Day : Saturday   Time : 11:00 AM-02:00 PM
Date : 2/7/2022   **S-15050-2022**   Max. Marks : 60

N.B.:
  1) All questions are **COMPULSORY**.
  2) Figures to the right indicate **FULL** marks.
  3) Use of scientific non-programmable **CALCULATOR** is allowed.

Q.1   Attempt **ANY TWO** of the following: [12]

  a) What are the additive, constitutive and colligative properties?

  b) Discuss use of dipole moment in the determination molecular structure.

  c) Obtain the equation for decay constant.

Q.2   Attempt **ANY TWO** of the following: [12]

  a) Discuss the effect of isotopic substitution on rotational spectrum.

  b) Give a detail account of distortion polarization.

  c) Explain different types of radioactive decay.

Q.3   Attempt **ANY TWO** of the following: [12]

  a) Give the outline of Raman Spectroscopy.

  b) What are plane of symmetry axis of symmetry and center of symmetry?

  c) Define unit cell and draw a neat and labeled diagram of NaCl unit cell.

Q.4   Attempt **ANY THREE** of the following: [12]

  a) A crystal plane intercepts the three crystallographic axes at the multiples of the unit distances 3/2, 2 and 1. What will be the Miller indices of the plane?

  b) The activity of radioelement falls to half of its initial value in 8 days. Calculate **i)** decay constant **ii)** the time for the activity to fall to $1/10^{th}$ of its initial value.

  c) Calculate the frequency and wave number of radiations having wavelength 2000 Å. $[C = 3 \times 10^8 \text{ m.sec}^{-1}]$

  d) The first order reflection of a beam of x-rays of wavelength 0.64×10^{-10} m from (100) plane of NaCl occurs at an angle 6^0 30′. Calculate the length of unit cell.

Q.5   Attempt **ANY FOUR** of the following: [12]

  a) What are space lattice and lattice points?

  b) What are the aspects of crystal analysis?

  c) State and explain the law of rational indices.

  d) How the term electromagnetic arose?

  e) Discuss in brief vapour-temperature method for the measurement of dipole moment.

  f) Give the applications of rotational spectra.

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