

## Alpha Decay Quiz Questions and Answers PDF

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**Which of the following best describes the penetration power of alpha particles?**

- High
- Moderate
- Low ✓**
- Extremely high

Alpha particles have low penetration power and can be stopped by a sheet of paper or the outer layer of human skin. They are not able to penetrate solid materials effectively due to their relatively large mass and charge.

**Describe the process of alpha decay and its impact on the original atom's nucleus.**

**Alpha decay occurs when an unstable nucleus emits an alpha particle (helium nucleus), leading to a decrease in atomic number by 2 and mass number by 4, transforming the original atom into a different element.**

**Which safety precautions are necessary when handling alpha emitters?**

- Wearing lead aprons
- Using gloves and masks ✓**
- Ensuring proper ventilation ✓**
- Using thick concrete barriers

When handling alpha emitters, it is essential to use appropriate shielding, maintain distance, and wear protective clothing to minimize exposure. Additionally, proper containment and disposal methods should

be followed to prevent contamination.

**What happens to the atomic number of an element after alpha decay?**

- It increases by 2
- It decreases by 2 ✓
- It remains the same
- It decreases by 4

After alpha decay, the atomic number of an element decreases by 2, as it emits an alpha particle consisting of 2 protons and 2 neutrons.

**How does alpha decay contribute to the stability of a radioactive nucleus? Provide an example.**

Alpha decay contributes to the stability of a radioactive nucleus by emitting an alpha particle (two protons and two neutrons), which decreases the nucleus's mass and atomic number, thus moving it towards a more stable state.

**Which of the following materials can stop alpha particles?**

- Lead
- Aluminum foil
- Paper ✓
- Concrete

Alpha particles can be stopped by materials such as paper, skin, or even a few centimeters of air due to their relatively large mass and positive charge, which makes them less penetrating compared to beta or gamma radiation.

**Explain why alpha particles have low penetration power compared to other types of radiation.**

Alpha particles have low penetration power compared to other types of radiation due to their large mass and positive charge, which result in significant interactions with matter that quickly absorb their energy.

Discuss the potential health risks associated with exposure to alpha particles and how they can be mitigated.

The potential health risks associated with exposure to alpha particles include lung cancer and other tissue damage due to their high ionizing power, particularly when alpha-emitting materials are inhaled or ingested. These risks can be mitigated by implementing safety measures such as using protective equipment, ensuring proper ventilation, and adhering to regulatory guidelines to limit exposure.

What is an alpha particle composed of?

- 1 proton and 1 neutron
- 2 protons and 2 neutrons ✓
- 2 electrons and 2 protons
- 3 protons and 3 neutrons

An alpha particle is a type of nuclear particle that consists of two protons and two neutrons, making it identical to a helium nucleus.

Which element is commonly known to undergo alpha decay?

- Carbon-14
- Uranium-238 ✓

- Iodine-131
- Cesium-137

Alpha decay is a common form of radioactive decay where an atomic nucleus emits an alpha particle, typically consisting of 2 protons and 2 neutrons. Elements such as Uranium-238 and Radium-226 are well-known examples that undergo alpha decay.

**Write the nuclear equation for the alpha decay of Uranium-238.**

$$\text{}^{238}_{92}\text{U} \rightarrow \text{}^{234}_{90}\text{Th} + \text{}^4_2\text{He}$$

**Compare and contrast alpha decay with beta decay in terms of particles emitted and changes in the nucleus.**

Alpha decay emits an alpha particle, reducing the atomic number by 2 and mass number by 4, while beta decay emits a beta particle, changing a neutron to a proton or vice versa, altering the atomic number by 1 without changing the mass number.

**What is the charge of an alpha particle?**

- +1
- 1
- +2 ✓
- 0

An alpha particle carries a positive charge due to its composition of two protons and two neutrons, which is equivalent to a helium nucleus. Therefore, it has a charge of  $+2e$ , where  $e$  is the elementary charge.

**Alpha decay typically results in the formation of which type of element?**

- A lighter element ✓
- A heavier element
- An isotope of the same element
- A non-radioactive element

Alpha decay typically results in the formation of a new element that is two atomic numbers lower than the original element, often leading to the creation of a heavier noble gas or a different heavy element.

**What is the primary reason for alpha decay in a nucleus?**

- To increase atomic mass
- To achieve nuclear stability ✓
- To emit gamma rays
- To increase the number of neutrons

Alpha decay occurs primarily due to the instability of a nucleus that has too many protons and neutrons, leading to the emission of an alpha particle to achieve a more stable configuration.

**Which of the following are characteristics of alpha particles?**

- High mass ✓
- High penetration power
- Positive charge ✓
- Short range in air ✓

Alpha particles are positively charged, consist of two protons and two neutrons, and have low penetration power, being stopped by a sheet of paper or human skin.

**What are potential applications of alpha particles?**

- Cancer treatment ✓
- Smoke detectors ✓
- Power generation in nuclear reactors
- Imaging in medical diagnostics

Alpha particles have various applications in fields such as medical treatment, radiation therapy, smoke detectors, and nuclear research.

**Which isotopes are known to undergo alpha decay?**

- Uranium-238 ✓
- Radium-226 ✓
- Carbon-14
- Polonium-210 ✓

Alpha decay is a common form of radioactive decay that occurs in heavy isotopes, particularly those with atomic numbers greater than 82, such as uranium-238, radium-226, and polonium-210.

**What changes occur in the nucleus during alpha decay?**

- Loss of 2 protons ✓
- Gain of 2 neutrons
- Loss of 2 neutrons ✓
- Gain of 2 electrons

During alpha decay, the nucleus loses two protons and two neutrons, resulting in the formation of a new element with a lower atomic number and mass number.

**Which of the following statements about alpha decay are true?**

- It increases the atomic number of the element.
- It decreases the mass number by 4. ✓
- It results in the emission of a helium nucleus. ✓
- It is a form of beta decay.

Alpha decay is a type of radioactive decay where an atomic nucleus emits an alpha particle, resulting in a decrease in atomic number by two and mass number by four. This process typically occurs in heavy elements, leading to the formation of a new element.