

## Nuclear Chemistry MCQs

- Radioactivity** is the spontaneous emission of energy or particles from the nucleus of an atom. Which of the following is not a type of radioactive decay?
  - Alpha decay
  - Beta decay
  - Gamma decay
  - Delta decay
- Half-life** is the time required for half of the radioactive nuclei in a sample to decay. If the half-life of a radioactive isotope is 10 years, how long will it take for 75% of the original sample to decay?
  - 20 years
  - 30 years
  - 40 years
  - 50 years
- Nuclear fission** is the splitting of a heavy nucleus into lighter nuclei, releasing a large amount of energy. Which of the following is a common fissionable isotope?
  - Uranium-235
  - Uranium-238
  - Plutonium-238
  - Plutonium-239
- Nuclear fusion** is the combining of lighter nuclei into a heavier nucleus, releasing a large amount of energy. Where does nuclear fusion occur naturally?
  - The Earth's core
  - The Sun
  - The Moon
  - The atmosphere
- Radioactive isotopes** have many applications in medicine. Which of the following is a common use of radioactive isotopes in medical diagnosis?
  - Treating cancer
  - Imaging bones
  - Sterilizing medical equipment
  - Dating archaeological artifacts
- Nuclear waste** is a byproduct of nuclear power generation. What is the main challenge in managing nuclear waste?
  - Its low radioactivity
  - Its short half-life
  - Its high toxicity
  - Its low toxicity
- Nuclear power** is a source of electricity generated by nuclear fission. What is the main advantage of nuclear power compared to fossil fuels?
  - It produces less greenhouse gas emissions
  - It is a renewable energy source
  - It is cheaper to produce
  - It is safer

8. **Radiocarbon dating** is a method used to determine the age of organic materials. Which radioactive isotope is used in radiocarbon dating?
- A. Carbon-12
  - B. Carbon-13
  - C. Carbon-14
  - D. Carbon-15
9. **Nuclear reactors** are used to produce nuclear power. What is the main component of a nuclear reactor?
- A. Fuel rods
  - B. Control rods
  - C. Moderator
  - D. All of the above
10. **Nuclear weapons** are devices that use nuclear fission or fusion to release a large amount of energy. What is the main concern about the proliferation of nuclear weapons?
- A. The cost of producing them
  - B. The environmental impact
  - C. The risk of nuclear war
  - D. The health hazards
11. **Transmutation** is the process of changing one element into another. Which type of nuclear reaction is used in transmutation?
- A. Nuclear fission
  - B. Nuclear fusion
  - C. Radioactive decay
  - D. Nuclear bombardment
12. **Nuclear medicine** is the use of radioactive isotopes to diagnose and treat diseases. Which type of radioactive decay is most commonly used in nuclear medicine?
- A. Alpha decay
  - B. Beta decay
  - C. Gamma decay
  - D. Positron emission
13. **Nuclear energy** is a controversial topic. What is one of the main arguments against the use of nuclear energy?
- A. It is a renewable energy source
  - B. It produces a lot of greenhouse gas emissions
  - C. It is a safe and reliable source of energy
  - D. It poses a risk of nuclear accidents
14. **Radiotherapy** is the use of radiation to treat cancer. Which type of radiation is most commonly used in radiotherapy?
- A. X-rays
  - B. Gamma rays
  - C. Alpha particles
  - D. Beta particles
15. **Nuclear disarmament** is the process of reducing or eliminating nuclear weapons. What is the main goal of nuclear disarmament?
- A. To increase the number of nuclear weapons
  - B. To promote nuclear proliferation

- C. To reduce the risk of nuclear war
- D. To increase the cost of producing nuclear weapons

### Answers

- **D. Delta decay** - There is no such thing as delta decay.
- **C. 40 years** - After one half-life (10 years), 75% of the original sample will have decayed.
- **A. Uranium-235** - Uranium-235 is a common fissionable isotope.
- **B. The Sun** - Nuclear fusion occurs naturally in the Sun.
- **B. Imaging bones** - Radioactive isotopes are used to image bones in medical diagnosis.
- **C. Its high toxicity** - The main challenge in managing nuclear waste is its high toxicity.
- **A. It produces less greenhouse gas emissions** - Nuclear power produces less greenhouse gas emissions compared to fossil fuels.
- **C. Carbon-14** - Carbon-14 is used in radiocarbon dating.
- **D. All of the above** - Fuel rods, control rods, and a moderator are all essential components of a nuclear reactor.
- **C. The risk of nuclear war** - The main concern about the proliferation of nuclear weapons is the risk of nuclear war.
- **D. Nuclear bombardment** - Transmutation is achieved through nuclear bombardment.
- **D. Positron emission** - Positron emission is most commonly used in nuclear medicine.
- **B. It produces a lot of greenhouse gas emissions** - The main argument against the use of nuclear energy is its potential for accidents and the production of radioactive waste.
- **B. Gamma rays** - Gamma rays are most commonly used in radiotherapy.
- **C. To reduce the risk of nuclear war** - The main goal of nuclear disarmament is to reduce the risk of nuclear war.