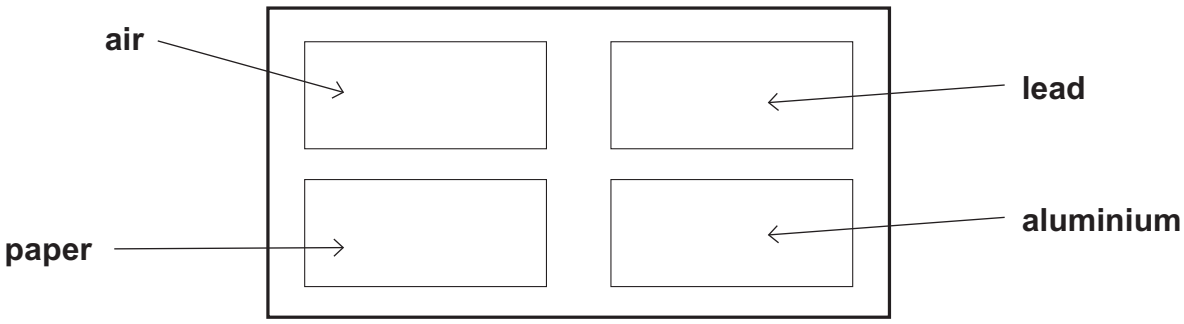
(ii) What is the trend shown by these results?

_____

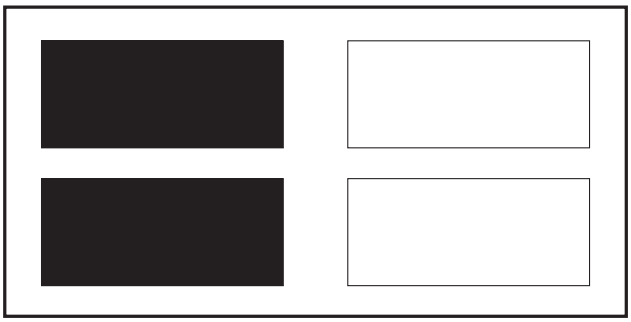
_____ [1]

[Turn over

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]

(ii) Some of the radiation present is background radiation.
What is meant by **background radiation**?

_____

_____ [1]

(iii) Radon gas is a source of background radiation. Give one other source of **natural** background radiation.

_____ [1]

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

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

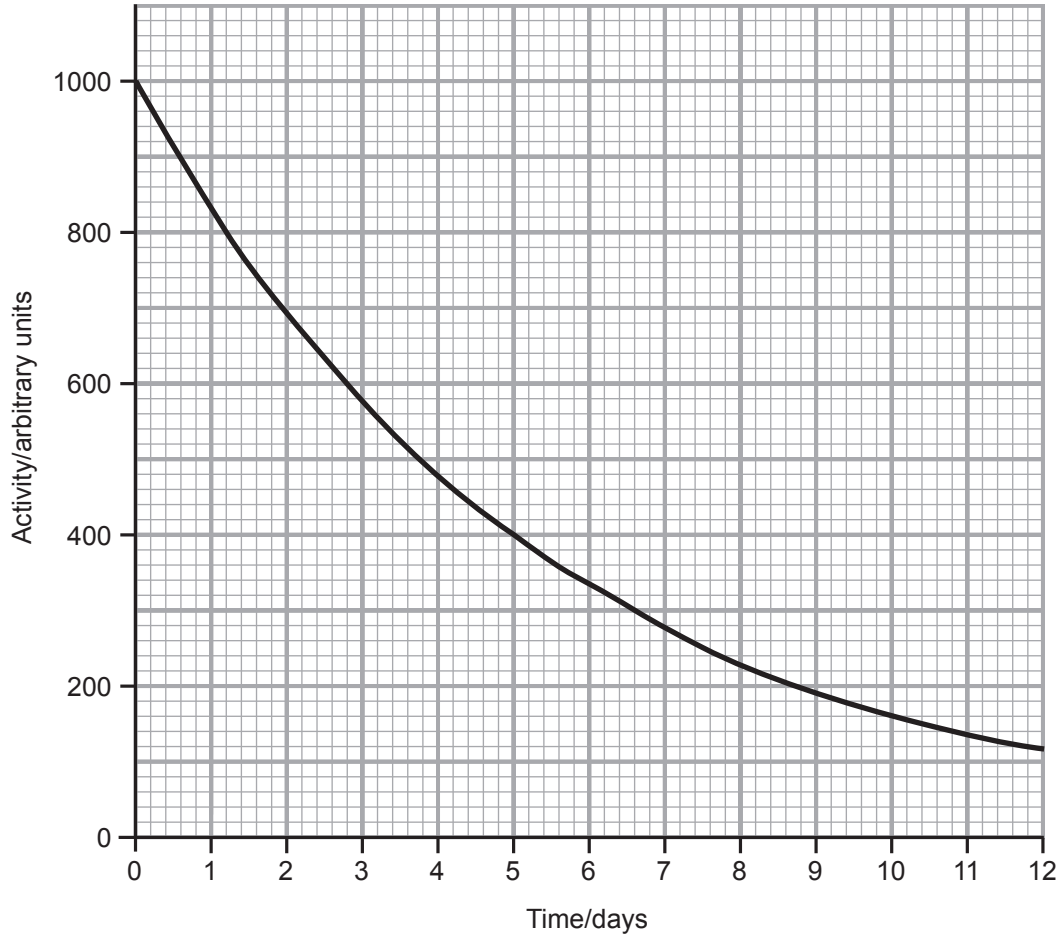
(b) Write down **one** conclusion that can be made from this information.

_____

_____ [1]

[Turn over

Look at the graph below. It shows how the radioactivity of radon-222 changes with time.



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

Answer _____ days [1]

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

Circle the correct answer.

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

[1]

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Question Number	Marks
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