



**PS-003-1204002**

Seat No. \_\_\_\_\_

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

**August - 2020**

**CT-12 : Experimental Techniques with  
Interdisciplinary Applications**

**Faculty Code : 003**

**Subject Code : 1204002**

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

[Total Marks : 70

- Instructions :** (1) All questions are compulsory.  
(2) All questions carry equal marks.

**1** Answer the following questions : (any seven out of ten) **14**

- (i) Find the short wavelength limit for an X-ray tube operating at a potential difference of 35 KV.
- (ii) State the working Principle of Ionization based Detectors.
- (iii) Name the types of Radiation sources.
- (iv) What is Bremsstrehlung ?
- (v) What do you mean by hyperfine splitting of ESR spectrum?
- (vi) What happens when microwave and infrared waves are absorbed by the molecules?
- (vii) If the resolution of mass spectrometer is 2000, then what does it mean?
- (viii) What do you mean by hyperfine interaction in Mossbauer effect?
- (ix) What do you mean by positive shielding and negative shielding in NMR spectroscopy?
- (x) What is relaxation process of nucleus? Mention its types.

- 2** Write any two :
- (a) List the various radiation interactions with matter. **7**  
Discuss on interaction of Gamma rays.
- (b) State the principle of production of X-Rays. **7**  
Discuss the Filament tube in detail.
- (c) Discuss Electron spectroscopy for chemical analysis **7**  
(ESCA) in detail.
- 3** Answer the following questions : (All are compulsory.)
- (a) State the principle of production of X-Rays. Discuss **7**  
the production of X-Rays by gas tubes in detail.
- (b) What is Radiation? State the Various Radiation sources **7**  
and write in detail about Fast electron sources.
- OR**
- 3** Answer the following questions : (All are compulsory.)
- (a) Derive an equation showing a relation between **7**  
wavenumber, atomic masses and force constant.
- (b) Discuss the degrees of freedom and possible number **7**  
of vibration modes.
- 4** Write any two :
- (a) Discuss  $_{57}\text{Fe}$  Mossbauer spectroscopy. **7**
- (b) Discuss the hyperfine splitting of ESR spectrum by **7**  
considering an example of hydrogen atom.
- (c) Discuss the theory of Mass spectroscopy.
- 5** Write notes on any **two** : **14**
- (i) Electron spectroscopy for chemical analysis.
- (ii) Applications of Mass spectroscopy
- (iii) Mossbauer Spectrometer
- (iv) Applications of IR spectroscopy.