

Day: Monday  
Date: 08/04/2019

S-2019-1024

Time: 03.00 PM To 05.00 PM  
Max. Marks: 40

**N.B.:**

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answers to both the sections should be written in **SAME** answer book.
- 4) Use of non – programmable **CALCULATOR** is allowed.

**SECTION-I**

**Q.1** Attempt any **TWO** of the following: (10)

- a) Explain the vibrational spectroscopy in brief.
- b) State the selection rule for rotational transitions and obtain the equation  
$$\bar{\nu}_{rot} = 2B(J+1)$$
- c) Discuss the radioactive decay kinetics.

**Q.2** Attempt any **TWO** of the following: (10)

- a) Elaborate on the elements of symmetry.
- b) Explain the significance of N/Z ratio.
- c) Draw neat diagrams of simple cubic lattice, face centered cubic lattice and body centered cubic lattice.

**SECTION-II**

**Q.3** Attempt any **TWO** of the following: (10)

- a) Discuss the vapour-temperature method for the measurement of dipole moment.
- b) Describe the orientation polarization.
- c) Distinguish between Raman spectra and IR spectra.

**Q.4** Solve any **TWO** of the following: (10)

- a) A crystal plane intercepts the three crystallography axes at the multiples of unit distances 5/2, 3, 1. What will be Miller indices of the plane?
- b) Calculate the frequency and wave number of radiations having wavelength 2000 Å. ( $3 \times 10^8 \text{ m sec}^{-1}$ )
- c) 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<sup>th</sup> of its initial value.