

OCR B Physics A Level

6.2.4 - Nuclear Radiation

Flashcards

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What two processes can cause electrons to change energy levels?



What two processes can cause electrons to change energy levels?

- The absorption or emission of photons of energy.
 - Collisions with free electrons.



How are line spectra formed?



How are line spectra formed?

Line spectra are formed when white light passes through a cool gas. The low energy electrons in the cool gas absorb photons of certain energies/wavelengths from the light, which correspond to the differences in their energy levels. The emitted light spectrum will have absorption lines representing the absorbed photons.



What type of gas is found in fluorescent tubes?



What type of gas is found in fluorescent tubes?

Mercury vapour.



What is the inside coating of a fluorescent tube?



What is the inside coating of a fluorescent tube?

Fluorescent tubes have a phosphor coating.



What is the term for when an electron absorbs energy and moves to a higher energy level?



What is the term for when an electron absorbs energy and moves to a higher energy level?

Excitation



What are the four scenarios in which an atom may become unstable?



What are the four scenarios in which an atom may become unstable?

1. The atom having too many neutrons.
2. The atom having too few neutrons.
3. The atom having too much mass.
4. The atom having too much energy.



How do unstable nuclei become more stable?



How do unstable nuclei become more stable?

Unstable nuclei are radioactive, so emit radiation in order to become more stable.

The type of radiation they emit depends on what makes them unstable.



What are the constituents of an alpha particle?



What are the constituents of an alpha particle?

Two protons and two neutrons.



What are penetration capabilities of alpha radiation?



What are penetration capabilities of alpha radiation?

Alpha particles are weakly penetrating and so are stopped by a few centimetres of air or a sheet of paper.



What does beta-minus radiation consist of?



What does beta-minus radiation consist of?

High-energy electrons



What does beta-plus radiation consist of?



What does beta-plus radiation consist of?

High-energy positrons



What are the penetration capabilities of beta-minus radiation?



What are the penetration capabilities of beta-minus radiation?

Beta-minus radiation has medium penetrative capabilities and is stopped by a few mm of aluminium or around 1 m of air.



What are the penetration capabilities of beta-plus radiation?



What are the penetration capabilities of beta-plus radiation?

Beta-plus radiation is almost instantaneously annihilated by electrons and so has virtually zero range.



What is gamma radiation?



What is gamma radiation?

Gamma radiation is a form of high-energy electromagnetic radiation.



What charge do gamma rays have?



What charge do gamma rays have?

Gamma rays are a form of electromagnetic radiation and so don't have a charge.



Which type of radiation is most ionising?



Which type of radiation is most ionising?

Alpha radiation.



Which type of radiation is most weakly ionising?



Which type of radiation is most weakly ionising?

Gamma radiation.



Why type of radiation travels the fastest
and at what speed?



Why type of radiation travels the fastest and at what speed?

Gamma radiation travels the fastest since it is a type of electromagnetic radiation and so travels at the speed of light.



Under what circumstance is alpha radiation emitted?



Under what circumstance is alpha radiation emitted?

When a nucleus has too much mass.



Under what circumstance is beta-minus radiation emitted?



Under what circumstance is beta minus radiation emitted?

Beta-minus radiation is emitted when a nucleus has too many neutrons.



Under what circumstance is beta-plus radiation emitted?



Under what circumstance is beta plus radiation emitted?

Beta-plus radiation is emitted when a nucleus has too many protons.



Under what circumstance is gamma radiation emitted?



Under what circumstance is gamma radiation emitted?

Gamma radiation is emitted when a nucleus has too much energy.



What are the penetrative capabilities of gamma radiation?



What are the penetrative capabilities of gamma radiation?

Gamma radiation is highly penetrative but is absorbed by several inches of lead or several metres of concrete.



Explain the process of beta-minus decay.



Explain the process of beta minus decay.

Beta-minus decay is where a neutron in the nucleus turns into a proton, and releases an electron and an electron antineutrino.



Explain the process of beta-plus decay.



Explain the process of beta plus decay.

Beta-plus decay is where a proton in the nucleus turns into a neutron, and releases a positron and an electron neutrino.



What is meant by the absorbed dose of radiation?



What is meant by the absorbed dose of radiation?

This is the amount of energy absorbed by radiation per kg of body tissue.



What is the equation for the absorbed dose of radiation?



What is the equation for the absorbed dose of radiation?

$$\textit{Absorbed Dose} = \frac{\textit{Energy Deposited / J}}{\textit{Mass / kg}}$$



What is meant by effective dose?



What is meant by effective dose?

Effective dose is a measure of the tissue damage caused by radiation.



What is the equation used to calculate an effective dose?



What is the equation used to calculate an effective dose?

$$\textit{Effective Dose} = \textit{Absorbed Dose} \times \textit{Quality Factor}$$



What is quality factor a measure of, in terms of radiation?



What is quality factor a measure of, in terms of radiation?

Quality factor is a measure of how damaging a type of radiation is.

