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Reg. No. : .....

Name : .....

First Semester B.Sc. Degree Examination, January 2024

First Degree Programme under CBCSS

Chemistry

Complementary Course for Physics

CH 1131.1 : THEORETICAL AND ANALYTICAL CHEMISTRY

(2020 Admission Onwards)

Time : 3 Hours Max. Marks : 80

SECTION – A

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

1. Define the term orbital.
2. How many groups of d-block elements are there in the periodic table?
3. Which indicator can be used in the titration of weak base vs strong acid?
4. What is meant by hybridization?
5. What is the H-N-H bond angles in the ammonium ion?
6. Define the term entropy.
7. What is the work done when a system undergoes free expansion?
8. What is a primary standard in volumetric analysis?
9. Define molality of a solution.
10. Give the electronic configuration of Cu (atomic number 29).

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B

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

11. State and explain Hund's rule of maximum multiplicity.
12. What is an ionic bond? Explain with an example.
13. Explain the term diagonal relationship.
14. What are the reasons for the stability of configurations with completely filled and half-filled orbitals?
15. Mention the general characteristics of covalent compounds.
16. How does the concept of hybridization to explain the geometry of CH_4 molecule?
17. State and explain second law of thermodynamics in terms of entropy.
18. State the Gibbs energy criterion for an equilibrium state.
19. What is the entropy criterion for spontaneous and non-spontaneous process?
20. What is a redox indicator? Give any two examples.
21. How to prepare 0.05M, 100ml NaOH solution. (Mol wt. of NaOH = 40)?
22. What is the principle of paper chromatography?

(8 × 2 = 16 Marks)

SECTION – C

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

23. What are representative elements? Briefly explain their any three general characteristics.
24. Define the term electron affinity. Discuss the variation of electron affinity along a period.
25. What is meant by dipole moment? Discuss briefly how the dipole moment studies are helpful in elucidating molecular structure.
26. Compare the bond orders and stabilities of O_2, O_2^{2+}, O_2^{2-}.

27. Define the term electronegativity. Discuss the factors that influence the electronegativity of elements.

28. Calculate the maximum work done when 5 moles of an ideal gas expand reversibly and isothermally from a pressure oil 10atm to 2atm at 390K.

29. Show that the decrease in Gibbs energy in a process is equal to the useful work done by the system.

30. Explain how thin layer chromatography is carried out. Give any two of its applications.

31. Explain the term permanganometric titrations with suitable examples.

(6 × 4 = 24 Marks)

SECTION – D

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

32. (a) State and explain Fajan's rules. **7.5**

    (b) Discuss the MO energy diagram of NO molecule highlighting its bond order, stability and magnetic behaviour. **7.5**

33. (a) What are quantum numbers? Discuss the significance of each quantum number. **7.5**

    (b) What is Born-Haber cycle? Discuss with respect to NaCl. **7.5**

34. (a) Show that Cp – Cv = R for one mole of an ideal gas. **7.5**

    (b) Calculate the entropy of fusion of ice if its enthalpy of fusion at 273 K is 335 Jg^{-1}. **7.5**

35. (a) Explain the term dichrometric titrations with suitable examples. **8**

    (b) Discuss the titration curves for the titration of strong acid with weak base and weak acid with strong base. **7**

(2 × 15 = 30 Marks)
