

Surname	Centre Number	Candidate Number
First name(s)		0



GCSE

3430U60-1



S25-3430U60-1

THURSDAY, 22 MAY 2025 – MORNING

SCIENCE (Double Award)

**Unit 6 – PHYSICS 2
FOUNDATION TIER**

1 hour 15 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	6	
2.	8	
3.	13	
4.	12	
5.	6	
6.	15	
Total	60	

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01

ADDITIONAL MATERIALS

In addition to this paper, you will require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

The assessment of the quality of extended response (QER) will take place in question **5**.



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Equations

speed = $\frac{\text{distance}}{\text{time}}$	
acceleration [or deceleration] = $\frac{\text{change in velocity}}{\text{time}}$	$a = \frac{\Delta v}{t}$
acceleration = gradient of a velocity-time graph	
resultant force = mass $\times$ acceleration	$F = ma$
weight = mass $\times$ gravitational field strength	$W = mg$
work = force $\times$ distance	$W = Fd$
force = spring constant $\times$ extension	$F = kx$

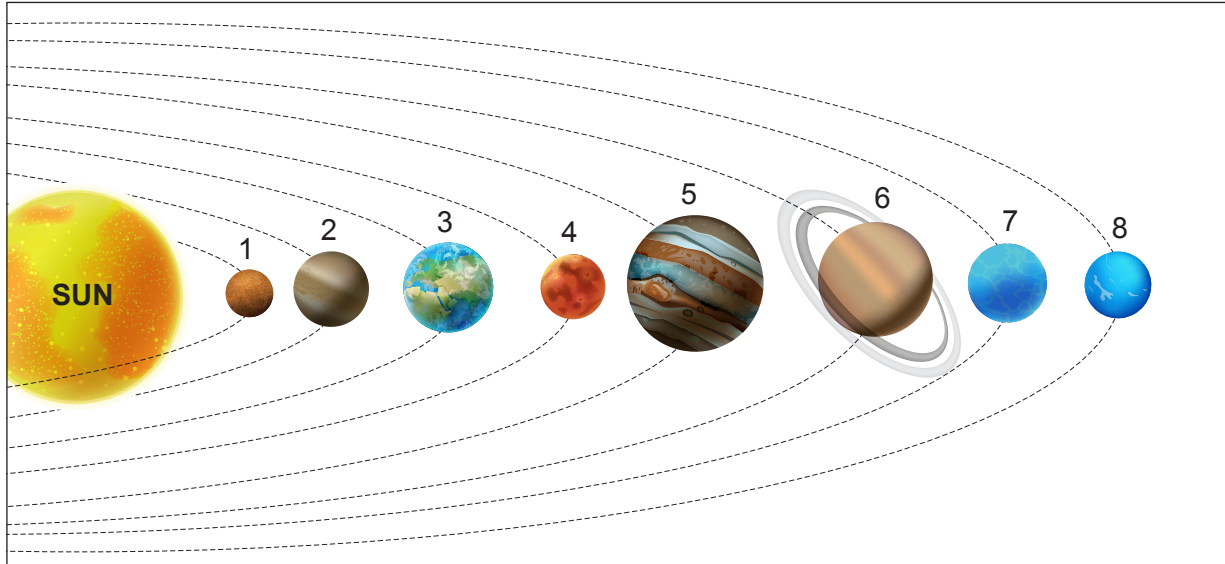
SI multipliers

Prefix	Symbol	Conversion factor	Multiplier
milli	m	divide by 1000	1×10^{-3}
centi	c	divide by 100	1×10^{-2}
kilo	k	multiply by 1000	1×10^3
mega	M	multiply by 1 000 000	1×10^6



Answer **all** questions.

1. (a) The diagram shows the 8 planets in our solar system orbiting the Sun. The diagram is not to scale.



Complete the sentences below using the numbers 1–8.

- (i) Venus is planet number [1]
- (ii) A gas planet is number [1]
- (iii) The asteroid belt is located between the orbits of planet numbers and [1]
- (b) **Draw a line** from each of the features of the Universe in the boxes on the left to its correct description on the right. [3]

Feature	Description
Moon	A star and all the objects that orbit it
Galaxy	A natural satellite of a planet
Comet	A collection of billions of stars
Planetary system	An object with a highly elliptical orbit



2. Cobalt-60 is a gamma emitter.
It is widely used in a range of applications including leak detection, radiotherapy and sterilising medical instruments.

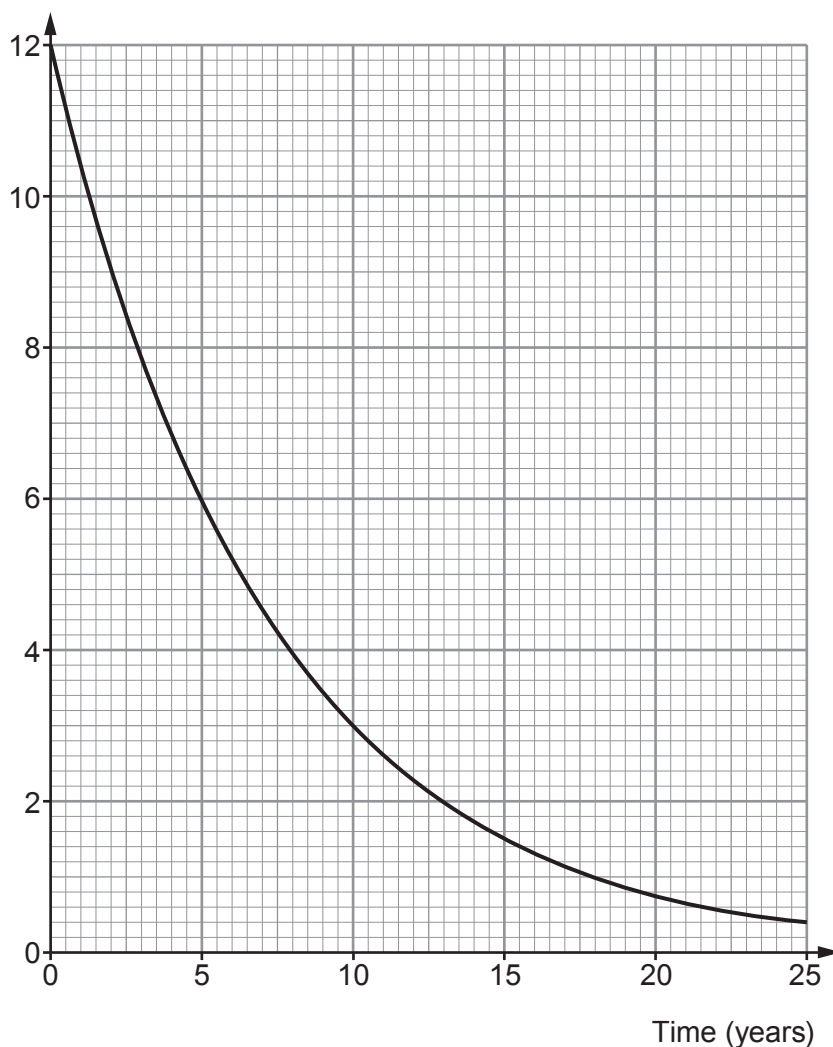
- (a) Underline the word or phrase in the brackets to correctly complete the sentences below. [2]

Gamma is [**a fast moving electron** / **em radiation** / **a helium nucleus**].

The half-life of a radioisotope is the time taken for the number of radioactive [**elements** / **cells** / **nuclei**] to halve.

- (b) The graph shows how the activity of a sample of cobalt-60 varies with time.

Activity of cobalt-60 (MBq)



- (i) I. The initial activity of cobalt-60 is 12 MBq.
State the activity after 1 half-life.

[1]

activity = MBq

- II. Use the graph to find the half-life of cobalt-60.

[1]

half-life = years

- (ii) A sample of cobalt-60 has an initial mass of 0.4 g.
Calculate the mass of cobalt-60 remaining after **two** half-lives.

[2]

mass remaining = g

- (c) Adam **incorrectly** states "if you double the initial mass of cobalt-60, the half-life doubles and the activity stays the same."

Complete the sentence below so that it is correct.

[2]

If you double the initial mass of cobalt-60, the half-life and the
activity

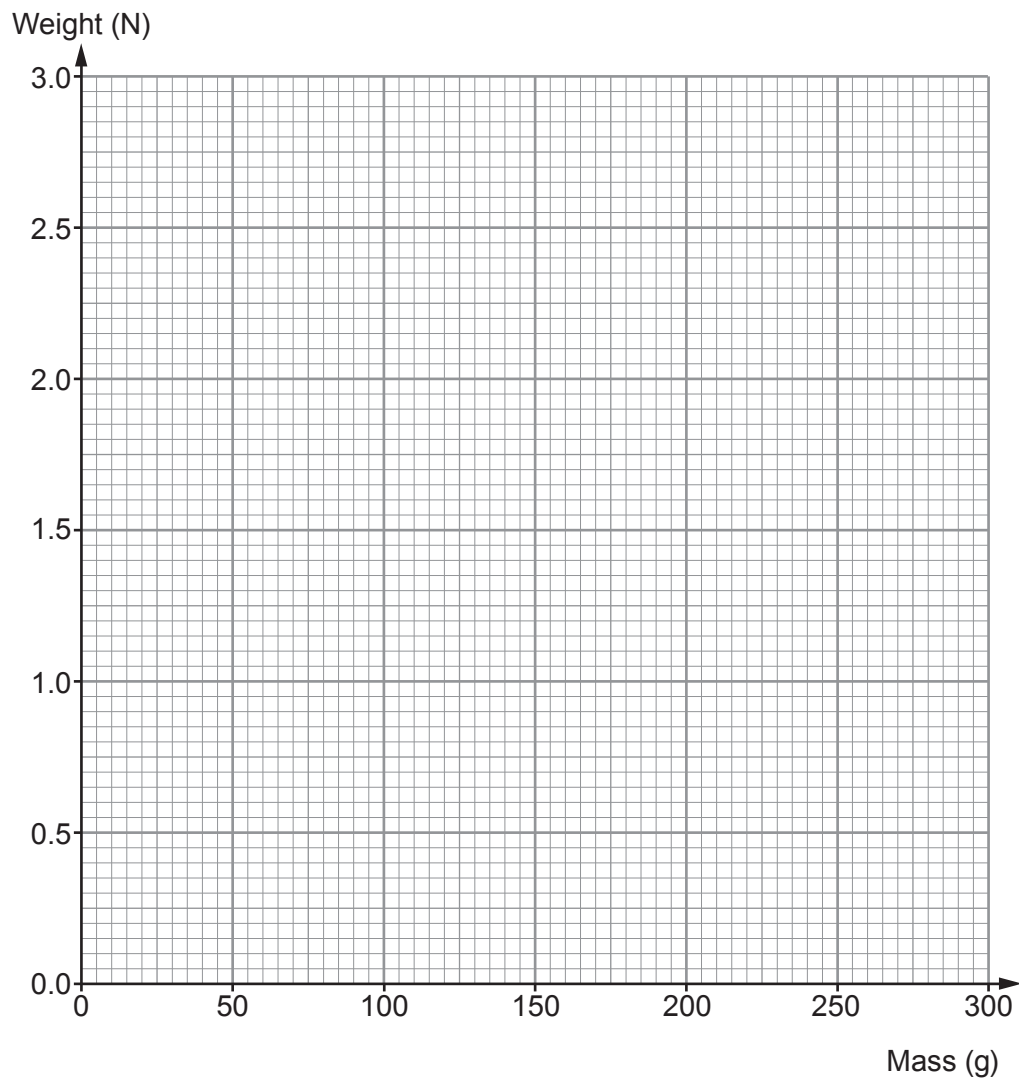


3. A group of students is studying forces. They investigate the relationship between mass and weight. They use a newton meter to measure the weight of different slotted masses. Their results are given in the table below.

Mass (g)	Weight (N)
50	0.5
150	1.5
250	2.5
300	3.0

- (a) (i) Plot the data on the grid below and draw a suitable line.

[3]



- (ii) Amy suggests that if the mass is four times bigger, then the weight will be four times bigger.

Use data from the graph to explain whether you agree.

[2]

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- (b) The students now investigate the motion of a model rocket.
The rocket is powered by a small motor, giving a thrust of 6.0 N.
The mass of the rocket is 150 g.

- (i) Use the information in the table to **complete the diagram below**.

[1]



- (ii) Underline the correct phrase in the bracket to complete the sentence below.

[1]

The rocket accelerates because the thrust is **(smaller than / equal to / bigger than)** the weight.

- (iii) Calculate the resultant force on the rocket.

[1]

resultant force = N



- (iv) Use the equation:

$$\text{acceleration} = \frac{\text{resultant force}}{\text{mass}}$$

to determine the acceleration of the rocket.

[3]

acceleration = m/s²

- (c) The diagram below shows the rocket in motion.

- (i) **Complete the labelling** on the diagram.

[1]

Exhaust gases push rocket



Rocket pushes exhaust gases downwards

- (ii) Underline the correct phrase in the bracket to complete the sentence below.

[1]

According to Newton's 3rd law, the force produced by the rocket pushing out exhaust gases is (**equal to** / **less than** / **more than**) the force produced by the exhaust gases pushing the rocket.



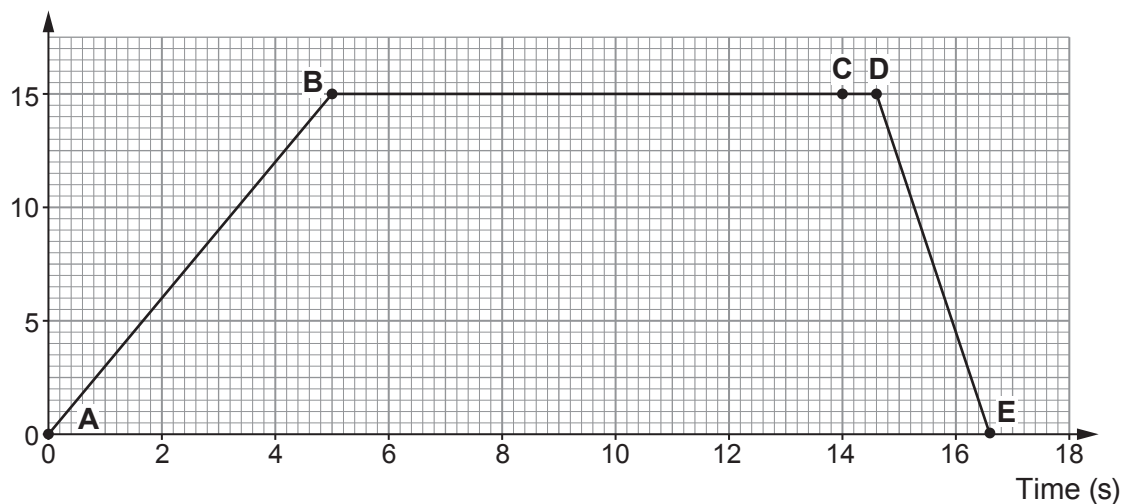
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4. The speed-time graph below shows the motion of a car along a **straight** road starting from rest.

Speed (m/s)



- (a) Use words or phrases from the box below to state the motion of the car in each region, **A–B**, **B–C**, **D–E**. [3]

Constant speed	Constant acceleration	Constant deceleration
Stationary	Increasing acceleration	Decreasing acceleration

Motion **A–B**

Motion **B–C**

Motion **D–E**

- (b) (i) The car driver spots a hazard at the time labelled **C** on the graph and begins braking at **D**.

Use the equation:

$$\text{distance} = \text{speed} \times \text{time}$$

to calculate the distance travelled by the car from **C–D**.

[2]

distance travelled = m

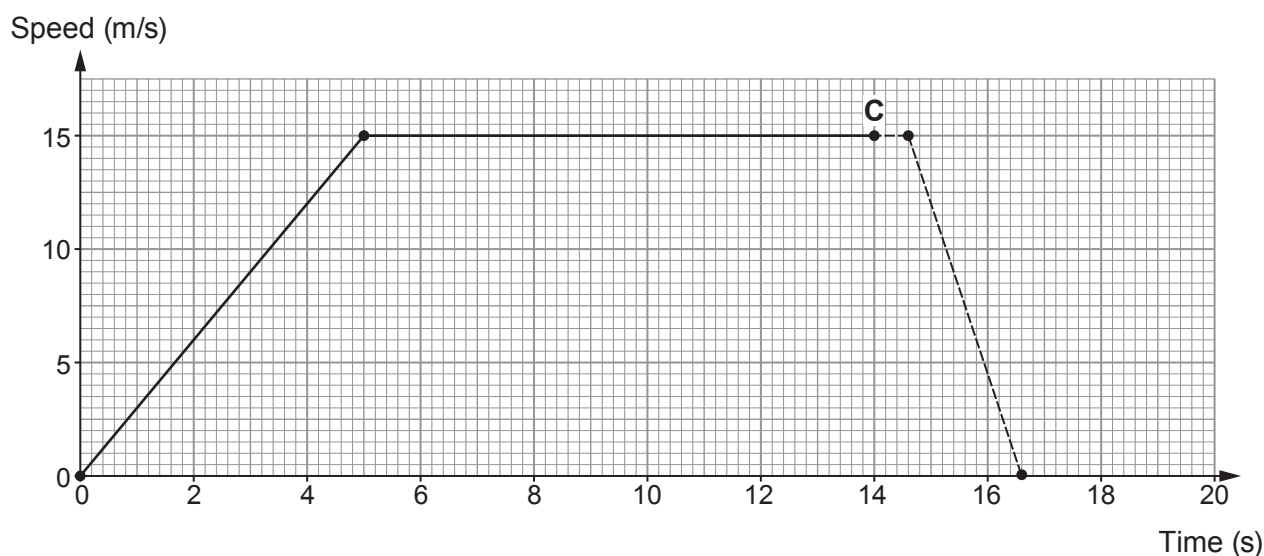


- (ii) The distance travelled by the car from **D–E** is the braking distance.
State the name of the distance travelled by the car from **C–D**.

[1]

- (iii) **Complete the graph below** to show the effect, if any, on the line from **C** if the car driver had been drinking alcohol.
The dotted line after **C** shows the original graph.

[2]



- (c) (i) A different car is travelling at 20 m/s when it collides with a wall.
The car stops in a distance of 1.5 m.
The work done on the car to bring it to rest during the collision is 135 000 J.

Use the equation:

$$\text{mean force} = \frac{\text{work done}}{\text{distance}}$$

to determine the mean force acting on the car during the collision.

[2]

mean force = N



(ii) Explain how a crumple zone helps to protect passengers during a collision. [2]

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Examiner
only

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5. The Sun is a low-mass yellow star.
It is on the main sequence because it is fusing hydrogen to make helium.
The combination of gas and radiation pressure balances the force of gravity.
Describe the remaining stages of the Sun's life cycle in terms of forces **and** fusion.
Include in your answer the names of the next **two** stages.

[6 QER]

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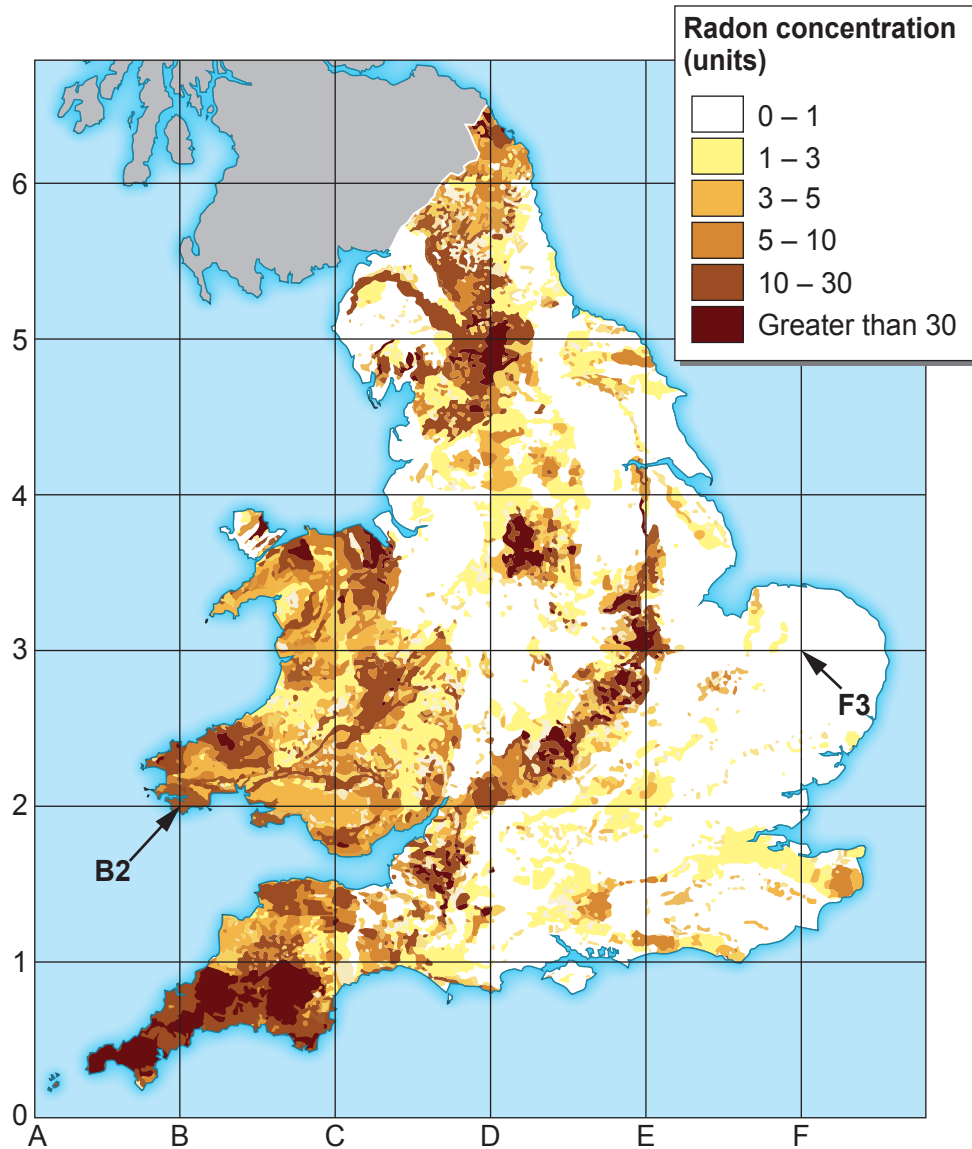
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6. Radon is a radioactive gas that occurs naturally. Radon is everywhere in the air around us but its concentration varies from place to place. Special devices are needed to detect it.

The map shows how the concentration of radon varies across England and Wales.



- (a) (i) State **one** reason why the concentration of radon varies across England and Wales.

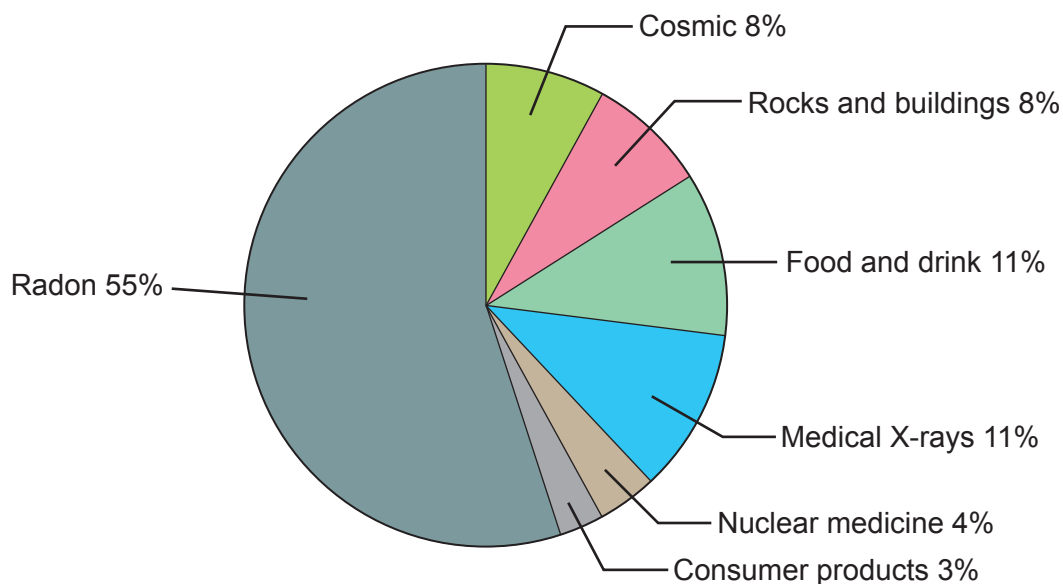
[1]

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- (ii) A pie chart showing sources of background radiation in a part of **Wales** is shown below.
The location is shown by the grid point **B2** on the map.



Explain how the **pie chart** would be different for a part of England shown by grid point **F3**. [3]

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- (iii) Alpha track detectors can be used to measure radon concentrations in houses.
The testing takes place over a long period of time, at least three months.
Explain why this time scale is chosen. [2]

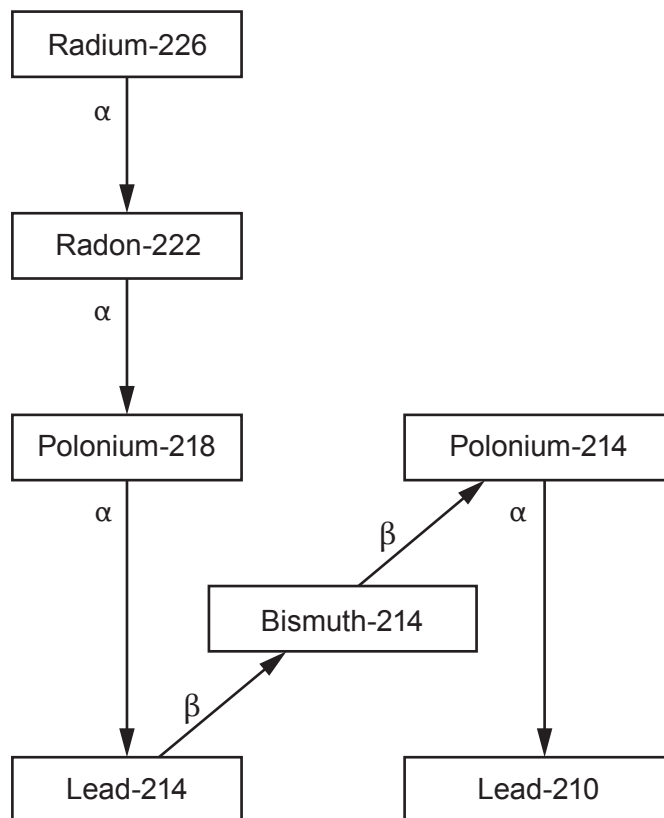
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- (b) Radon is part of the decay series shown below, where radium-226 decays to lead-210. The chart shows whether each decay is alpha (α) or beta (β).



Use the information in the decay series to answer the following questions.

- (i) Explain why radon gas can cause cancer when breathed in.

[2]

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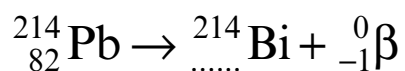
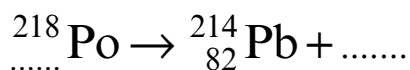
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- (ii) Part of the decay series is shown in the nuclear equations below where polonium-218 (Po-218) decays into lead-214 (Pb-214) which then decays into bismuth-214 (Bi-214).

Complete the equations.

[3]



- (iii) State the name given to the different forms of lead.

[1]

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- (iv) Owain says that the **atoms** of the two forms of lead, Pb-210 and Pb-214, have identical numbers of neutrons and protons.
Explain in terms of particles whether Owain is correct.

[3]

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