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TRIVANDRUM

First Semester B.Sc. Degree Examination, March 2023

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. Which has a higher electron affinity-F or Cl? Justify your answer.
2. Give the electronic configuration of Cr (atomic number 24).
3. Which element shows diagonal relationship with Li? Justify your answer.
4. Predict the dipole moment of CH_4 molecule.
5. What happens to the entropy of the universe in an irreversible process?
6. Define the term enthalpy.
7. Which property of a system is regarded a measure of the disorder present in it?
8. Define molarity of a solution.

9. What is meant by standard solution?

10. Name two indicators used in acid-base titrations.

(10 × 1 = 10 Marks)

SECTION – B

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

11. State and explain Pauli's exclusion principle.

12. What is a covalent bond? Explain with an example.

13. Give reasons for the stability of configurations with completely filled and half-filled orbitals.

14. Water is a bent molecule with an H-O-H bond angle of 104.5°. How can you explain this on the basis of VSEPR theory?

15. How does the strength of intermolecular forces affect the boiling point of a liquid?

16. How does the concept of hybridization to explain the geometry of acetylene molecule?

17. Give the statement of first law of thermodynamics and its mathematical formulations.

18. Mention the entropy criterion for the non-spontaneous and equilibrium state of a process.

19. State the Gibbs energy criterion for spontaneous and non-spontaneous process.

20. How is end-point detected in permanganometric titrations? Why?

21. What are the stationary and mobile phases in thin layer chromatography?

22. How to prepare 2M. 500ml NaOH solution. (Mol wt. of NAOH = 40)

(8 × 2 = 16 Marks)

SECTION – C

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

23. What is all ionic bond? Discuss the Factors that favour the formation of ionic bonds.

24. What are transition elements? Briefly explain their any three general characteristics.

25. How can you calculate the lattice energy of NaCl using Born – Haber Cycle?

26. State and explain Fajans rules.

27. Discuss the basic features of Pauling's scale of electronegativity.

28. Show that $C_P - C_V = R$ for one mole of an ideal gas.

29. Calculate the work of reversible expansion of 1 mole of ideal gas at 25°C from 10 L to 20 L.

30. Explain dichrometric titrations with suitable examples.

31. Explain how paper chromatography is carried out. Give any two of its applications.

(6 × 4 = 24 Marks)

SECTION – D

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

32. What are quantum numbers? Discuss the significance of each quantum number.

33. Discuss the MO energy diagram of CO molecule highlighting its bond order, stability and magnetic behaviour.

34. (a) Derive Gibbs-Helmholtz equation. **7.5**

    (b) Show that the decrease in Gibbs energy in a process is equal to the useful work done by the system. **7.5**

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

(b) Briefly outline the use of the principle of solubility product and common ion effect in the separation of cations in qualitative analysis. **8**

(2 × 15 = 30 Marks)
