

This question paper contains 4 printed pages]

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S. No. of Question Paper : 1568

Unique Paper Code : 222663

C

Name of the Course : B.Sc. Physical Science (PHPT-606)

Semester : VI

Duration : 3 Hours

Maximum Marks : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt any *five* questions.

All questions carry equal marks.

1. (a) Find the reciprocal lattice vectors for

$$\mathbf{a}=3\mathbf{i}, \mathbf{b}=3\mathbf{j}, \mathbf{c}=\mathbf{i}+\mathbf{j}+\mathbf{k}$$

5

- (b) State Bragg's diffraction law. Describe the Laue method or the powder method of X-ray diffraction method.

10

2. (a) Explain polarizability of atoms and molecules. Discuss what are its sources. Obtain Clausius-Mossotti relation between polarizability and dielectric constant of a solid.

10

P.T.O.

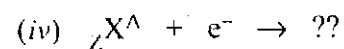
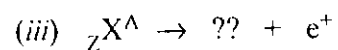
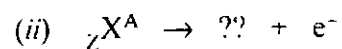
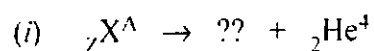
- (b) Derive the relationship between displacement vector \mathbf{D} , polarization vector \mathbf{P} and electric field intensity \mathbf{E} . 5
3. (a) Derive Curie's law for paramagnetism. 9
- (b) Distinguish between diamagnetic, paramagnetic and ferromagnetic materials. 6
4. (a) Explain superconductivity. What are type I and type II superconductors ? 5
- (b) Discuss Kronig-Penny model for energy band structure of solids. 10
5. (a) What is 'mass defect' and 'binding energy' ?
- Draw a curve showing the variation of binding energy per nucleon with respect to mass number of atom. Explain. 10
- (b) Compare the binding energy per nucleon of tritium (${}_1\text{H}^3$) and the light helium isotope (${}_2\text{He}^3$). Mass of neutron = 1.008665 u, mass of hydrogen atom = 1.007825 u, mass of proton = 1.007276 u, mass of ${}_1\text{H}^1 = 3.016$ u, mass of ${}_2\text{He}^3 = 3.016$ u. 5

6. (a) Describe radioactive decay law. Derive the relation between disintegration constant

(λ) and Half-life of radioactive substance. 8

(b) Explain (1) Nuclear isomerism; (2) Nuclear fusion. 2+5

7. (a) Complete the following reactions :



(b) Explain Liquid-drop model of a nucleus. 10

8. (a) Name *four* types of fundamental interactions mentioning (i) particles which are affected, (ii) particles which are exchanged. Which one is the strongest and which one the weakest of these four ? Which *two* has the longest range ? 10
- (b) Write a short note on Hadrons. 5