

Alpha & Beta Decay

Questions for GCSE Physics



1. What is meant by the term atomic number?

The number of protons in a nucleus

2. From which part of an atom is nuclear radiation emitted?

The nucleus

3. What is a nucleon?

A proton or neutron (a particle found in the nucleus)

4. State what the mass number tells you about a nucleus.

The total number of nucleons (total number of protons and neutrons)

5. A uranium-238 nucleus has an atomic number of 92. Calculate the number of neutrons in this nucleus.

Mass number – proton number = 238 – 92 = 146



6. Describe the composition of an alpha particle.

Two protons and two neutrons

7. An alpha particle has the same structure as the nucleus of which element? State its relative charge.

Helium nucleus with a relative charge of +2

8. State how the atomic number and mass number change during alpha decay.

The atomic number decreases by 2 (it loses 2 protons)

The mass number decreases by 4 (it loses 2 protons + 2 neutrons)

9. Explain why alpha decay changes the nucleus into the nucleus of a different element.

*There are a different number of protons and each element has a
different proton number.*

10. Uranium-238 (atomic number 92) emits an alpha particle to form thorium. State the atomic number and mass number of the thorium nucleus.

Atomic number = $92 - 2 = 90$

Mass number = $238 - 4 = 234$



11. What type of particle is emitted during beta-minus decay?

An electron

12. Describe the change that occurs to a neutron in the nucleus during beta-minus decay.

A neutron turns into a proton (and gives off an electron)

13. State the relative charge of a beta-minus particle.

- 1

14. State how the atomic number changes during beta-minus decay.

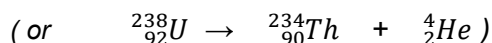
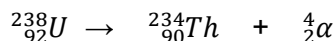
Atomic number increases by 1 (it gains a proton)

15. Explain why the mass number remains unchanged during beta-minus decay.

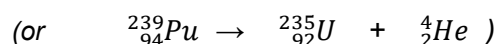
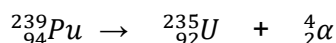
The nucleus gains a proton and loses a neutron



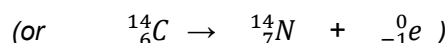
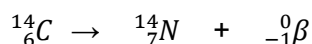
16. Write a balanced nuclear equation for the alpha decay of uranium-238 (atomic number 92 and symbol U) into thorium (Th).



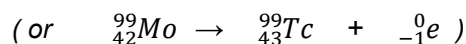
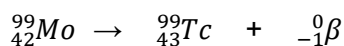
17. Plutonium-239 (atomic number 94 and symbol Pu) decays by alpha emission into uranium (U). Write a balanced nuclear equation for this decay.



18. Carbon-14 (atomic number 6 and symbol C) decays by beta-minus emission into nitrogen (N). Write a balanced nuclear equation for this decay.



19. Molybdenum-99 (atomic number 42 and symbol Mo) decays by beta-minus emission into technetium (Tc). Write a balanced nuclear equation for this decay.



20. A nucleus has a mass number of 238 and an atomic number of 92. It emits one alpha particle followed by two beta-minus particles. Calculate its final mass number and atomic number.

$238 \rightarrow \text{after } \alpha \text{ decay } 234 \rightarrow \text{after } \beta \text{ decay } 234 \rightarrow \text{after } \beta \text{ decay } \mathbf{234}$

$92 \rightarrow \text{after } \alpha \text{ decay } 90 \rightarrow \text{after } \beta \text{ decay } 91 \rightarrow \text{after } \beta \text{ decay } \mathbf{92}$

