(FOR THE CANDIDATES ADMITTED   SUBJECT CODE   22PCY101

DURING THE ACADEMIC YEAR 2022-23 ONLY)   REG.NO. [ ]

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI
END-OF-SEMESTER EXAMINATIONS : DECEMBER – 2022

M.Sc. – CHEMISTRY   **MAXIMUM MARKS: 50**

I SEMESTER   **TIME : 3 HOURS**

INORGANIC CHEMISTRY –I- SOLID STATE AND NUCLEAR CHEMISTRY

SECTION – A   (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.
(Objective Questions with four Multiple Choices)   **(K1)**

1. Which of the following is regarded as the 'repeatable entity' of a 3D crystal structure?

    a. Unit cell   b. Lattice   c. Crystal   d. Bravais Index

2. In an hcp structure find out the number of nearest atom………………

    a. 6   b. 8   c. 12   d. 4

3. Liquid crystals are characterized by ----------------structures.

    a. Anisotropic structures   c. rod like crystals

    b. isotropic structures   d. cone shaped crystals

4. The spontaneous decay of an unstable nucleus with accompanying emission

   of radiation……………….

    a. Radioactivity   b. Phosphorescence   c. Fluorescence   d. Inter system crossing

5. A hot atom is an atom that has a ----------- kinetic or internal energy.

    a. High   b. Low   c. Equal   d. Zero

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES   **(K2)**

6. What is the significance of Bragg's law?

7. What are called point defects in crystals?

8. Which point defect in crystals reduces crystal density?

9. What is meant by n/p ratio of an element?

10. What is meant by 'Q' of a nuclear reaction?

SECTION – B   **(5 X 3 = 15 MARKS)**
ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.   (K3)

11.   a) Determine the Miller indices for a crystallographic plane in a cubic unit cell.
                                 (OR)
       b) Find the crystallographic dimensions of a unit cell if the solids belong to the following
           Crystal systems (i) Triclinic   (ii) Tetragonal

12.   a) Find the number of atoms in FCC unit cell.

                                 (OR)
       b) Differentiate between a normal spinel structure and a Inverse spinel structure

13.   a) List the differences between Schottky and Frenkel defects
                                 (OR)
       b) Describe the Non-stoichiometric point defects which are commonly produced in crystals.

14.   a) Describe how nuclear Binding energy is related to nuclear stability.
                                 (OR)
       b) Describe the principles of linear accelerators, cyclotron and betatron

15.   a) Outline the differences between nuclear fusion and nuclear fission. Examine which
           reactions are seen in the Sun and in atom bombs.

                                 (OR)
       b) Point out the uses of radioisotopes in analytical chemistry - isotopic dilution analysis –
          neutron activation analysis and dating.

SECTION – C   **(5 X 5 = 25 MARKS)**
ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.
                                      (K4 (Or) K5)

16.   a) Derive the Braggs equation for a cubic crystal. Draw the experimental setup to determine
           interplanar distance between a cubic crystal
                                 (OR)
       b) Describe the Rotating crystal method to find the interplanar distance in a crystal.

17.   a) Apply Born-Haber cycle to calculating the lattice energy of a sodium chloride crystal
                                 (OR)
       b) Show that radius ratio of an ionic crystal determine the type and stability of the crystal.
           List out its limitations.

18.   a) Differentiate intrinsic semiconductors and impurity semiconductors
                                 (OR)
       b) Discuss and highlight the characteristics of liquid crystals.

19.   a) Determine the types of radiations given off by radioactive substances. How does the
           emission of each one of them affect the nucleus undergoing the change.
                                 (OR)
       b) Discuss the characteristics of α, β and γ rays.

20.   a) Justify the statement that "Transmutation of elements is possible"
                                 (OR)
       b) Enumerate the use of radioisotopes in analysis - agriculture - industry and medicine –
          mechanism of chemical reactions

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ETHICAL PAPER