

UNIT – A- 4162Answer *any five* questions

6. Discuss the advantages of measuring initial rates rather than following the entire reaction for the purpose of analysis of substrates. 5
7. A given solution contains traces of I^- and IO_4^- , How could you determine the total I^- content in that solution using any appropriate kinetic method? 5
8. Discuss any single point method for the determination of components in a closely related mixture? 5
9. For the enzymatic scheme $E+S \rightleftharpoons ES \rightarrow E+P$ where E, S, ES and P have their common definitions, how could you determine Michaelis constant without giving any restrictions on the rate constants of the three different steps shown in this scheme? Explain in detail. 5
10. Why is Mn^{2+} is a good catalyst for the redox reaction $2Ce^{4+} + TI^+ \rightarrow 2Ce^{3+} + TI^{3+}$? 5
11. Is the oxidation of Fe^{2+} by Ce^{4+} in acidic media slow or fast? Discuss with plausible reasoning. Explain how could you chemically prove that the reaction is slow or fast? 5

M. Sc. CHEMISTRY EXAMINATION, 2018

(4th Semester)

ANALYTICAL CHEMISTRY SPECIAL**PAPER - XVI-A**

Time : Two hours

Full Marks : 50

(25 Marks for each Unit)

Use a separate answerscript for each unit.

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1. Answer any three questions of the following :
- a) What do you mean by elastic scattering and inelastic scattering of electrons during electro micrograph studies? 2
- b) Explain AFM technique and the choice of AFM tips for material characterization. 2
- c) What do you mean by primary, secondary, backscattered electrons in relation with SEM? 2
- d) Write the full form of common analytical tools used for characterization of materials.
- (i) PL (ii) EDX (iii) XRD and (iv) DLS; Mention the utility of these tools in the field of material characterization. 2

[Turn over

[2]

2. a) How can “electron-beam” damage the sample surface or lattice packing during SEM and TEM studies ?
1
- b) What are the different patterns of TEM studies and how does it help to understand the crystallinity of the samples ?
1
- c) Why is Au or Pt coating necessary for biological samples/ soft samples during FESEM studies ?
1
- d) Write the Scherrer’s equation and how it relates to dislocation density of a particular sample.
1
- e) “One nanometer is a magical point on the dimension scale.” – Explain.
1
- f) What is ball-milling process for the synthesis of nanoparticles/nanopowders ? Write the advantage and disadvantage of this process.
1
3. a) Why is electrochemical technique called “green method” for the synthesis of nano-films or materials ?
1
- b) What are the functionalized metal nanoparticles ? Explain the sensing behaviour of Au-nanoparticles for alkali metal ions?
2
- c) What are electrochemical sensors? How these types of sensors are useful for the detection of different biological fluids.
2

[3]

4. a) How can you tailor the bulk materials to nanomaterials ? How is it influence the properties of materials ?
1
- b) Define MEMs.
1
- c) What are opto-electronic materials and where are they used ?
1
5. a) What are core-shell nanoparticles ? What are the advantages of core-shell nanoparticles in comparison to ordinary nanoparticles?
2
- b) Define Janus particle. List any four day to day live commercial applications of nanotechnology .
2
- c) Give two examples of each : (*any two*)
1
- (i) Met-Cars.
- (ii) Metal-Chalcogenides materials.
- (iii) Molecular- Clusters

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