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DHH-003-020407 Seat No. _____

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

May / June – 2015

ID - 3 : Experimental Techniques with Inter Disciplinary Applications

Faculty Code : 003
Subject Code : 020407

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Note : (1) All questions are compulsory.
(2) All questions carry equal marks.

Q-1. Answer any SEVEN: **14**

(i) Write the any two units of radioactivity.

(ii) Which particles are emitted in β^--sources?

(iii) Write the principle of ionization based detectors.

(iv) Find the shortest wavelength limit (λ_{swl}) for the X-ray tube operating at a potential difference of 45KV.

(v) The two masses m_1=250.000 and m_2=250.001 are separated by 10% valley, in a mass spectrogram. Find the resolution of a mass spectrometer.

(vi) Find the resonance frequency of an electron in the ESR spectrometer operated at H= 3400gauss.
($\mu_{electron}=9.27\times10^{-21}$erg/gauss, h=6.627 x 10^{-27}erg.sec)

(vii) In which of the following nuclides the NMR signal is not observed.
^{16}O, ^{12}C, ^{1}H

(viii) Write any two applications of a mass spectrometer.

(ix) Write the principle of production of X-rays?

(x) Write the Bragg's law for neutron diffraction.

Q-2 Write any TWO:

(a) Discuss various sources of electromagnetic radiation. **07**

(b) Discuss interaction of charged particle with matter. **07**

(c) Discuss interaction of gamma rays with matter. **07**

Q-3. **(a)** Discuss various parts that are needed in the production of X-rays. **07**

(b) Write the principle of X-ray fluorescence and absorption techniques. Discuss any one of the techniques in detail. **07**

OR

Q-3. **(a)** List the various X-ray detectors. Write the working of any one of them. **07**

(b) Discuss continuous and characteristic X-ray spectra. **07**

Q-4. Write any TWO:

(a) State the principle of a mass spectrometer. Draw the neat diagram of a magnetic deflection mass spectrometer. Explain its working. **07**

(b) What does one understand by resonance? State the principle of NMR spectrometer. Draw its diagram and explain its working in short. **07**

(c) Draw the energy level diagram of a nucleus having spin I=1/2 and 3/2 in the magnetic field H. Calculate the excitation frequency of a proton in the magnetic field H =21 Kgauss **07**

($\mu_p = 1.41 \times 10^{-23}$ erg/gauss)

Q-5. Write notes on any TWO: **14**

(i) IR spectroscopy.

(ii) Mossbauer effect.

(iii) Neutron diffraction techniques.

(iv) ESR spectrometer.
