

M.SC.(Phy.) Semester - 4 (CBCS) Examination**April/May-2022 (NEW COURSE)****Experimental Techniques with interdisciplinary applications (Core)****Time: 2:30 Hours****Marks: 70****Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate marks.

Q – 1: Answer any SEVEN:**14**

1. State the principle of ionization based detectors.
2. State the principle of scintillation based detectors.
3. State the Bragg's law for X-ray diffraction.
4. Find the λ_{SWL} for an X-ray tube operating at a potential difference of 35 kV.
5. State the general rules to predict the spin of a nucleus.
6. How two different energy states are produced in ESR spectroscopy?
7. What is mass spectrum?
8. What do you mean by absorption spectra?
9. In which state, Recoil energy loss is very large? Why?
10. What is elastic neutron scattering?

Q – 2: Write any TWO:**14**

- (a) Discuss in detail: Continuous and characteristic X-rays.
- (b) Discuss various sources of electromagnetic radiation.
- (c) Discuss interaction of gamma rays with matter.

Q – 3: Answer the following questions: ALL ARE COMPULSORY**14**

- (a) Discuss scintillation spectrometer in detail.
- (b) State the principle of production of X-rays.
Discuss various parts that are needed in production of X-rays.

OR**Q – 3: Answer the following questions: ALL ARE COMPULSORY****14**

- (a) Discuss with necessary figure: Continuous Wave NMR Spectrometer.
- (b) Discuss the theory of ESR and ESR spectra.

Q – 4: Write any TWO:**14**

- (a) Discuss the various components of the mass spectrometer.
- (b) Discuss various types of detectors used in IR spectroscopy.
- (c) Discuss the various modes of vibrations of atoms in molecules.

Q – 5: Write notes on any TWO:**14**

- (i) Important condition to observe resonance fluorescence.
- (ii) Neutron diffraction and X-ray diffraction.
- (iii) ^{57}Fe Mossbauer Spectroscopy
- (iv) Nuclear Magnetic Energy Levels in NMR
