



BBB-003-1204002

Seat No. _____

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

July - 2021

Physics : CT-12

(Experimental Techniques with Interdisciplinary Applications)

Faculty Code : 003

Subject Code : 1204002

Time : $2\frac{1}{2}$ Hours]

[Total Marks : 70

- Instructions :** (1) The question paper contains ten questions carry 14 marks each.
(2) The students shall answer any five questions.

- 1** Answer the following questions in brief **14**
- (1) State the principle of ionization based detectors.
 - (2) State the principle of production of X-rays.
 - (3) State the Bragg's law for X-ray diffraction.
 - (4) Write the full forms of XFS and ESCA.
 - (5) State the principle of scintillation based detectors.
 - (6) Write the two units of gamma ray exposure.
 - (7) Name the types of Radiation sources.
- 2** Answer the following questions in brief **14**
- (1) Write the principle of NMR.
 - (2) Write the principle of mass spectroscopy.
 - (3) If the resolution of mass spectrometer is 2000, then what does it mean?
 - (4) What do you mean by positive shielding and negative shielding in NMR spectroscopy?
 - (5) What is Mossbauer Effect?
 - (6) Mention the different modes of vibration of atoms in a molecule.
 - (7) What do you mean by degrees of freedom?
- 3** Answer the following questions in detail **14**
- (a) Discuss various sources of electromagnetic radiation.
 - (b) Write the principle of ionization based detectors. Discuss the GM detector in detail.

- 4 Answer the following questions in detail **14**
(a) Discuss in detail: Continuous and characteristic X-rays.
(b) Write the principle of production of X-rays. Discuss the various equipments that are needed in the production of X-rays.
- 5 Answer the following questions in detail **14**
(a) Write the principle of scintillation detector. Discuss scintillation spectrometer in detail.
(b) Write a short note on X-ray absorption and fluorescence technique.
- 6 Answer the following questions in detail **14**
(a) Discuss with necessary example: Spin-spin coupling in NMR.
(b) Discuss the theory-of ESR with ESR -spectra.
- 7 Answer the following questions in detail **14**
(a) Discuss with necessary figures: Nuclear Magnetic Energy Levels.
(b) Discuss hyperfine splitting of ESR spectrum with energy levels diagram.
- 8 Answer the following questions in detail **14**
(a) Discuss the theory of mass spectroscopy.
(b) Discuss the recording of Mass Spectrogram.
- 9 Answer the following questions in detail **14**
(a) Discuss the requirements for a molecule to absorb IR radiation.
(b) Derive a relationship between wavenumber of oscillation, atomic masses and force constant.
- 10 Answer the following questions in detail **14**
(a) Write a short note on ^{57}Fe Mossbauer Spectroscopy.
(b) Mention the condition to observe resonance fluorescence.