8. Discuss any kinetic method by which you can determine trace of iodide in a sample of common salt. 5

9. With suitable examples discuss the specificity and power of enzymes in comparison to non-enzymatic catalysts. 5

10. Consider the enzymatic reaction scheme where E, S, ES and P have their usual definitions :

$$E + S \rightleftharpoons ES \rightarrow E + P$$

How could you determine the concentration of Substrate (S) in a sample ? 5

M. Sc. Chemistry Examination, 2019

(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.

UNIT – A- 4161

1. a) What are photo switchable molecules ?

   b) What are functionalized metal nanoparticles ? Explain the sensing properties of Au-nanoparticles for heavy metal ions.

   c) What are the different patterns of TEM studies and how it helps to understand the crystallinity of the samples ?

   d) What do you mean by an elastic scattering, inelastic scattering and back scattered electrons during electro-micrograph studies ?

   e) Write the Scherrer's equation and how it relates to dislocation density of a particular sample.

$1+1\frac{1}{2}+1\frac{1}{2}+1\frac{1}{2}+1$

2. a) What are wet and dry methods for the synthesis of nanomaterials ? Why resolution power of an electron microscope (EM) is higher than optical microscope (OM)?

   b) Define MEMs. What are the applications of MEMs?

   c) What are the basic differences between FESEM and HRTEM studies ? $1\frac{1}{2}+1\frac{1}{2}+1$

3. a) Write the full form of common analytical tools used for characterization of materials : (i) LVSEM; (ii) EDX: and (iii) DLS; Mention the utility of these tools in the field of material characterization.

   b) Explain the mechanical ball milling process for the synthesis of nano-structured materials. Give one example of it. Explain their catalytic behaviour towards hazardous chemicals. 3+2

4. a) Define Janus particle. How core-shell nanoparticles differ from an ordinary system ?

   b) Explain the different modes of AFM technique with schematic diagram for material characterization. 'Choosing of AFM tip is very important'-Justify the statement.

   c) What are electrochemical sensors ? Why an electrochemical sensing is the promising methos for the detection of different biological fluids in recent years ?

   2+2+2

5. a) What is "electron-beam" damage ? Why Au or Pt coatings are necessary for biological samples during SEM studies ?

   b) What are false positive and false negative sensors? Give one examples of each.

   c) Give one examples of each : ***(any two)***

      (i) Met-Cars.

      (ii) Metal-Chalcogenides thin-films.

      (iii) Nano- Clusters $1\frac{1}{2}+1+1$

UNIT – A- 4162

6. Discuss Graphical Extrapolation Method for the determination of closely related components in a binary mixture. 5

7. Although thermodynamically highly favourable, Ce(IV) oxidises Tl^{+} very slowly in aqueous media. Why ? State one catalyst for this reaction with probable steps of the reaction.

   5