

Radiation Hazards Uses

GCSE Physics · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

Explain the difference between irradiation and radioactive contamination. (2 marks)

Step 1 · Irradiation

Being exposed to radiation from a source outside the body. The object does not become radioactive.

Step 2 · Contamination

Unwanted radioactive atoms get onto or into an object (or a person) and keep emitting radiation until removed.

Answer: Irradiation: exposure to radiation from outside; contamination: radioactive material on or in something

Check: An X-rayed patient is irradiated, not contaminated.

2. Now try one with the steps

Use the table of isotopes to choose one for a medical tracer injected into a patient. Explain your choice. (3 marks)

Step 1 · Type of radiation

Step 2 · Half-life

Step 3 · Choice

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. Define irradiation. [1]

2. Define radioactive contamination. [1]

3. Give two precautions that reduce the risk of irradiation for a worker using a radioactive source. [2]

4. Give two natural sources of background radiation. [2]

5. Give one precaution against contamination when handling radioactive materials. [1]

6. State the unit of radiation dose. [1]

7. Convert a dose of 2.7 mSv into sieverts. [1]

8. Explain why an alpha source is most dangerous inside the body but least dangerous outside it. [2]

9. Explain why medical tracers use gamma emitters. [2]

10. Explain why a medical tracer should have a short half-life. [2]

11. The UK average annual dose is about 2.7 mSv. A chest X-ray gives about 0.02 mSv. Calculate how many chest X-rays give the same dose year of average background radiation. [2]

12. Suggest why background radiation is higher in some parts of the UK, such, than in others. [1]

13. Explain why it is important that studies on the effects of radiation on people are published and peer reviewed. [2]

14. A paper mill uses a radioactive source and detector to monitor paper thickness. Explain which type of radiation should be used. [3]

4. Before you hand it in

"Food that has been irradiated becomes radioactive."

Irradiated objects do not become radioactive. Only contamination leaves radioactive atoms behind.

"Alpha is always the most dangerous."

Outside the body, gamma (and beta) are more hazardous because they penetrate; inside, alpha is the most dangerous.

Choosing a long half-life for a medical tracer

Tracers need a short half-life (hours). Smoke alarms need a long one (years).

"Background radiation is all from nuclear power stations."

Most background radiation comes from natural sources such as gas from rocks, cosmic rays, food and medical procedures.