

**M. SC. CHEMISTRY EXAMINATION, 2022**

( 4th Semester )

**ANALYTICAL CHEMISTRY SPECIAL**

**PAPER – XVI-A**

Time : Two hours

Full Marks : 50

**Use a separate answer script for each Unit.**

**UNIT: A-4161**

1. a) Why is electrochemical technique called “green-method” for synthesis of nano-films or materials? 1
- b) What are the functionalized metal nanoparticles? Explain the sensing properties of Au nanoparticles for alkali metal ions. 2
- c) What are the different patterns of TEM studies and how does it help to understand the crystallinity of the samples? 1
- d) What do you mean by elastic scattering and inelastic scattering of electrons during electron micrograph studies? 2
- e) Write the Scherrer’s equation and state how it relates to dislocation density of a particular sample. 2
2. a) Explain the mechanical milling process for synthesis of nanoparticles or nanopowders. List the advantages and disadvantages of this process. 2

[ Turn over

[ 2 ]

- b) What are opto-electronic materials and where are they used? 1
- c) Write the full form of analytical tools: (i) STEM (ii) XRD (iii) DLS; Mention the utility of these tools in the field of material characterization. 3
- d) How can “electron-beam” damage the sample surface/lattice packing during FESEM and HRTEM studies? 2
3. a) What are core-shell nanoparticles? What are the advantages of core-shell nanoparticles in comparison to other nanoparticles? 2
- b) Explain AFM technique and the choice of AFM tips for material characterization. 3
- c) Why is Au or Pt coating necessary for non-conducting sample during SEM studies? 1
- d) What is the reason for the shifting of XRD peak of Mn doped ZnO nanocrystals with respect to pure ZnO? 2
- e) What is the use of FTIR studies for biosynthesized nanoparticles? 1

**UNIT: A-4162**

4. Discuss any Single Point Method for the determination of components of a closely related mixture. 7

[ 3 ]

5. With a proper enzymatic reaction scheme explain what could be the maximum possible rate that might be attained for a particular enzyme activity. With this, comment on the analytical region for the determination of enzyme activity. 7+3
6. With one example each, state what do you mean by complementary and non-complementary redox reaction. 4
7. Outline any possible method for the determination of fluoride ( $F^-$ ) in toothpaste by enzymatic method. 4