

Background Radiation and Contamination

Warm-Up

Name **one** natural source of background radiation.

.....

- 1 Workers in a nuclear power station take many precautions to prevent unnecessary exposure to radiation. Suggest **two** methods that could be used to reduce their exposure to radiation when dealing with highly radioactive substances.



1.
2.

[Total 2 marks]

- 2 A physicist is investigating the radioactivity of a sample. She measures the background radiation before the experiment and subtracts it from her measurements.



- 2.1 What is meant by the term background radiation? Tick **one** box.

The levels of alpha radiation nearby. ☐

Radiation produced by radon gas reserves in the ground. ☐

Low-level radiation that is around us all the time. ☐

All radiation from man-made sources in the local area. ☐

[1]

- 2.2 State the type of error that the physicist is trying to avoid when she subtracts the background radiation level from her results. Explain your answer.

.....

.....

.....

[2]

- 2.3 State the name given to the amount of radiation that an individual is exposed to.

.....

[1]

- 2.4 State **two** things that can affect the amount of radiation that an individual is exposed to.

1.
2.

[1]

[Total 5 marks]

- 3 A scientist is reviewing the safety procedures to be used in her lab. She is concerned about **contamination** and **irradiation**.



3.1 Explain the difference between contamination and irradiation.

.....

.....

.....

.....

[2]

3.2 Give **one** example of how the scientist can protect herself from being irradiated by a radioactive sample with a low activity.

.....

[1]

3.3 Give **two** ways in which the scientist can protect herself against contamination when handling a radioactive sample with a low activity.

1.

2.

[2]

[Total 5 marks]

- 4* Radium-226 is an alpha source that was used in clocks until the 1960s to make the hands and numbers glow. Explain whether a clockmaker should be more concerned about irradiation or contamination when repairing old clocks that contain radium.



.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[Total 6 marks]

Exam Practice Tip

It's important to remember that contamination and irradiation aren't the same thing. In the exam, you'll have to make sure you use the correct term when explaining your answers. Go back over your notes if you're unsure, then have another go at the questions on these pages. Then you can reward yourself with a cuppa and a biscuit. Smashing.



Uses and Risk

Warm-Up

Choose some of the words on the left to fill in the blanks on the right.

mutate die
survive
diagnose radiation
cancer sickness

Radiation can cause cells to or ,
which can cause cancer or radiation sickness. Radiation can also be used
to treat and to illnesses.

- 1 Radiotherapy is ~~use~~ often used in the treatment of cancer. Radiation is directed towards the cancerous cells from outside of the body to kill them.



- 1.1 What type of ionising radiation could be used in this procedure? Tick one box.

alpha ☐ beta ☐ gamma ☐ background ☐ [1]

- 1.2 The beam of radiation can be rotated around the patient, keeping the cancerous cells at the centre. Suggest how this method can minimise the risks of radiotherapy.

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

[Total 3 marks]

- 2 Sources of radiation can be used in medical imaging to explore internal organs. Iodine-123 is a radioactive isotope that is absorbed by the thyroid. Grave's disease causes an overactive thyroid, which causes the thyroid to absorb more iodine than usual.



- 2.1 Briefly explain how iodine-123 could be used to determine if a patient has Grave's disease.

.....
.....
.....
.....
[3]

- 2.2 Iodine-123 emits gamma radiation. Explain why an alpha emitter would not be used for medical imaging.

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

- 2.3 Explain why an isotope with a short half-life must be used in this type of procedure.

.....
.....
[1]
[Total 6 marks]

Fission and Fusion

- 1 Below are two statements about nuclear fusion.



Statement 1: During fusion, a heavier nucleus is formed by joining two lighter nuclei.

Statement 2: During fusion, some mass is converted into energy.

Which of the following is true? Tick **one** box.

Neither statement is true.

☐

Only statement 1 is true.

☐

Only statement 2 is true.

☐

Both statements are true.

☐

[Total 1 mark]

- 2 State **one** similarity and **one** difference between nuclear fission and nuclear fusion.



Similarity:

.....

Difference:

.....

[Total 2 marks]

- 3 Fission reactors use chain reactions to produce energy.



3.1* Briefly explain how the absorption of a neutron can lead to a chain reaction.

.....

.....

.....

.....

.....

.....

.....

[4]

3.2 Chain reactions have to be controlled. This means limiting the number of neutrons causing fission. Explain what could happen if a chain reaction is uncontrolled.

.....

.....

[2]

[Total 6 marks]


☐

☐

☐