Chemistry (01)

[Time: $2\frac{1}{2}$ Hours] [ Marks: 60]

Please check whether you have got the right question paper.

N.B:
1. **All** questions are **compulsory**.
2. **Figures** to the **right** indicate **full marks**.
3. **All** questions carry **equal marks**.

Q.1 a) Attempt **any two** of the following: **08**

i) Explain-How X-ray intensities are related to electron density and structural factors?
ii) Discuss the features of Laue's method in the determination of Lattice parameters.
iii) Explain the working of each component of X-ray diffractometer, with neat labelled diagram.
iv) What are "Miller Indices"? Explain the procedure followed to determine the miller indices.

b) Attempt **any one** of the following: **04**

i) Explain the Bragg's conditions for X-ray diffraction.
ii) Comment on Salient features of Debye Scherrer method of x-ray analysis.

Q.2 a) Attempt **any two** of the following: **08**

i) Explain – Neutron diffraction supplements x-ray diffraction and is particulary useful in location of hydrogen atom.
ii) Write an informative note on "Wierl equation".
iii) Explain the significance of scattering intensity in electron diffraction.
iv) Explain the working of electron diffraction apparatus with a neat labelled diagram.

b) Attempt **any one** of the following: **04**

i) Describe the measuring techniques for neutron diffraction.
ii) Explain the 'source', 'detector' and scattering factor with reference to neutron diffraction.

Q.3 a) Attempt **any two** of the following: **08**

i) Write a comprehensive note on 'Magic T' in ESR spectroscopy.
ii) Describe the various components of source used in ESR spectroscopy.
iii) What is matrix isolation in ESR? Why is it required?
iv) Discuss the following properties of spectral lines.
A) Intensity B) Bandwidth

b) Attempt **any one** of the following: **04**

i) Explain the interaction between electron spin and applied magnetic field w.r.t ESR
ii) Explain applications of ESR spectroscopy to study metal complexes.

Q.4 a) Attempt **any two** of the following: **08**

i) Write an informative note on "Cosine effect".
ii) Discuss the instrumental set up of Mossbauer Spectrometer. Draw a neat labelled diagram.
iii) Explain the principles of Mossbauer Spectroscopy with respect to
A) Quadrapole splitting B) Nuclear Zeeman Splitting
iv) Describe the factors affecting the magnitude of isomer shift in Mossbauer spectroscopy.



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b) Attempt **any one** of the following: **04**

i) Explain recoil free emission and absorption w.r.t Mossbauer spectroscopy.

ii) Enlist the various conditions to obtain good Mossbauer Spectrum.

Q.5 Attempt **any four** of the following: **12**

a) State and explain Bragg's equation.

b) Distinguish between x-ray diffraction and neutron diffraction.

c) Comment on ESR spectrum of methyl radical.

d) Explain the term Doppler shift w.r.t Mossbauer spectroscopy.

e) Describe the use of x-ray diffraction data in order to obtain the configuration of a molecule.

f) Explain Scattering of neutrons by solids and liquids.

g) What is the principle of ESR Spectroscopy? Describe spin lattice relaxation.

h) Comment on source used in Mossbauer spectroscopy.

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