

**CHAPTER 21**  
**NUCLEAR PHYSICS**

**1. Encircle the correct answers.**

- i. 1 amu is equal to:
- $1.0606 \times 10^{77}$  kg
  - $1.66 \times 10^{-31}$  kg
  - $1.66 \times 10^{-27}$  kg
  - $1.66 \times 10^{-19}$  kg
- ii. Radioactivity happens due to the disintegration of:
- Nucleus
  - Mass
  - Electrons
  - Protons
- iii. The radioactive decay obeys the law:
- $N = N_0 e^{\lambda t}$
  - $N = N_0 e^{-\lambda t}$
  - $N_0 = N e^{-\lambda t}$
  - $N_0 = N(1 + e^{-\lambda t})$
- iv. The SI unit of decay constant is:
- m
  - $m^{-1}$
  - $S^{-1}$
  - $Nm^{-1}$
- v. The first atomic reactor was introduced by:
- Currie
  - Enrico Fermi
  - Newton
  - Bohr
- vi. In Wilson cloud chamber,  $\beta$ -particles leave:
- Thin and continuous tracks
  - Thick and continuous tracks
  - No tracks
  - Thin and discontinuous tracks
- vii. The potential difference between the top and bottom of a cloud chamber is of the order of:
- 290 v
  - 400 v
  - 1 kv
  - None of above
- viii. The mass spectrum of naturally occurring neon, showing:
- 1 isotope
  - 2 isotope
  - 3 isotope
  - 4 isotope
- ix. The energy of photon for photoelectric effect is less than:
- 1 Me V
  - 2 Me V
  - 5 Me V
  - 8 Me V
- x. In Wilson cloud chamber, if tracks are thick, straight and continuous, then particle is:
- $\alpha$  - particles
  - $\beta$  - particles
  - $\gamma$  - rays
  - All

**Q.2 Write the short answers.**

- What are isotopes? What do they have in common and what are their differences?
- Why are heavy nuclei unstable?
- What fraction of a radioactive sample decays after two half-lives have elapsed?

- Describe a brief account of interaction of various types of radiations with matter.
- A particle which produces more ionization is less penetrating. Why?
- What information is revealed by the length and shape of the tracks of an incident particle in Wilson cloud chamber?
- What do we mean by the term critical mass?
- Discuss the advantages and disadvantages of nuclear power compared to the use of fossil fuel generated power.

**Note: Long questions:**

**Q.3 (a)** What is G.M. counter? Give its construction. How is it used to count the nuclear radiation?

**(b)** The half-life of  ${}_{38}^{91}\text{Sr}$  is 9.70 hours. Find its decay constant.

**Q.4 (a)** describe the principles, construction and working of Wilson Cloud Chamber.

**(b)** if  ${}_{92}^{233}\text{U}$  decays twice by  $\alpha$  - emission, what is the resulting isotope?