(Pages : 4) **P – 2519**

Reg. No. : .....

Name : .....

Fifth Semester B.Sc. Degree Examination, December 2022

First Degree Programme under CBCSS

CHEMISTRY

Core Course VI

CH 1542 : INORGANIC CHEMISTRY III

(2020 Admission)

Time : 3 Hours Max. Marks : 80

SECTION A

Answer **all** questions. Each question carries **1** mark.

1. Give the reasons for the intense violet colour of $KMnO_4$ solution.
2. Among Cr, Mn, and Fe, which has the lowest second ionization energy?
3. Draw the structure of $KMnO_4$.
4. The stability of $Cu2^{+}_{(aq)}$ is more than $CU^{+}_{(aq)}$. Why?
5. Give the IUPAC name of the complex : $[Cr(H_2O)_3(NH_3)_3]Cl_3$.
6. Name and formulate any one ore of *aluminium*.
7. What is π - donor *ligand* in Ziese's salt?
8. Which is the photosensitizer in the photosynthesis that occurs in plants?
9. Give an example of an *iron-sulphur* protein.
10. What happens when a *sulphide ore* is roasted?

($10 \times 1 = 10$ Marks)

P.T.O.

SECTION B

Answer any **eight** questions. Each question caries **2** marks.

11. What are *inner transition* elements?

12. Mention two differences in the characteristics of lanthanides and actinides.

13. Why do Eu and Yb exhibit +2 oxidation states?

14. Complete and balance the following equation :
$MnO^-_{4(aq)} + Fe^{2+}(aq) + H^+_{(aq)} \longrightarrow$

15. Calculate the E.A.N. of $[Fe(CN)_6]^{4-}$ and $[Ag(CN)_2]$:

16. Calculate the CFSE for $[Mn(H_2O)_6]^{3+}$.

17. Draw the optical isomers of $[Co(en)_3]^{3+}$.

18. Tetrahedral complexes are generally *high spin*. Why?

19. Explain the term *pyrometallurgy*.

20. What is meant by *calcination*?

21. What is the use of *atomic absorption spectroscopy*?

22. What are *cytochromes*? Give examples.

23. Give the overall chemical reaction of *photosynthesis*.

24. Explain the term *hapticity* of a ligand in organometallic chemistry.

25. Discuss the vibrational frequencies of CO in *terminal* and *bridged metal carbonyls*.

26. State and explain *Beer-Lambert's* law.

($8 \times 2 = 16$ Marks)

SECTION C

Answer **six** questions. Each question carries **4** marks.

27. What is *monazite sand*? Explain a method to separate the group of lanthanides from the other ingredients of the *monazite sand*.

28. Cr^{2+} ion is a reducing agent and Mn^{3+} ion is an oxidising agent even though they are having the same d-orbital configuration. Explain.

29. Explain the important differences between *lanthanides* and *actinides*.

30. Give any four reactions to show the oxidising properties of $K_2Cr_2O_7$.

31. Explain why $[CoF_6]^{3-}$ is *paramagnetic* while $[Co(NH_3)_6]^{3+}$ is *diamagnetic*? Classify the above complexes into inner orbital and *outer orbital* complexes.

32. Explain the *crystal field splitting* in square planar complexes.

33. Briefly discuss the merits and demerits of VBT.

34. Write a note on *spectrochemical series*.

35. What is the *18-electron rule*? Illustrate an example for predicting the structure of a complex assuming that the *18-electron rule* is obeyed.

36. Briefly discuss the principle of *Differential Thermal Analysis* (DTA).

37. Explain the classification of *metal carbonyls* with suitable examples.

38. Discuss the mechanism *oxygen binding* in haemoglobin.

(6 × 4 = 24 Marks)

SECTION D

Answer any **two** questions. Each question carries **15** marks.

39. (a) Write a note on the oxidation states exhibited by *lanthanides* and *actinides*.

    (b) What is meant by *lanthanide contraction* and discuss the consequences of it?

40. (a) Discuss the variation of *atomic radii* among the first transition series.

    (b) Write a note on the *magnetic properties* and reducing properties of transition elements.

41. Discuss the factors that affect the stability of complexes by taking suitable examples.

42. (a) Write a note on the mechanism of *sodium-potassium pump.*

    (b) Explain the structure and bonding in *ferrocene*.

43. Explain :

    (a) Electrolytic refining

    (b) The van *Arkel* method

    (c) *Zone refining*.

44. (a) Discuss the instrumentation and applications of DSC.

    (b) Explain how TEM and SEM are beneficial for the analysis of nanostructures.

(2 × 15 = 30 Marks)

———————