

## Contnet-Nuclear and Particle Physics

### **9.1 Basic Nuclear Properties.....(1-13)**

- 9.1.1 Size and Density
- 9.1.2 Spin and Magnetic Moment
- 9.1.3 Angular Momentum of Nucleus
- 9.1.4 Stable Nuclei
- 9.1.5 Binding Energy
- 9.1.6 Parity

### **9.2 Nuclear Models.....(14-29)**

- 9.2.1 Liquid Drop Model of Nucleus
  - 9.2.1.1 Most stable nuclei among members of Isobaric family
  - 9.2.1.2 Mass Parabola's
  - 9.2.1.3  $\beta$ -decay stability
- 9.2.2 Shell Model of Nucleus
  - 9.2.2.1 Prediction of angular momentum and nuclear ground state

### **9.3 Nuclear Forces.....(30-33)**

- 9.3.1 Meson Theory of Nuclear Forces (Yukawa Theory)
  - 9.3.1.1 Postulates
  - 9.3.1.2 Yukawa Potential
- 9.3.2 Salient Features of Nuclear Forces
- 9.3.2 Deuteron Problem
  - 9.3.2.1 Properties
  - 9.3.2.2 Ground state of deuteron

---

#### Head office

fiziks, H.No. 40 D, G.F, Jia Sarai,  
Near IIT, Hauz Khas, New Delhi-16  
Phone: 011-26865455/+91-9871145498

#### Branch office

Anand Institute of Mathematics,  
28-B/6, Jia Sarai, Near IIT  
Hauz Khas, New Delhi-16

**9.4 Radio Active Decay.....(34-44)**

9.4.1 Activity

9.4.2 Alpha Decay

9.4.2.1 Tunnel Theory of  $\alpha$ -decay

9.4.3 Beta Decay

9.4.3.1 Positron emission

9.4.3.2 Electron capture

9.4.4 Gamma Decay

9.4.4.1 Various processes by which  $\gamma$ -rays can lose its energy

9.4.4.2 Internal Conversion

9.4.4.3 Pair Production (Energy into matter)

9.4.4.4 Pair Annihilation

9.4.4.5 Massbauer Effect

**9.5 Nuclear Reaction.....(45-58)**

9.5.1 Conservation Laws

9.5.2 Nuclear Reaction Kinematics ( $Q$ -Value)

9.5.2.1 General solution of  $Q$ -Equation

9.5.2.2 Exothermic Reaction ( $Q > 0$ )

9.5.2.3 Exothermic Reaction ( $Q < 0$ )

9.5.3 Nuclear Fission

9.5.4 Nuclear Fusion in Stars

---

**Head office**

fiziks, H.No. 40 D, G.F, Jia Sarai,  
Near IIT, Hauz Khas, New Delhi-16  
Phone: 011-26865455/+91-9871145498

**Branch office**

Anand Institute of Mathematics,  
28-B/6, Jia Sarai, Near IIT  
Hauz Khas, New Delhi-16

**9.6 Particle Physics..... (59-71)**

9.6.1 Classification of Elementary Particles

9.6.1.1 Leptons

9.6.1.2 Baryons

9.6.1.3 Mesons

9.6.2 Particles and Anti-Particles

9.6.3 Elementary Particles Quantum Numbers

9.6.4 Classification of Fundamental Forces

9.6.5 Gellmann & Neeman's classification system for Hadrons

9.6.6 Quark Model of Hadrons

**Practice Set..... (72-105)**

---

**Head office**

fiziks, H.No. 40 D, G.F, Jia Sarai,  
Near IIT, Hauz Khas, New Delhi-16  
Phone: 011-26865455/+91-9871145498

**Branch office**

Anand Institute of Mathematics,  
28-B/6, Jia Sarai, Near IIT  
Hauz Khas, New Delhi-16