

[2]

- b) Can you suggest a method to find out LOD and sensitivity in electrochemical sensor applications? $1\frac{1}{2}$
- c) How can we calculate the band gap energy from cyclic voltammetry measurements? $1\frac{1}{2}$
- d) What is electrochemical impedance spectroscopy? Draw the Nyquist plot for single EIS parameters with equivalent circuit diagram. $2\frac{1}{2}$
- e) What are the different types of solar cells? Construct a PEC solar cell having a suitable cathode and anode in a stable redox couple. 3
6. a) What is surface plasmon resonance (SPR)? Briefly discuss Gans theory of SPR (with schematic diagram) taking Au-np as an example. 1+3
- b) Describe the basic difference in the working principle between scanning electron microscopy (SEM) and tunnelling electron microscopy (TEM). 2
- c) Write short note on (**any one**) :
- i) Sol-gel method of nanomaterial synthesis, 2
- ii) Atomic force microscopy 2
- d) What is “quantum confinement”? Discuss how fluorescent colour of the semiconducting gallium arsenide (GaAs) quantum dots changes with particle size. 2

Ex/SC/CHEM/PG/CORE/TH/XVI-I/2023

M. Sc. (CHEMISTRY) EXAMINATION, 2023

(4th Semester)

PAPER: XVI-I

[INORGANIC CHEMISTRY SPECIAL]

Time : Two Hours

Full Marks : 40

(20 marks for each unit)

Use a separate answer script for each unit.

Unit: I-4161

1. What is hydroformylation reaction? Illustrate the mechanism of hydroformylation of an alkene ($RCH=CH_2$) using a cobalt catalyst. Comment on the ratio of n:iso products. 2+4+1
2. What is transfer hydrogenation? Show the mechanism of one such reaction. 2+3
3. Describe the structure of $[Ru(C_6Me_6)_2]^{2+}$ and comment on its stability. Highlight the structural differences, if any, on two-electron reduction of the metal center. 2+2
4. Describe the mechanism of asymmetric hydrogenation of methyl acetoacetate using Ru-BINAP catalyst. Mention the observed *enantiomeric excess* for this reaction. 3+1

Unit: I-4162

5. a) How many types of electrodes are used in cyclic voltammetry experiment? What type of waveform is used for cyclic voltammetry experiment? $1\frac{1}{2}$

[Turn over