

Atoms & Nuclear Radiation

Nuclear radiation is very useful in modern medicine. It can be used to sterilise medical equipment, investigate what is happening inside the human body, and to treat cancer.

Kromek is a company that makes gamma radiation detectors used in medical scanning. These detectors are helping to improve the quality of medical imaging – it is like having modern high-definition photographs instead scanning faster, so patients receive a lower dose of radiation during medical diagnosis, and physically smaller devices open up new possibilities for diagnosis.



image credit: courtesy Kromek Ltd.

Array of modular Cadmium-Zinc-Telluride gamma radiation detectors for medical imaging applications, made by Kromek.

Know

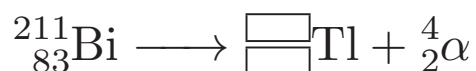
1. Complete the table below:

Type of Radiation	Symbol	Composition	Charge	Penetrating Power
Alpha				
	β			Stopped by a few mm of aluminium
		Electromagnetic radiation		

2. The **activity** of a radioactive source is the rate at which its unstable nuclei decay. State the unit of activity.
3. The three types of nuclear radiation all cause ionisation when they pass through the human body. Explain what is meant by the term "ionisation".
4. Explain what is meant by the **half-life** of a radioactive source.

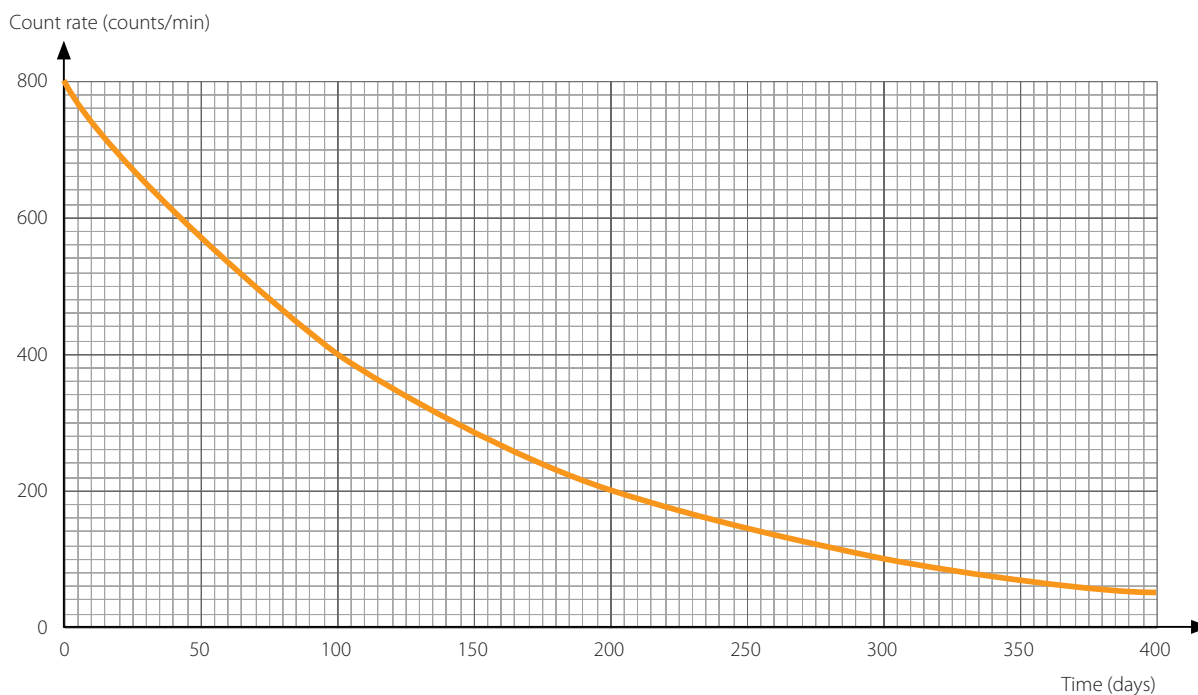
Apply

- Radioactive tracers are used in medical imaging to look inside human bodies. The tracer is a substance which emits nuclear radiation. Patients either drink a solution containing the tracer, or it is injected into them. The Kromek detectors detect gamma radiation. Discuss why elements that emit alpha radiation are not used as medical tracers.
- Explain why medical tracers need to have a short half-life.
- Bismuth-211 decays by alpha emission. Complete the nuclear equation for this decay:



Extend

- The element strontium has 38 protons in its nucleus. The isotope strontium-90 decays by beta emission. Write the nuclear equation for this decay.
- The graph below shows how the activity of a radioactive source changes with time. Use the graph to find the half-life of the source.



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