4.5 Radioactive contamination

Name: _____ Class: _____ Date: _____ **Total: 20 marks**

KEY WORDS Contamination • Irradiation

Objective

Distinguish contamination from irradiation, compare their hazards, and give the credited precautions. Original questions for spec statement 4.4.2.4.

1 Key knowledge and worked examples

	Contamination	**Irradiation**
meaning	unwanted radioactive atoms **on or in** the object	exposing the object to radiation
object radioactive?	yes, until the atoms are removed/decay	**no** – never becomes radioactive
dose ends when?	when the atoms are removed or decay away	when the source is shielded or removed

Hazard comparison (credited pair):

- Contamination may cause continuing exposure while atoms remain **on or in** the body. Internal alpha can be especially hazardous because it strongly ionises living tissue; external alpha is stopped by skin. Compare activity, radiation type, exposure time and pathway before ranking doses.
- Irradiation stops when the exposure stops, and the radiation's type sets its danger.

Precautions for handling sources: hold with **tongs**, keep at a **distance**, limit **time** of exposure, point away from people, store in lead-lined boxes; wear gloves/apron against contamination.

Findings about radiation effects are **published and shared** so other scientists can check them – **peer review**.

2 Practice

2.1 Define contamination and irradiation. [2]

2.2 A nurse holds a gamma source with tongs and limits the time near it. Explain how each precaution reduces her dose. [2]

2.3 State why studies of radiation effects are published and shared. [1]

3 Exam-style questions

3.1 After a nuclear accident, dust containing radioactive atoms settles on a town.

(a) Explain why settled dust is contamination and can cause continuing irradiation. [2]

(b) Why is an alpha-emitting dust more dangerous once breathed in than when on the skin? [2]

(c) Residents are told to stay indoors. Explain how this reduces their dose from the passing dust cloud. [2]

3.2 Medical staff irradiate a patient with gamma rays for 10 minutes.

(a) Explain why the patient does not become radioactive. [1]

(b) The staff stand behind a lead screen. Explain why this protects them but does not stop the treatment. [2]

3.3 A laboratory worker spills a beta-emitting liquid on her glove.

Describe the immediate actions she should take and the reason for each, and state how the hazard differs from receiving a 10-second beta irradiation. [6]