Reg. No. : ....

Name : ....

Fourth Semester B.Sc. Degree Examination, August 2022

Career Related First Degree Programme under CBCSS

Group 2(a) : Biochemistry and Industrial Microbiology

Complementary Course IV

CH 1431.7 : BIOINORGANIC AND ELECTROCHEMISTRY

(2019 Admission onwards)

Time : 3 Hours   Max. Marks : 80

SECTION – A

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

1. What are *essential elements*?

2. Give the names of two iron storing proteins.

3. Define cell constant.

4. Why the conductivity of an electrolyte solution decreases with dilution?

5. What is the base peak for cyclopentane in a mass spectrum?

6. Give the structures of electrophiles tn *nitration* and *sulphonation* reactions of benzene.

7. Draw the structural formula for the most stable carbocation with molecular formula $C_4H_7^+$.

P.T.O.

8. Give the structure of EDTA.

9. Draw the structure of $[NiCl_4]^{2-}$ complex.

10. What is *Walden inversion*?

<div align="right">(10 × 1 = 10 Marks)</div>

SECTION – B

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

11. Explain the toxic effect of CO and CN^- on haemoglobin.

12. What is a *metalloenzyme*? Give an example.

13. Calculate the E.A.N. of Cr in $[Cr(NH_3)_6]^{3+}$ and of Co in $[Co(NH_3)_6]^{3+}$.

14. Explain the crystal filed splitting in tetrahedral complexes.

15. Identify the following reaction and give the structure of product:

$$CH_3CH_2CH_2CH=CH_2 + HI \longrightarrow$$

16. Give the structure of the major product formed, when butan-1-ol undergoes dehydration with 75% H_2SO_4.

17. How will you convert *chlorobenzene* into *aniline*?

18. Explain the mechanism of dehalogenation of vicinal dihalides.

19. What are the limitations of Werner's theory?

20. Calculate the CFSE for Mn^{3+} in the octahedral complex $[Mn(H_2O)_6]^{3+}$.

21. What is the coordination number of the central metal ion in the following complexes :

   (a) $[Cu(NH_3)_4]^{2+}$

   (b) $[Fe(C_2O_4)_3]^{3-}$
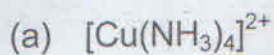
22. State and explain Faraday's first law of electrolysis.

23. How can you represent a *Daniel cell*?

24. What are the base peak and molecular ion peak obtained for acetone in mass spectra?

25. Explain any two uses of *electrochemical series*.

26. A silver rod is placed in 0.01 M $AgNO_3$ solution at 298 K has a potential of 0.6808 V. Calculate the standard potential of the Ag^+/Ag electrode.

$$(8 \times 2 = 16 \text{ Marks})$$

SECTION – C

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

27. Discuss the biochemistry of iron in both plants and animals.

28. Explain the mechanism of O_2 and CO_2 transportation by haemoglobin and myoglobin.

29. What is the major product obtained when 2-bromo-2,2-dimethylbutane undergoes dehydrohalogenation with water? Explain.

30. What is meant by Kharasch's effect? Explain with an example.

31. Discuss S_NAr mechanism by taking suitable example.

32. The resistance of a 0.1 M solution of an electrolyte taken in a conductivity cell containing two platinum electrodes 4 cm apart and 10.7 cm^2 in area was found to be 70 ohms. Calculate the conductivity and molar conductivity of the solution.

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33. Describe briefly the *Hittorf's* method for determining the transport numbers.

34. Write a note on the demerits of *VBT*.

35. How does VBT explain the bonding in hexafluoroferrate (III) ion and its magnetic behaviour?

36. Explain conductometric titration of (a) Stong acid vs weal base; (b) Weak acid vs weak base.

37. The EMF of the cell : $Zn(s) / Zn^{2+}$ (aq) // Ni^{2+} (0.1M) / Ni(s) at 298 K is found to be 0.518895 V. Calculate the concentration of Zn^{2+} solution in the cell. Given $E^0 Zn^{2+}/Zn = -0.76V$; $E^0 Ni^{2+}/Ni = -0.25V$

38. Describe briefly the principle of mass spectrometry.

(6 × 4 = 24 Marks)

SECTION – D

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

39. What is photosynthesis? Discuss the light and dark reactions involved in *photosynthesis.*

40. What are the applications of *Kohlrausch's* law?

41. Write a note an *Friedel-Craft's alkylation* and *Friedel-Craft's acylation.*

42. Bring about the significance of the competition between *nucleophilic substitution* and *elimination* reactions with regard to alkyl halides with suitable examples.

43. Discuss the different types of reversible electrodes with examples.

44. Discuss the splitting of d-orbitals in *tetrahedral field* according to CFT.

(2 × 15 = 30 Marks)

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