

EX/SC/CHEM/PG/CORE/TH/XII-I/2025

M. Sc. CHEMISTRY EXAMINATION, 2025

(3rd Semester)

PAPER : XII-I

[Inorganic Chemistry (Special)]

Time : Two Hours

Full Marks : 40

(20 marks for each part)

Use a separate answer script for each part

UNIT—I-3121

CO-1

1. Answer *any four* of the following :

- (a) What are hydrolytic metallo-enzymes? With the help of schematic diagram highlight the role of the metal ion in one such enzyme. 1+1½
- (b) What are the essential differences in cis-Platin and Rh(II)-carboxylates acting as DNA targeting agents? 2½
- (c) Mention essential features that enabled cis-Platin to act as an effective anticancer agent. With two examples discuss drug design beyond cis-Platin. 1+1½
- (d) With suitable model studies, explain the methyl transfer reaction mediated by Vitamin B₁₂. 2½
- (e) Discuss the role of Vitamin B₁₂ as a coenzyme in the reduction of ribonucleotide to 2'-deoxyribonucleotide in biological systems. 2½

CHEM-1036

[Turn Over]

(2)

2. Answer *any two* of the following : $5 \times 2 = 10$

- (a) Draw the structure of the active site in cytochrome C oxidase. Why does it exhibit unusual magnetic properties and EPR spectrum? Discuss its mechanistic pathway for oxygen reduction. $1+2+2$
- (b) Mention the unique role of anion (carbonate/bicarbonate) in transferrin. Mention different parts of Ferritin. Why is it used as an example for bio-mineralization? $2+2+1$
- (c) Mention the unique role of the metal ion present in chlorophyll. What do you mean by photophosphorylation? How does the Oxygen Evolving Complex (OEC) work in the Kok cycle? $2+1+2$
- (d) What is ferryl complex? Mention the structural difference found in Peroxidase and Myoglobin. Mention their behaviour towards molecular oxygen. $1+2+2$

UNIT—I-3122

CO-

Answer *any five* questions : $2 \times 5 = 10$

- 1. (a) Categorize polymorphs with respect to their stability over certain temperature and pressure range. Draw the structure of the molecule which has highest numbers of polymorphs reported so far.
- (b) Define P-type and T-type photochromic materials with examples. What do you mean by Z_{50} and $t_{1/2}$ of a photochromic material?

CHEM-1036

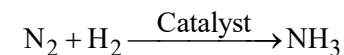
[Continued]

(3)

- (c) Define electrochromic materials with examples. Explain the mechanism of electrochromism in WO_3 mentioning redox reaction.
- (d) Depict and explain superhydrophilic, hydrophilic, hydrophobic and superhydrophobic materials in the context of contact angles.
- (e) What is shape memory material? Briefly explain shape memory effect in NiTiInol.
- (f) "A 'centrosymmetric' crystal cannot exhibit piezoelectric behaviour" — explain with pictorial depiction.
- (g) Define thermochromism and its mechanism of colour switching by taking an example of inorganic complex.

CO-

- 2. (a) Write any four differences between homogeneous catalysis and heterogeneous catalysis.
- (b) What is a photosensitizer and how does it help in photocatalysis?
- (c) Write a rate expression for an adsorption reaction when cumene (C) adsorbs during its decomposition.
- (d) Write down the intermediates (schematic diagram) for the following reaction :



★ ★ ★

CHEM-1036

XX24(113)—70