DN-003-1204002 Seat No. _____

M. Sc. (Sem. IV) (CBCS) Examination

March / April - 2022

Physics

CT-12 : Experimental Techniques with Interdisciplinary Applications

Faculty Code : 003

Subject Code : 1204002

Time : **2:30** Hours] [Total Marks : **70**

Instruction : (1) All questions are compulsory.

(2) All questions carry equal marks.

1 Answer the following questions : Any SEVEN out of TEN. **14**

(i) Define : Radiation source in Experimental Techniques.

(ii) What is X-ray generation collimator ?

(iii) What are the full names of XRD and XFS ?

(iv) Define Gas filled detectors.

(v) Which of the following nuclei possess the property of nuclear spin ?

($^{2}He_{4}$, $^{6}C_{12}$, $^{2}H_{1}$, $^{7}N_{14}$, $^{13}C_{6}$, $^{19}F_{9}$)

(vi) What is ESR spectrum and derivative curve ?

(vii) What is the meaning of resolution of Mass Spectrometer ?

(viii) How will you represent absorption spectra in IR spectroscopy ?

(ix) In which of the state of matter, recoil energy is negligible ?

(x) What is hyperfine interaction in Mossbauer spectroscopy ?

2 Write any TWO : **14**

(a) Give the principle of X ray production. Explain filament tube in detail.

(b) Discuss ESCA for chemical analysis.

(c) Discuss in detail : Radiation sources with their types.

3 Answer the following questions : All are Compulsory. **14**

(a) Explain in detail : Interaction of gamma rays with matter.

(b) Discuss the modification of Mossbauer spectrum due to Quadrupole interaction and magnetic hyperfine interaction.

OR

3 Answer the following questions : All are Compulsory. **14**

(a) Discuss in detail : Shielding effect in NMR spectroscopy.

(b) Discuss the hyperfine splitting of ESR spectrum with example of hydrogen atom and methyl redical.

4 Write any TWO : **14**

(a) Discuss the requirements for absorption of IR radiation by a molecule.

(b) Discuss : Various modes of vibrations of atoms in molecules.

(c) Discuss various components of Mass spectrometer.

5 Write notes on any TWO : **14**

(i) $_{57}Fe$ Mossbauer spectroscopy

(ii) Applications of Mass spectroscopy

(iii) Nuclear magnetic energy levels in NMR

(iv) Recording of Mass Spectrogram.

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