CIE Physics GCSE

Topic 5.2 - Radioactivity

Flashcards

Describe α radiation.

Describe α radiation.

- 1 particle consists of 2 protons and 2 neutrons (same as a helium nucleus)
- Highly ionising
- Weakly penetrating (blocked by ~5cm of air)

Give the equation for an α particle.

Give the equation for a α particle.

$$\alpha \; {}^{4}_{2}$$

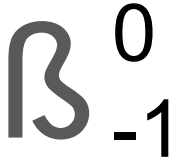
Describe ß radiation.

Describe ß- radiation.

- 1 particle consists of a single electron
- Medium ionising effect
- Medium penetration (blocked by ~50cm of air or a sheet of metal)

Give the equation for a ß particle.

Give the equation for a ß particle.



Describe γ radiation.

Describe γ radiation.

- Weakly ionising
- Highly penetrating (blocked by several cm of lead)
- Electromagnetic radiation (no particles)

Give the equation for γ radiation.

Give the equation for γ radiation.

$$\gamma^{0}_{0}$$

γ radiation is an EM wave.

How is α radiation affected by electric and magnetic fields? (supplement)

How is α radiation affected by electric and magnetic fields? (supplement)

It is slightly deflected by electric and magnetic fields.

How is β radiation affected by electric and magnetic fields? (supplement)

How is β radiation affected by electric and magnetic fields? (supplement)

It is greatly deflected by electric and magnetic fields, in the opposite direction to alpha radiation.

How is γ radiation affected by electric and magnetic fields? (supplement)

How is γ radiation affected by electric and magnetic fields? (supplement)

It is not deflected.

How can radiation be detected?

How can radiation be detected?

- Photographic film
- Geiger-Muller tubes
- Cloud chamber

How does photographic film work?

How does photographic film work?

The film is white; as it absorbs radiation it darkens.

Describe the action of Geiger-Muller tubes

Describe the action of Geiger-Muller tubes

They are tubes which transmit an electric pulse every time radiation is absorbed, producing a clicking sound.

How are cloud chambers used?

How are cloud chambers used?

A cloud chamber is a container filled with water vapour. Ionising radiation causes the vapour to condense, forming tracks.

What is background radiation?

What is background radiation?

Weak radiation from external sources which is always present.

Give some sources of background radiation.

Give some sources of background radiation.

- Cosmic rays
- Radiation from rocks underground
- Nuclear fallout
- Medical rays

How is background radiation dealt with in calculations? (supplement)

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It must be subtracted before calculations (half life etc.) are attempted.

Define half life.

Define half life.

Half life is the time taken for the number of radioactive nuclei to halve, or the time taken for the count rate/activity to halve.

Give 3 practical applications of radioactive materials (supplement)

Give 3 practical applications of radioactive materials (supplement)

- Medical tracers
- Radiotherapy
- Smoke alarms

What kind of radiation is used in smoke alarms? (supplement)

What kind of radiation is used in smoke detectors? (supplement)

Alpha radiation

How do smoke alarms work?
(supplement)

How do smoke alarms work? (supplement)

Alpha radiation is emitted into the air, reaching a detector and completing the circuit. If smoke is present, it blocks alpha radiation so it does not reach the detector and the circuit is broken, causing an alarm to sound.

Give a use of beta emitters (supplement)

Give a use of beta emitters (supplement)

Thickness monitoring of metal sheets.

How does thickness monitoring work? (supplement)

How does thickness monitoring work? (supplement)

A source and receiver are placed on either side of the sheet. If there is a drop or rise in the number of particles detected, the thickness has changed and needs adjusting.

How is radiation used in sterilisation? (supplement)

How is radiation used in sterilisation? (supplement)

Gamma emitters are used to kill bacteria/parasites on equipment.

How are medical tracers chosen?
(supplement)

How are medical tracers chosen? (supplement)

They should have a short half life and decay into a stable isotope which can be excreted, making it safe for use in the body.

It should release only gamma radiation so is weakly ionising and can pass easily through body tissue without damaging it.

What kind of radiation is used for radiotherapy? (supplement)

What kind of radiation is used for radiotherapy? (supplement)

Gamma radiation

Explain the process of radiotherapy (supplement)

Explain the process of chemotherapy (supplement)

- Gamma emitters direct gamma rays onto specific areas with cancerous cells
- The cells absorb the radiation and die

What are the risks of ionising radiation to people?

What are the risks of ionising radiation to people?

It can damage living cells, causing them to die or mutate and become cancerous.

What are some safety precautions for using radiation?

What are some safety precautions when using radiation?

- Minimise exposure time
- Keep as much distance from the source as possible
- Use shielding eg. lead