Irradiation, contamination and control

Student activity • observation and reasoning

YEAR 11 / LESSON 97 / PHYSICS + SCIENCE (DOUBLE AWARD)

The question

Why can removing a radiation source end irradiation but not remove contamination?

Classify original scenarios and match controls to how exposure can occur.

Equipment

- Booklet and original scenario cards

Desk-based discussion only. No radioactive materials, powders, contamination demonstrations or waste handling. Do not use glitter or dust as an exposure simulation.

Course coverage: Shared Physics / Double Award: 7.15–7.16. Irradiation, contamination, biological damage and radioactive waste.

Plan, model or apparatus sketch

Draw a labelled graph, nuclear diagram or application model appropriate to the question.

Method and reasoning

Read the whole sequence before starting

YEAR 11 / LESSON 97 / PHYSICS + SCIENCE (DOUBLE AWARD)

1. Define irradiation as exposure to radiation and contamination as unwanted radioactive material on or inside something. Draw a separate labelled diagram for each.

2. Classify three stated scenarios: a patient near an external treatment beam; radioactive dust on a glove; radioactive material accidentally swallowed. Explain whether material is transferred.

3. Explain how ionisation can damage cells and DNA. Distinguish possible mutation or cancer risk from guaranteed harm in every exposure; effects depend on dose and conditions.

4. Match time, distance and suitable shielding to external exposure control. Match containment and preventing ingestion/inhalation to contamination control. Do not suggest handling or cleaning unknown radioactive material.

5. Compare short-lived and long-lived radioactive waste in a paper scenario. Explain the need for controlled containment, shielding, monitoring and an authorised disposal route appropriate to the material.

6. Correct the claim that ordinary irradiation automatically makes an object radioactive. State the limits: nuclear activation can occur under particular particle/energy conditions, so avoid an absolute claim about every possible radiation process.

Cleanup

- Collect cards and retain corrected definitions.

Record your evidence

Blank spaces are for your own work

YEAR 11 / LESSON 97 / PHYSICS + SCIENCE (DOUBLE AWARD)

Reference and task data

This lesson is conceptual, not an emergency-response or waste-handling procedure. If a real suspected source or contamination issue is encountered, stop and notify the responsible staff; do not investigate with classroom equipment.

Scenario	Irradiation / contamination	Reason / appropriate control
External treatment beam		
Dust on glove		
Material swallowed		
Stored waste		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

YEAR 11 / LESSON 97 / PHYSICS + SCIENCE (DOUBLE AWARD)

1. What is irradiation?

2. What is contamination?

3. Does removing an external source remove radioactive dust?

4. Why can ionisation damage living tissue?

5. Why can alpha contamination be hazardous inside the body?

6. Why is waste disposal controlled?