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W – 5622

Reg. No. :

Name :

First Semester M.Sc. Degree Examination, January 2026

Chemistry/Analytical Chemistry/Polymer Chemistry/Chemistry with
Specialisation in Drug Design and Development

CH 51125/CL 51125/PC 51125/CHDD 51125 : INORGANIC CHEMISTRY — I
(2025 Admission)

Time : 3 Hours

Max. Marks : 75

SECTION – A

Answer any **two** questions from each unit.

- I. 1. How do photocatalysts differ from ordinary catalysts in their mode of activation?
2. Why can one-dimensional metals show anisotropic electrical conductivity?
3. What are metal-rich phases?
- II. 4. What are Chevrel phases? Give one example.
5. How do isopoly acids differ from heteropoly acids?
6. What are polyoxometalates? Give one application.
- III. 7. Sketch d orbital splitting in a square planar complex.
8. What is meant by π -bonding in metal complexes?
9. Explain the reason for colour in transition metal complexes based on CFT.
- IV. 10. Mention one difference between direct and back titration methods.
11. What is the function of oxine in gravimetric analysis?
12. What is precipitation titration?
- V. 13. Why is the hydrologic cycle essential for maintaining environmental balance?
14. Mention any two redox-sensitive elements in the lithosphere
15. What is photochemical smog? Name its main components.

(10 × 2 = 20 Marks)

SECTION – B

Answer **all** questions. **Each** question carries **5** marks.

16. Examine how oxygen vacancies in perovskite materials influence their magnetic and electrical behaviour.

OR

17. Write short notes on inorganic pigments and phosphors with suitable examples.
18. Compare the structures of XeF_2 , XeF_4 and XeF_6 .

OR

P.T.O.



19. Explain the bonding and geometry of beryllium oxalate and copper acetate complexes.
20. Crystal field stabilisation energy Δ_t is smaller than Δ_o . Why?

OR

21. Draw and explain the MO diagram for $[\text{Ti}(\text{H}_2\text{O}_6)]^{3+}$ complex.
22. Describe complexometric titrations using EDTA and explain the difference between direct and back titrations.

OR

23. Explain the principle and applications of thermogravimetric analysis (TGA) in the study of metal complexes.
24. Discuss the catalytic roles of nitrogen oxides and chlorofluorocarbons in stratospheric ozone depletion.

OR

25. Describe the cation exchange processes in soils and factors influencing cation exchange capacity.

SECTION – C

(5 × 5 = 25 Marks)

Answer any **three** questions. **Each** question carries **10** marks.

26. (a) Explain how intercalation compounds act as hosts for guest ions and the factors governing their stability.
- (b) Explain how the molecular structure of fullerenes contributes to their reactivity and potential applications in materials chemistry.
27. (a) What are polyoxometalates? Explain their structure and applications.
- (b) Describe the bonding and magnetic properties of $\text{Re}_2\text{Cl}_8^{2-}$ based on molecular orbital considerations.
28. (a) Explain Jahn—Teller distortion in $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{Mn}(\text{H}_2\text{O})_6]^{3+}$ complexes.
- (b) Describe any two experimental evidences that support π -bonding in coordination compounds.
29. (a) Write short notes on:
- (i) Minimization of errors
- (ii) Confidence intervals
- (iii) Statistical reliability in chemical analysis.
- (b) Explain the significance of Student's *t*-test, Q-test, and F-test in analytical data interpretation.
30. (a) Discuss the importance of pE-pH predominance diagrams for redox-sensitive elements such as Fe and Cr.
- (b) Write a note on the hazards of common air pollutants and their effects on human health.

(3 × 10 = 30 Marks)

