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Reg. No. : .....

Name : .....

First Semester B.Sc. Degree Examination, March 2023

First Degree Programme under CBCSS

Chemistry

Complementary Course for Zoology

CH 1131.4 : THEORETICAL CHEMISTRY

(2020 Admission Onwards)

Time : 3 Hours Max. Marks : 80

SECTION – A

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

1. What is Balmer series of lines?
2. Which orbital does not have directional characteristic?
3. The spectra of He^{+}, Li^{2+} and Be^{2+} are similar to that of hydrogen atom. Why?
4. How does the strength of intermolecular forces affect the boiling point of a liquid?
5. What is the H-N-H bond angles in the ammonium ion?
6. Calculate the bond order of H_2 molecule.
7. What is meant by standard solution?
8. Define molarity of a solution.

9. Which is the pollutant introduced to water when synthetic detergents are used?

10. What is meant by DO?

(10 × 1 = 10 Marks)

SECTION – B

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

11. State and explain Pauli's exclusion principle.

12. Write Schrodinger wave equation and explain the terms.

13. What are the reasons for the stability of configurations with completely filled and half-filled orbitals?

14. List two main conditions for forming hydrogen bonds.

15. How can you predict the ionic character of a bond?

16. Give any two limitations of Bohr atom model.

17. Explain the term Eutrophication.

18. What is meant by BOD of water? How is it different from COD?

19. What is meant by greenhouse effect?

20. How to prepare 0.5 M, 250 ml NaOH solution. (Mol wt. of NaOH = 40).

21. State and explain Beer-Lambert law.

22. Methyl orange is not a suitable indicator in the titration of a weak acid against a strong base?

(8 × 2 = 16 Marks)

SECTION – C

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

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

24. Calculate the wavelength of the radiation emitted when the electron in the hydrogen atom excited to the 5^{th} energy level returns to the 2^{nd} energy level. (Rydberg constant = $1.097 \times 10^7\ m^{-1}$).

25. Discuss the important postulates of the VSEPR theory.

26. Explain Born-Haber cycle for the formation of NaCl.

27. What are the consequences of ozone layer depletion?

28. Discuss the causes and consequence of ozone layer depletion.

29. Explain the colourimetric estimation of iron.

30. Discuss briefly the principle of iodometric titrations with suitable example.

31. Compare the bond orders and stabilities of O_2, O_2^{2+}, O_2^{2-}.

(6 × 4 = 24 Marks)

SECTION – D

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

32. What is meant by orbital hybridization? Explain the molecular geometries associated with Sp^3d^2 and Sp^3d^3 hybridizations with illustrative examples.

33. (a) Discuss the important postulates of Bohr's atomic theory. **7.5**

    (b) How is hydrogen spectrum explained on the basis of Bohr's theory? **7.5**

34. (a) Discuss the various factors responsible for water pollution. **7.5**

(b) Explain the different methods for the treatment of industrial waste water. **7.5**

35. (a) What are complexometric titrations? Explain with special reference to EDTA titrations. **7.5**

(b) Explain the theory of acid-base indicators with examples. **7.5**

(2 × 15 = 30 Marks)