1 Fossil fuel power stations generate electricity.
Nuclear power stations also generate electricity.

(a) Many people think that nuclear power stations are a greater risk to people than fossil fuel power stations. Explain why.

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..... **[2]**

(b) In 2011 there was an accident at a nuclear power station in Japan.
This was a very serious accident but there were no deaths reported.

The authorities evacuated the general public from the area.
Suggest other things that the authorities might have done to reduce the risks to the workers and rescue staff.

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..... **[2]**

(c) Explain how the authorities could decide when the public can return to the area.

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..... **[2]**

2 Scientists use several methods to find out when old plants lived.

(a) Here is information about two methods.

	Relative Dating	Absolute Dating
Method	Find out where plant fossils are in layers of rocks. Newer rocks are on top of older rocks. The method can be used in very old rocks.	This uses carbon dating. The amount of radioactive Carbon-14 can be measured in dead plants. This can be compared with the amount of Carbon-14 in living plants to find the age.
Problems	Cannot find the exact age of the plant fossils.	Cannot be used for very old dead plants as the amount of Carbon-14 is too low.

Describe why scientists might use both methods to find out when old plants lived.

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..... **[2]**

(b) Another method uses radioactive dating of rocks by calculating the ratio of two metals in the rocks.

One of the metals is uranium.

What is the name of the other metal?

Choose from

lead

potassium

rubidium

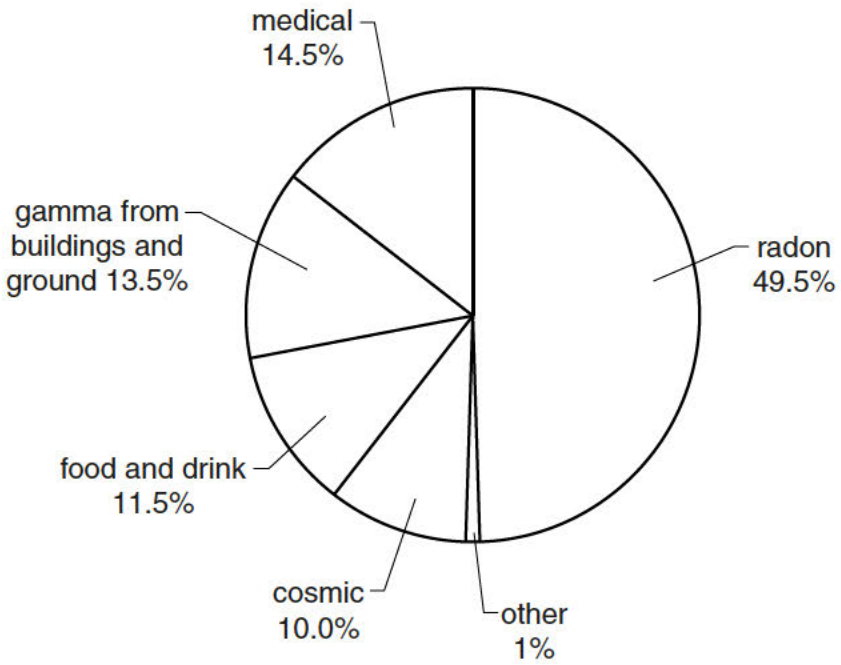
strontium

thorium

answer ..... **[1]**

3 This question is about sources of background radiation in the UK.

(a) The chart shows the average percentage contributions from different sources.



The percentage radiation from each source is different for each person in the UK.

Write down **two** reasons for this difference.

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..... **[2]**

(b) Teams of scientists monitor sources of background radiation in different areas of the UK.

Why is it important for all the teams of scientists to publish their findings each year?

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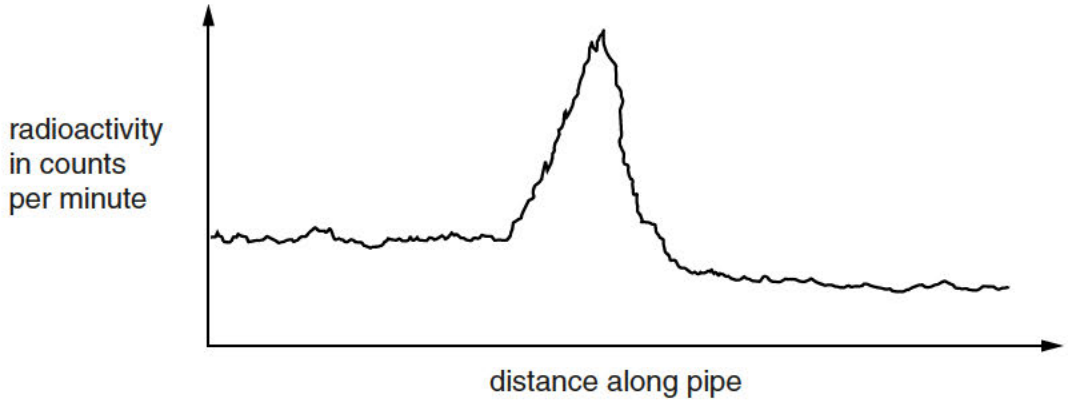
..... **[2]**

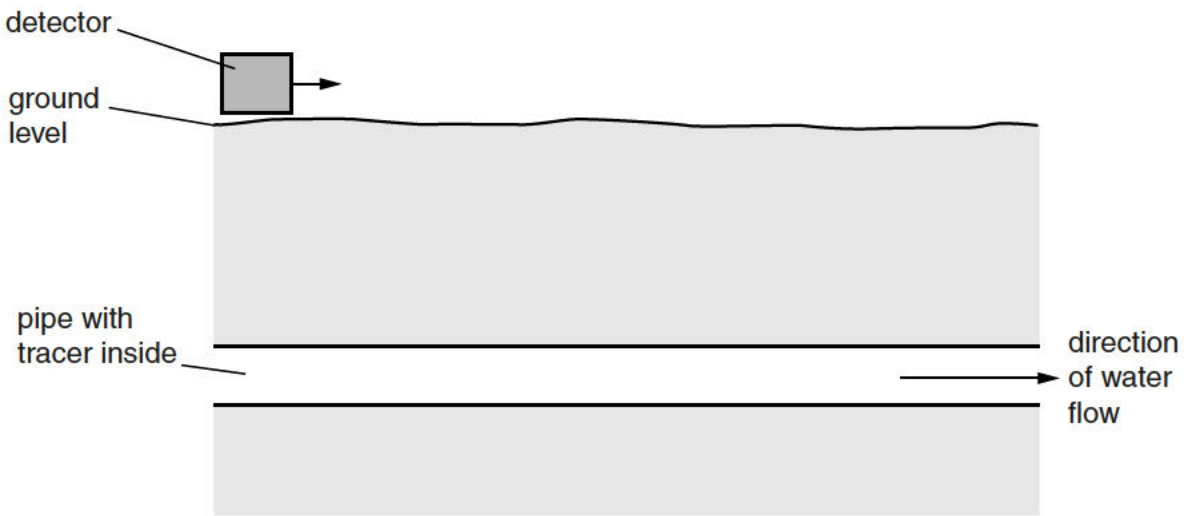
[Total: 4]

4 **(a)** A radioactive tracer is put into an underground water pipe.

A detector above the ground measures the radioactivity.

The graph shows the amount of radioactivity detected along the length of the pipe.





Describe the patterns in the graph and explain how this information can be useful.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

(b) Radioactive substances decay naturally.

Look at the information about two different radioactive substances.

Time in hours	Activity of substance X in counts per second	Activity of substance Y in counts per second
0	8070	12810
1	6801	6385
2	5697	3221
3	4808	1594
4	4027	807
5	3390	392
6	2861	197
7	2410	102
8	2008	51

Use the data in the table to compare the half-life of substance **X** and the half-life of substance **Y**.

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..... **[2]**

[Total: 8]

5 This question is about nuclear energy.

(a) Complete the crossword.

Across

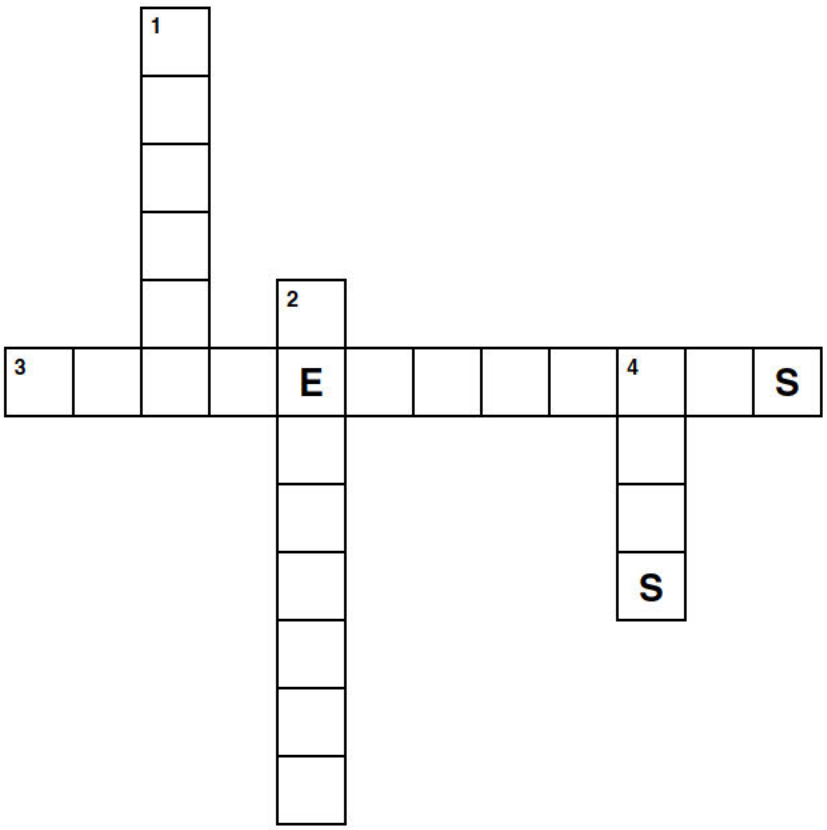
3 In stars, fusion happens at extremely high _ _ _ _ **e** _ _ _ _ _ _ **s**.

Down

1 Nuclei of hydrogen isotopes undergo fusion to form _ _ _ _ _ _ nuclei.

2 Scientists stop nuclear fission reactions going out of control in a reactor by absorbing some of the _ **e** _ _ _ _ _ _.

4 Scientists stop nuclear reactions going out of control by placing metal _ _ _ **s** in the reactor.



[2]

(b) Andrea Rossi **claims** to have invented an 'energy catalyser cold fusion system'.

He demonstrated the system in January 2011 by passing hydrogen over a secret catalyst. It appeared to show that an input of a few hundred kilowatts produced an output of a few thousand kilowatts.

Some scientists believe there is a nuclear reaction taking place because of the large amounts of extra energy produced.

Suggest why other scientists might **not** accept this claim.

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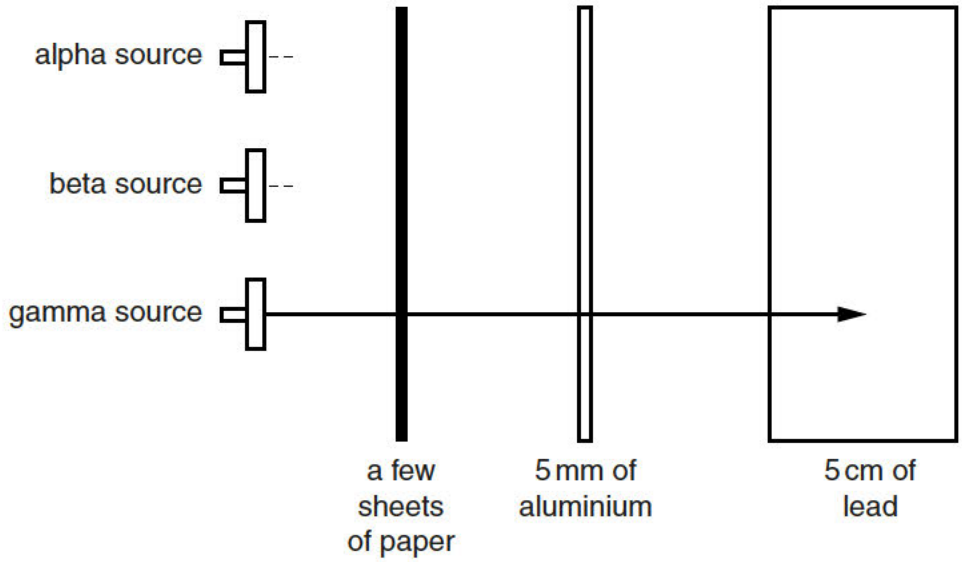
..... **[2]**

[Total: 4]

6 This question is about nuclear radiation.

(a) Complete the diagram to show the penetrating power of alpha **and** beta radiation.

Gamma radiation has been completed for you.



[1]

(b) Write down **two** examples of beneficial uses of gamma radiation.

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..... **[2]**

(c) Explain the problems of dealing with radioactive waste.

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..... **[2]**

[Total: 5]

7 Nuclear radiation can be both useful and dangerous.

The three types of nuclear radiation are alpha, beta and gamma.

(a) Look at the table about nuclear radiation. It is incomplete.

Complete the table.

nuclear radiation	example of use	stopped by
alpha		a sheet of card
beta		
gamma	treating cancer	a few cm of lead

[3]

(b) Radioactive materials have to be disposed of safely.

Some high level nuclear waste from a power station is in liquid form.

The nuclear power company want to bury the liquid waste underground.

Explain the risks of doing this.

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..... **[2]**

[Total: 5]