

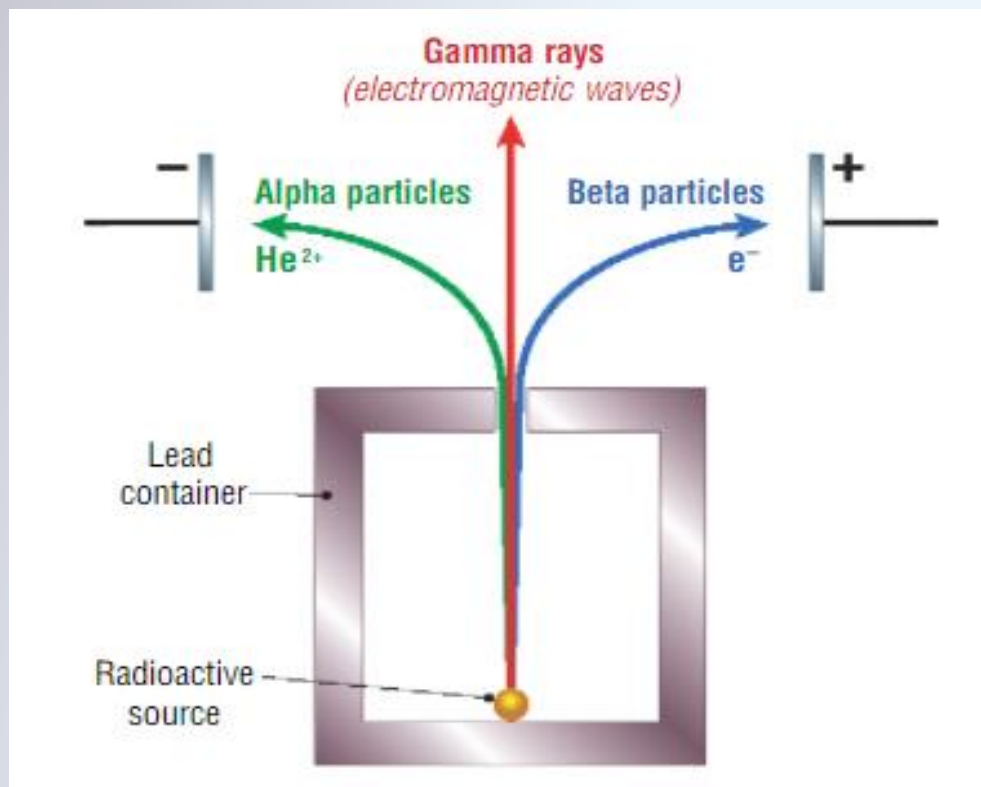


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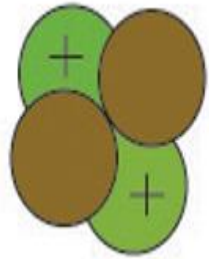
Radiation



- Radioactivity - spontaneous breaking up of unstable nuclei with the emission of one or more types of radiation
- Three types; alpha, beta and gamma radiation.



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Alpha particle



Beta particle

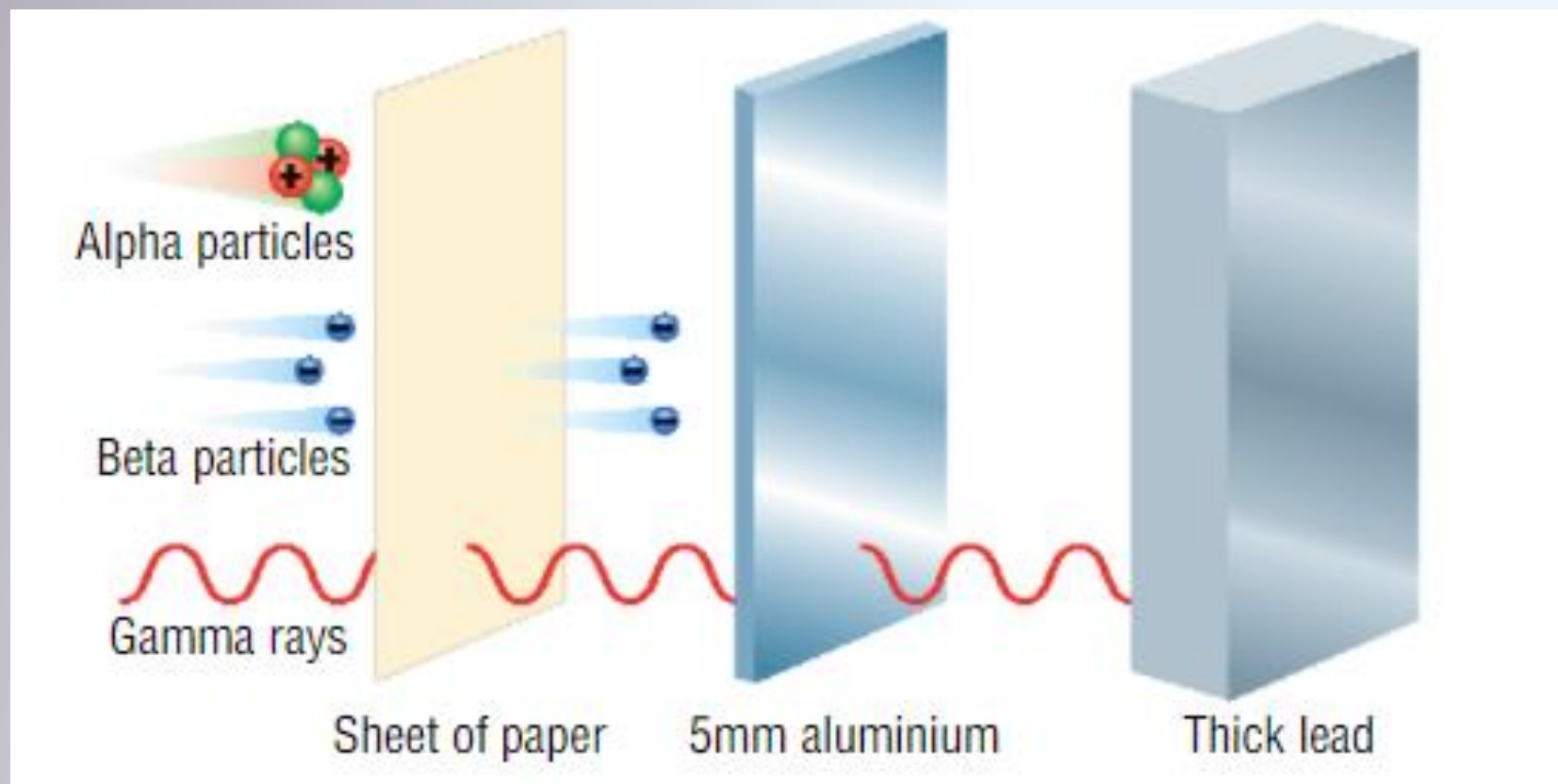


Gamma ray

Alpha Radiation	Beta Radiation	Gamma Radiation
Consists of 2 Protons and 2 Electrons (helium nucleus)	Consists of 1 Electron	Consists of high-energy electromagnetic radiation
2 ⁺ charge	1 ⁻ charge	No charge
Emitted from unstable nucleus to become a more stable nucleus	Neutron turns into proton and electron. Electron flies away, proton stay in nucleus.	Emitted from unstable nucleus to lose excess energy
Low penetrating power, stopped by paper	More penetrating than alpha, stopped by 5mm of aluminium.	High penetrating power, stopped by thick lead.
		Most dangerous to humans due to high penetrating power.



Penetrating power of radiation



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Nuclear reaction is one that alters the composition, structure or energy of an atomic nucleus.

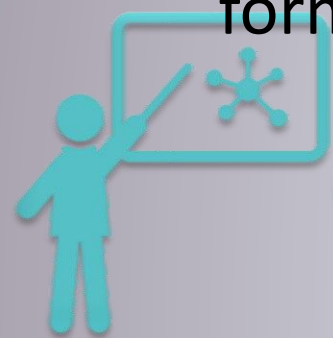


Chemical Reaction

- Involves electrons rather than nucleus.
- No new element formed.
- No nuclear radiation released.
- Chemical bonds broken and formed.

Nuclear reaction

- Changes occur in nucleus, electrons not involved.
- New element formed.
- Nuclear radiation is released.
- No chemical bonding/breaking involved.

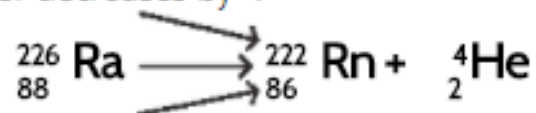


Writing radiation equations:

Alpha:

radium-226 → radon-222 + alpha particle

mass number decreases by 4



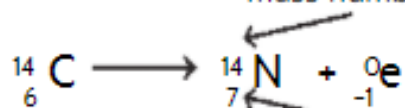
atomic number decreases by 2

1. Reduce mass number by 4
2. Reduce atomic number by 2
3. Look up new element formed from P.T.

Beta:

carbon-14 → nitrogen-14 + beta particle

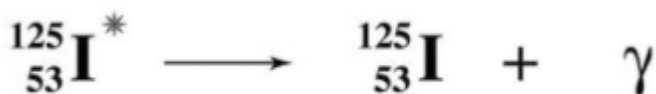
mass number stays the same



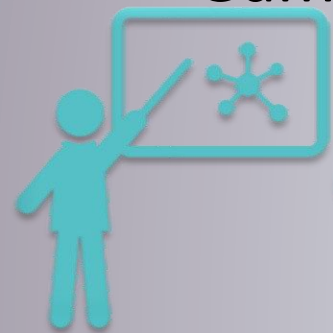
atomic number increases by 1

1. Mass number stays the same
2. Atomic number increases by 1
3. Look up new element formed from P.T.

Gamma:



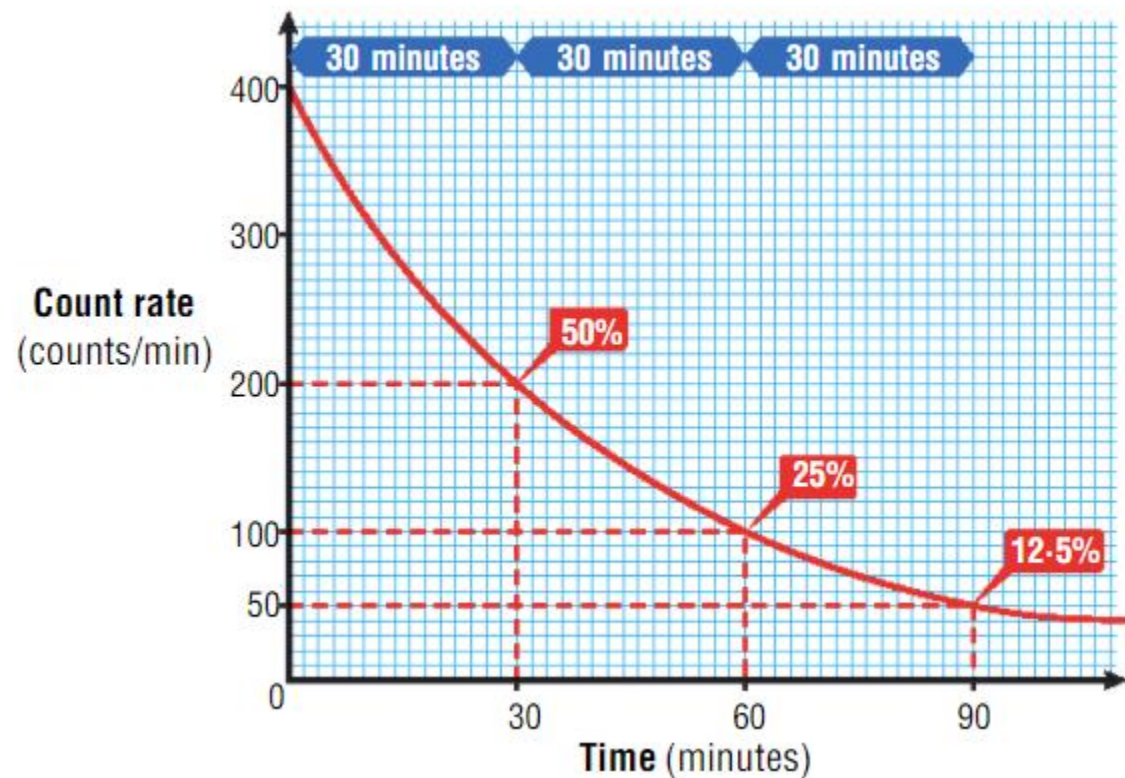
1. No change to either number
2. No new element formed.



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Half-life

The half life of an element is the amount of time it takes for half of the nuclei of any given sample to decay.



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Radioisotopes

A radioisotope is a radioactive isotope.



Medical uses

- Gamma radiation is used to kill cancerous tissues.
- Gamma radiation is used to sterilise equipment.



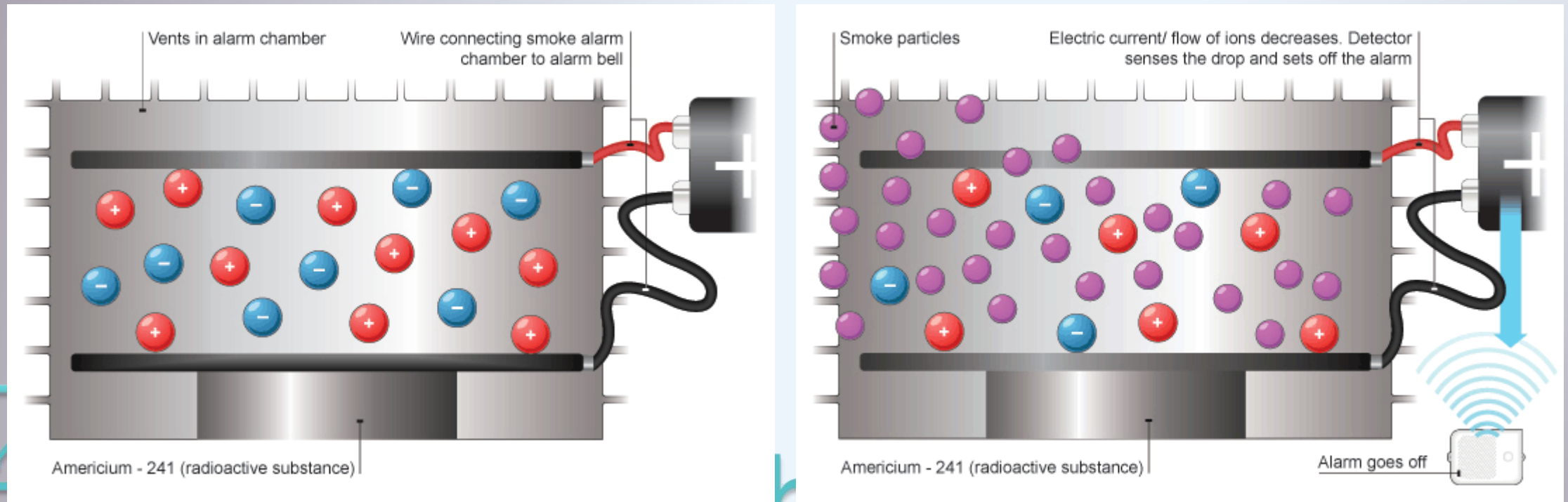
Archaeological uses

- Radiocarbon dating (carbon dating) – is a technique used to determine the age of an object containing carbon. Based on the ratio of carbon-14 to carbon-12 in the object.
- During life the ratio of carbon-12 to carbon-14 stays the same. After death the level of carbon-14 drops whilst the level of carbon-12 stays the same.



Smoke alarms

Smoke alarms use alpha radiation to detect the presence of smoke.



Food Irradiation

- Gamma rays are used to kill micro-organisms on foods in order to prevent spoilage.

