0 1

The 'enriched' uranium which is used in the fuel rods of nuclear reactors comes in the form of two isotopes. Information about each of these is given in the below table.

Isotope	Percentage of mass of fuel rod (%)	Half-life ($\times 10^9$ years)
Uranium-235	3	0.7
Uranium-238	97	4.5

0 1 . 1

The process of nuclear fission does not lead to the release of greenhouse gases, and so some countries rely heavily on nuclear energy in meeting their electricity demands.

Suggest then why many people are still opposed to the use of nuclear power.

_____

_____

[2 marks]

0 1 . 2

A particular nuclear fuel rod contains 4.85 kg of uranium-238.
Calculate the mass of uranium-235 which it contains.

Mass = _____ kg

[2 marks]

0 1 . 3

What fraction of this mass of uranium-235 would remain after 1.4 billion years?

Fraction remaining = _____

[2 marks]

0 1 . 4

If some of the uranium from a fuel rod was accidentally released into the environment, which of the above isotopes would provide the larger contamination risk? Explain your answer.

_____

_____

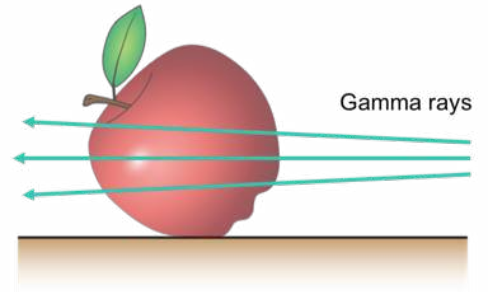
[2 marks]

0 2 Radioactive substances may lead to the contamination or irradiation of places, objects, plants, animals or people.

0 2 . 1 Explain the difference between radioactive contamination and irradiation.

[2 marks]

0 2 . 2 Gamma rays are sometimes used for the sterilisation of foodstuffs.



Write down one reason why gamma rays are used in this way.

[1 mark]

0 2 . 3 A friend is concerned about eating apples and other foodstuffs which have been sterilised using gamma rays. How would you explain to them that there was no need to worry?

[1 mark]

0 2 . 4 They then go on to ask you about the radiation hazards which some people are exposed to in the workplace.

In a hospital, a radiographer might take dozens of X-rays per day.
Write down **two** ways in which they protect themselves against the harmful effects of radiation.

1

2

[2 marks]