



Date: 03-04-2019  
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

**PART – A**

**Answer ALL questions:**

**(10x2=20 marks)**

1. Write down the postulates of Bohr's atom model.
2. State Pauli's exclusion principle.
3. What is meant by spin-orbit coupling?
4. What is anomalous Zeeman effect?
5. Define mass defect and packing fraction.
6. Calculate the binding energy of a deuteron. Given: Mass of  ${}_1\text{H}^1=1.008145$  amu, mass of  ${}_0\text{n}^1=1.008987$  and mass of  ${}_1\text{H}^2=2.014741$  amu.
7. Why neutrons are moderated in nuclear reactors?
8. Explain the terms, 'critical and supercritical' in nuclear reactors.
9. What are cosmic rays?
10. Explain dark matter with examples.

**PART – B**

**Answer any FOUR questions:**

**(4X7.5=30 marks)**

11. Explain i) L-S coupling and ii) j-j coupling schemes. **(4+3.5)**
12. Discuss the pure vibrational spectra of a diatomic molecule.
13. Explain the concepts of line and continuous spectrum of  $\alpha$  decay. **(4+3.5)**
14. Brief the methods of detection of slow and fast neutrons. **(4+3.5)**
15. a) State the conservation laws in elementary particles.  
b) Explain the conservation of baryon and lepton numbers. **(3.5+4)**
16. Give an account of any three sources of neutrons.

**PART – C**

**Answer any FOUR questions:**

**(4X12.5=50 marks)**

17. Explain the principle and experimental arrangement of Stern-Gerlach in support of spatial quantisation. **(5+7.5)**
18. Derive an expression for Lande's 'g' factor and explain the sodium doublet lines  $D_1$  and  $D_2$ .
19. Discuss in detail Gamow's theory of  $\alpha$ -decay.
20. Explain the construction and working of a nuclear reactor.
21. Discuss the variation of cosmic ray intensity with i) altitude, ii) latitude and iii) east-west direction.
22. Discuss about (i) particles and antiparticles and (ii) fundamental interactions between elementary particles. **(6+6.5)**

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