

## Uses and Hazards

### Q1.(2019)

Radioactive elements can contaminate or irradiate objects.

Which statement describes irradiation?

- A Radiation from outside your body travels into your body.
- B Radioactive material is on the skin.
- C Radioactive material is breathed in.
- D Radioactive material is eaten.

Your answer

[1]

### Q2.a(2022)

In 1986, a nuclear power station exploded in Chernobyl.

The radioactive isotopes caesium-137 (Cs-137) and iodine-131 (I-131) were released.

- (a) An old unit of activity is the Curie (Ci).
- The activity of Cs-137 released in the explosion was 2 300 000 Ci.
  - 1 Ci = 37 000 000 000 Bq

Calculate the activity of Cs-137 released in Bq.  
Give your answer in standard form.

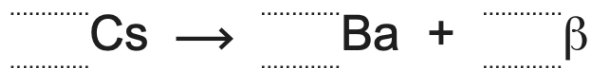
Activity = ..... Bq [2]

### Q2.b(2022)

Cs-137 emits beta radiation. The table shows some information about this decay.

| Element | Symbol | Charge on nucleus | Mass of nucleus |
|---------|--------|-------------------|-----------------|
| Caesium | Cs     | +55               | 137             |
| Barium  | Ba     | +56               | 137             |

Use the table to complete the balanced nuclear equation for Cs-137 decay.



[3]

### Q2.c(2022)

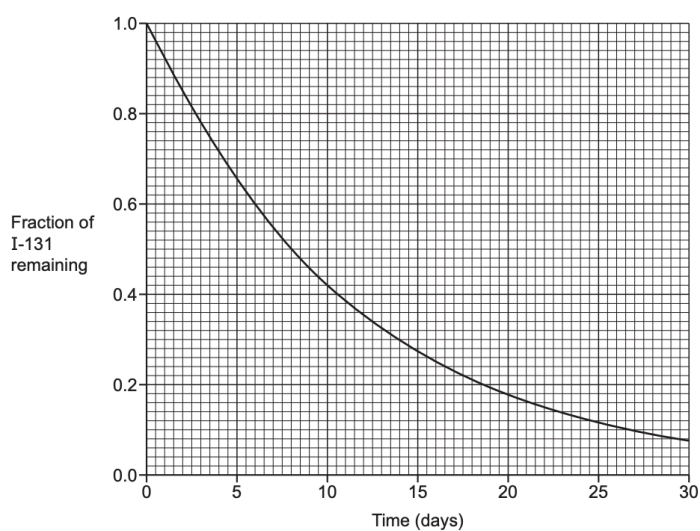
\*(c) The isotopes I-131 and Cs-137 from Chernobyl contaminated sheep.

The government stopped the movement of contaminated sheep for 26 years.

- If the activity per kilogram of sheep was greater than 1000 Bq/kg, the sheep were **contaminated**.
- In 1986, the activity per kg of some sheep was greater than 1600 Bq/kg.
- I-131 emits beta radiation.
- Cs-137 emits beta **and** gamma radiation.

The graphs show how the amount of I-131 and Cs-137 change with time:

**Graph for I-131**



A line graph showing the decay of Cs-137. The y-axis is labeled 'Fraction of Cs-137 remaining' and ranges from 0.2 to 1.0 with major grid lines every 0.2 and minor grid lines every 0.02. The x-axis is labeled 'Time (years)' and ranges from 0 to 50 with major grid lines every 10 years and minor grid lines every 2 years. The curve starts at (0, 1.0) and decreases exponentially, passing through approximately (10, 0.81), (20, 0.66), (30, 0.53), (40, 0.43), and ending at approximately (50, 0.32).

| Time (years) | Fraction of Cs-137 remaining |
|--------------|------------------------------|
| 0            | 1.00                         |
| 10           | 0.81                         |
| 20           | 0.66                         |
| 30           | 0.53                         |
| 40           | 0.43                         |
| 50           | 0.32                         |

Use ideas about half-life and half-life calculations.

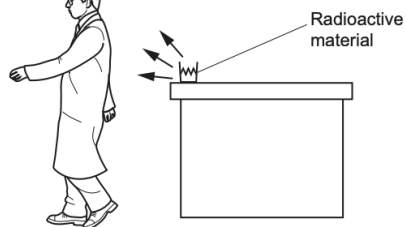
[6]

Q3.a(2023)

A scientist is working with a radioactive material.  
The radioactive material emits **beta** radiation.

(a) Fig. 11.1 shows the scientist walking very close to the radioactive material.

Fig. 11.1



Describe the effect of the radioactive material on the scientist as they walk past.

Tick (✓) **one** box.

They have been irradiated only.

☐

They have been contaminated only.

☐

They have been irradiated and contaminated.

☐

They have **not** been irradiated or contaminated.

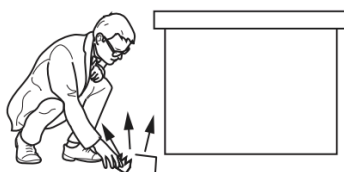
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[1]

### Q3.b(2023)

In Fig. 11.2, the scientist knocks the radioactive material onto the floor.  
They pick up the radioactive material with their bare hands.

Fig. 11.2



Describe the effect of the radioactive material on the scientist as they pick it up.

Tick (✓) **one** box.

They have been irradiated only.

☐

They have been contaminated only.

☐

They have been irradiated and contaminated.

☐

They have **not** been irradiated or contaminated.

☐

[1]

### Q3.c(2023)

**Fig. 11.3** shows the scientist standing behind a lead screen and a lead-glass window. They use a robotic arm to handle the radioactive material.

**Fig. 11.3**



Describe the effect of the radioactive material on the scientist when they are behind the lead screen.

Tick (✓) **one** box.

They have been irradiated only.

☐

They have been contaminated only.

☐

They have been irradiated and contaminated.

☐

They have **not** been irradiated or contaminated.

☐

[1]