S – 2718

Reg. No. : ....

Name : ....

First Semester B.Sc. Degree Examination, January 2024

First Degree Programme under CBCSS

Chemistry

Complementary Course for Botany / Zoology / Microbiology

CH 1131.3/CH 1131.4/ CH 1131.7 : THEORETICAL CHEMISTRY

(2017-2019 Admission)

Time : 3 Hours   Max. Marks : 80

PART – A

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

1. Write down the de Broglie equation for the wavelength of matter waves.

2. Write Rydberg equation.

3. Write the electronic configuration of chromium ($Z = 24$).

4. Define bond order.

5. Draw the shape and give hybridization of XeF_4.

6. Explain the reason for the high boiling point of water molecule.

7. What are secondary standards? Give one example.

8. Name two acid-base indicators.

9. Name two important greenhouse gases.

10. Explain COD.

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

PART – B

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

11. Give the reason for the extra stability of half-filled and fully filled orbitals.

12. Using s, p, d, f notation, describe the orbitals with following quantum numbers.
    (a) $n = 1, 1 = 0$
    (b) $n = 2, 1 = 0$
    (c) $n = 3, 1 = 1$
    (d) $n = 4, 1 = 3$

13. Give the merits of Bohr theory.

14. Show that O_2^{2+} is diamagnetic and O_2 is paramagnetic.

15. C-C bond length in ethane is 154 pm while in ethylene it is 34 pm. Explain.

16. On the basis of VSEPR theory, explain the geometry of NH_3.

17. What are the criteria for a primary standard?

18. Calculate the normality of 250 ml solution which contains a mass of 66 g sodium carbonate.

19. Differentiate iodimetry and iodometry.

20. How does ozone depletion affect human life and climate change?

21. What is electro dialysis? Give an application of it.

22. What are the four types of pesticides?

PART – C

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

23. Hydrogen atom has only one electron yet it has many spectral lines. Explain.

24. Discuss the failures of Bohr model of atom.

25. Sketch the shapes of all the d orbitals.

26. Discuss the Born-Haber cycle for the formation of MgO.

27. Draw the MO diagram of O_2 molecule and calculate its bond order.

28. Explain with suitable examples the transition from ionic to covalent bond.

29. Briefly explain the theory behind acid-base indicators.

30. Discuss the principle and procedure for the estimation of iron colorimetrically.

31. How does amount of BOD and COD affect water quality?

(6 × 4 = 24 Marks)

PART – D

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

32. (a) What are quantum numbers? Explain the significance of various quantum numbers.

    (b) Write notes on Aufbau principle, Hund's rule and Pauli's exclusion principle.

33. (a) What are the main postulates of VSEPR theory?

    (b) Explain the shape of ammonia and water using VSEPR theory.

    (c) Discuss the bond order and magnetic behaviour of NO and NO^+.

34. Briefly discuss the principle of complexometric, dichrometric and colorimetric titrations using examples.

35. Write on various factors affecting purity of water.

<div align="right">(2 × 15 = 30 Marks)</div>

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