

Background Radiation *(Physics only)*

Sources of background radiation

tick the correct box

1 Which of these is a source of **natural** background radiation?

☐ A medical X-rays

☐ B cosmic rays from space

☐ C nuclear power stations

☐ D nuclear weapons testing

2 Which of these is a source of **man-made** (artificial) background radiation?

☐ A radon gas from rocks

☐ B food and drink

☐ C cosmic rays from space

☐ D medical tracers used in hospitals

Measuring the count-rate of a radioactive source

EXAMPLE

Measure the background count (no source), then the count with the source. Subtract the background, then divide by the time in seconds to get the count-rate in becquerels (Bq).

Measurement	Count in 5 minutes
Background	300
With source	2100

Subtract the background: $2100 - 300 = 1800$ counts (from the source, in 5 min).

Convert the time: 5 min = 300 s.

Count-rate = count ÷ time: $1800 \div 300 = 6$ Bq.

Count-rate of source = 6 Bq

NOW YOU TRY

Measurement	Count in 10 minutes
Background (source removed)	1200
Source present	7200

Calculate the count-rate of the source in becquerels (Bq). (1 Bq = 1 count per second)

Count-rate of source = _____ Bq

Exam-style question

[6 marks]

A student measures the **background radiation** in two different parts of the UK. Each reading is taken over **30 minutes** with no source present.

Location	Count in 30 minutes
Cornwall (granite rock)	5400
London (clay soil)	1800

(a) Calculate the background count-rate in **Cornwall**, in Bq. (2)

count-rate = _____ Bq

(b) Suggest why the background count-rate is **higher in Cornwall** than in London. (2)

(c) In Cornwall the student then puts a radioactive source next to the detector and records **9000 counts in 30 minutes**. Calculate the count-rate of the **source alone**, in Bq. (2)

count-rate of source = _____ Bq

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Uses of Nuclear Radiation *(Physics only)*

Monitors *e.g. thickness gauges & smoke detectors*

Why do the sources used in monitors need a **long** half-life?

Draw / annotate an example

space for drawing

Explain

Key words to use ☐ long half-life ☐ constant count-rate ☐ count-rate decreases ☐ radiation absorbed

Tracers *e.g. medical tracers*

Why do the sources used as tracers need a **short** half-life?

Draw / annotate an example

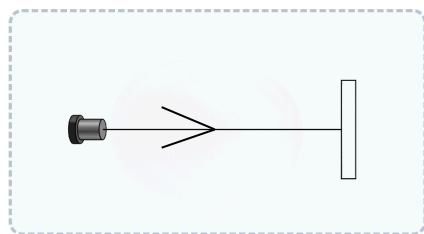
space for drawing

Explain

Key words to use ☐ short half-life ☐ count-rate reduces to zero ☐ limits harmful exposure to humans

Three real uses *stick your diagram in each box, then explain how it works*

Smoke alarm

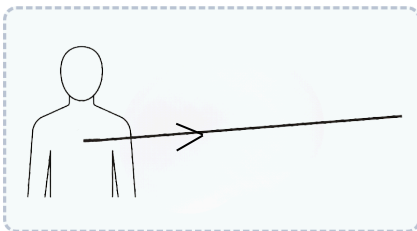


radiation _____

half-life _____

how does it work?

Technetium-99m in medicine

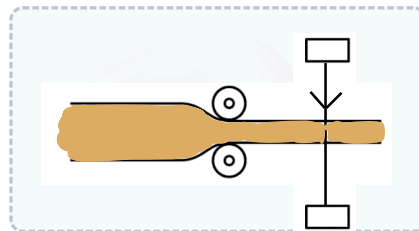


radiation _____

half-life _____

how does it work?

Paper thickness monitor



radiation _____

half-life _____

how does it work?