MR SULLY UNFOLDS PHYSICS ANSWERS

Radiation: hazards and uses

AQA 4.4.2.4 · 4.4.3
Atomic structure · Paper 1
Foundation & Higher

Name _____ Class _____ Date _____

Ionising radiation can damage living cells, so it must be handled carefully, but it is also very useful, especially in medicine.

KEY IDEAS

- **Irradiation**: exposure to radiation; the object does **not** become radioactive. **Contamination**: radioactive atoms on or in a material.
- Reduce risk: keep your distance (tongs), limit exposure time, use shielding, store sources in lead-lined boxes.
- **Physics only:** background radiation comes from natural (rocks, cosmic rays) and man-made sources; dose is measured in sieverts (Sv).

Section A · Recall

Grade 4–5

1 What is the difference between irradiation and contamination? [2]

Irradiation: the process of exposing an object to nuclear radiation; it does not become radioactive.

Contamination: the unwanted presence of materials containing radioactive atoms on other materials.

2 Give three precautions to reduce the risk when handling a radioactive source. [3]

Use long-handled tongs (keep a distance).

Keep the time of exposure short.

Store it in a lead-lined box / never point it at people.

3 Why should research on the effects of radiation be published and peer reviewed? [1]

So other scientists can check the findings are valid.

Section B · Explain

Grade 5–6

4 Explain why alpha sources are not very dangerous outside the body, but are very dangerous inside it. [3]

Outside: alpha is stopped by skin / a few cm of air, so it can't reach living cells.

Inside: alpha is the most ionising radiation,

so it badly damages nearby cells.

5 Name two natural sources of background radiation. (Physics only) [2]

Rocks (e.g. radon gas) and cosmic rays from space

Section C · Physics only

Grade 6–7+

6 Explain why radioactive waste with a long half-life is a particular problem. [2]

It stays radioactive (hazardous) for a very long time,

so it must be stored safely for hundreds or thousands of years.

7 Radiotherapy uses radiation to treat cancer. Explain why doctors must weigh up the benefits and risks. [3]

Radiation can destroy unwanted tissue (tumours).

But it can also damage healthy cells and cause mutations or cancer.

The benefit of treating the cancer must outweigh the risk.

Exam-style question

AQA style

8 Some food is irradiated with gamma rays to kill bacteria.

a A shopper is worried that the food is now radioactive. Explain why it isn't. [2]

Irradiation only exposes the food to radiation;

no radioactive atoms are added, so it doesn't become radioactive.

b Explain why gamma rays, rather than alpha particles, are used to irradiate packaged food. [2]

Gamma is very penetrating, so it passes through the packaging and food.

Alpha would be stopped by the packaging.

Total: _____ / 20

How confident am I?	Not yet	Nearly	Got it
I can explain contamination and irradiation	☐	☐	☐
I can describe how to handle sources safely	☐	☐	☐
I can explain medical uses of radiation (Physics only)	☐	☐	☐