

**IMAYAM ARTS AND SCIENCE COLLEGE, KANNANUR.**  
**DEPARTMENT OF PHYSICS**  
**III B.SC PHYSICS**  
**SUB CODE:16SCCPH8-NUCLEAR PHYSICS**

**TWO MARK QUESTIONS:**

**UNIT-I**

**1. Define nuclear size.**

- Rutherford works on the scattering of alpha particles showed that the mean radius of an atomic nucleus of the order of  $10^{-14}$  to  $10^{-15}$  m while that the atom is  $10^{-10}$ . This is known as nuclear size.

**2. Define nuclear mass.**

- The mass of the nucleus is the sum of the masses of neutron and proton.

$$\text{Nuclear mass} = Zm_p + Zm_n$$

**3. Define mass defect.**

- The difference of the nuclear masses is real nuclear mass is known as mass defect.

**4. Define nuclear spin.**

- Electrons & protons have a spin of  $\frac{1}{2}$ . Thus nuclei with an even number of protons & electrons should have integral spins. This is known as nuclear spin.

**5. Define nuclear force.**

- The stable nuclei exist, it follows that there must be certain forces acting b/w their nucleons that bind them into the nucleus. These are called nuclear force.

**UNIT-II**

**1. Properties of alpha particles.**

- An alpha particles is a helium nucleus consisting of two protons and two neutrons.
- They affect a photographic plate but the effect is very feeble.
- They are deflected by electric and magnetic fields.

**2. Properties of beta particles.**

- Their ionising power is low & range is large.
- They affect a photographic plate.
- They are deflected by electric and magnetic fields.

**3. Geiger –Nuttal law.**

- The range R of an alpha particles and the disintegration constant of the radioactive element .

#### **4. Half life period.**

- The half life period of a radioactive substance is defined as the time required for one half of radioactive substance to disintegrate.

#### **5. Average life period.**

- It is defined as the ratio of the total life time of all the radioactive atoms to the total number of such atoms in it.

### **UNIT-III**

#### **1. Define plateau.**

- The applied potential is increased ,the counting begins and rises rapidly to a flat portion of the curve is called plateau.

#### **2. Define efficiency of counter.**

- The efficiency of counter is defined as the ability of its counting,if atleast one ion pair is produced in it.

#### **3. Write the limitations of cloud chamber.**

- One is not always sure of the sense of track photographed.
- The range of the particle may exceed of the dimensions of the chamber so that the whole track is not photographed.

#### **4. Define frequency modulated cyclotron.**

- The frequency of the applied A.C. is varied so that it is always equal to the frequency of rotation of the ion. This is called frequency modulated cyclotron.

### **UNIT-IV**

#### **1. Define nuclear fission.**

- Combining of two light nuclei of low mass to produce a heavy nucleus is called nuclear fission.

#### **2. Define Threshold energy.**

- It is defined as the minimum kinetic energy of the incident particle which will initiate an endoergic reaction.

### **3. Define elastic scattering.**

- The incident particle strikes the target nucleus and leaves without loss of energy, but its direction may change.

### **4. Chain reaction.**

- A Chain reaction is a self-propagating process in which number of neutrons goes on multiplying rapidly almost in geometrical progression during fission till whole of fissile material is disintegrated.

### **5. Define nuclear fusion.**

- The two or more nuclei combine together to form a single heavy nucleus.

## **UNIT-V**

### **1. Define Lepton .**

- These are light weight elementary particles. The leptons are stable except muons. They interact weakly with other particles. The members of lepton are electron and positron, muons-neutrinos.

### **2. Define weak interaction.**

- Force that acts on both quarks and leptons is called weak interaction.

### **3. Define baryons.**

- Proton and particles heavier than proton form this group. Proton and neutron are called nucleons and the rest are called hyperons. Every baryon has an antiparticle.

### **4. Define hypercharge.**

- A quantity called hypercharge is conserved in strong interaction. Hypercharge is equal to the sum of the strangeness and baryon numbers of the particle.

### **5. Define Electromagnetic interaction.**

- It operates on all charged particles. Thus Electromagnetic interaction is charge dependent. The range is infinite and the interaction works through the photon.

## **FIVE MARK QUESTIONS:**

### **UNIT-I**

1. Explain Classification of nuclei.
2. Describe the salient features of liquid drop model.
3. Compare a liquid drop with the nucleus.
4. Write note on (a) Nuclear charge (b) Nuclear spin
5. Explain binding fraction vs mass number curve.
6. Write note on (a) Nuclear size (b) Nuclear magnetic moment

## UNIT-II

1. Explain half life and average life.
2. Prove radio active decay law.
3. Give the theory of successive disintegration of radioactive substances.
4. Explain energetic of beta decay.
5. Properties of neutrino.

## UNIT-III

1. Write short note on linear accelerator.
2. Write short note on proportional counter.
3. Write short note on scintillation counter
4. Write short note on electron synchrotron.
5. Write short note on solid state detector.

## UNIT-IV

1. Discuss about conservation laws in nuclear reactions.
2. Explain thermonuclear reaction.
3. Write note on nuclear fission and fusion.
4. Explain possibility of fusion reactor.
5. Discuss about types of nuclear reactions .

## UNIT-V

1. Write note on (a) Pions (b) K-mesons
2. Write note on (a) Hyper nucleus (b) Hyperons
3. Quark model explain.
4. Conservation laws in elementary particles.
5. Write short note on resonance particles.

**TEN MARKS QUESTIONS:**

- 1. Discuss Yukawa's theory of nuclear force.**
- 2. Explain shell model.**
- 3. Explain salient features of shell model.**
- 4. Explain Gamow's theory of alpha decay.**
- 5. Explain origin of the gamma rays.**
- 6. Explain Geiger -Nuttal law.**
- 7. Explain ionization chamber.**
- 8. Explain G.M counter.**
- 9. Explain semiconductor detector.**
- 10. Explain solution of the Q-value equation.**
- 11. Discuss the theory of cyclotron.**
- 12. Describe the working of betatron.**
- 13. Discuss kinematics of nuclear reactions.**
- 14. Explain hydrogen bomb.**
- 15. Explain threshold energy of nuclear reactions.**
- 16. Discuss cross -section of nuclear reactions.**
- 17. Discuss about classification of elementary particles.**
- 18. Discuss fundamental interactions of elementary particles.**
- 19. Discuss about symmetry classification of elementary particles.**
- 20. Explain cloud chamber.**