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L – 3559

Reg. No. :

Name :

First Semester B.Sc. Degree Examination, August 2021

First Degree Programme under CBCSS

Chemistry

Complementary Course I for Physics and Geology

CH 1131.1/CH 1131.2 – PRINCIPLES OF CHEMISTRY

(2013, 2015 – 2016 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer all questions. Answer in 1 word to maximum of 2 sentences.

Each question carries 1 mark.

1. Lyman series in hydrogen atom occur in _____.
2. Write Rydberg equation.
3. What is a Bohr radius? Give its approximate value.
4. Define dipole moment and give its unit.
5. Explain lattice energy.
6. Explain standard free energy of formation.
7. State the criteria for equilibrium in terms of entropy.

P.T.O.

8. Define thermodynamic equilibrium.
9. What are extensive and intensive properties?
10. Define standard enthalpy of neutralisation.

(10 × 1 = 10 Marks)

SECTION – B

Short answer type (Not to exceed 1 paragraph)

Answer **any eight** questions from the following.

Each question carries 2 marks.

11. Give the importance of Pauli's exclusion principle.
12. Explain the significance of ψ and ψ^2 .
13. Write the electronic configuration of N and O atom based on Hund's rule.
14. CO_2 and H_2O are triatomic molecules but both have different structures. Why?
15. Describe Mulliken's electronegativity scale.
16. Explain reversible and irreversible process with example.
17. What is the hybridization of central atom in SF_6 ?
18. Based on free energy change how you can predict the spontaneity of a process.
19. Distinguish between bonding and antibonding molecular orbitals.
20. State the reason why N_2 is more stable than O_2 .
21. Explain enthalpy of a reaction.
22. Define bond order. Calculate the bond order of CO.

(8 × 2 = 16 Marks)

SECTION – C

Short essay (Not to exceed 120 words)

Answer any six questions from the following.

Each question carries 4 marks.

23. Explain the various lines in atomic spectra of hydrogen.
24. State how hydrogen bonding influences the boiling point?
25. Describe the method for determining the ionic character of a covalent bond.
26. Explain why dipole moment of NH_3 is greater than NF_3 .
27. Discuss the geometry of molecules having sp^3d^2 and sp^3d^3 hybridisation.
28. Deduce an expression for work done during the adiabatic reversible process.
29. Derive the relationship between heat capacity at constant pressure and constant volume.
30. Explain bond dissociation energy with respect sp and sp^2 hybridised molecules.
31. Calculate the enthalpy of combustion of CH_4 at 25°C from the given data.
 $\Delta H^\circ_f(\text{CO}_2) = -393.5 \text{ kJ mol}^{-1}$, $\Delta H^\circ_f(\text{H}_2\text{O}) = -286.2 \text{ kJ mol}^{-1}$ and
 $\Delta H^\circ_f(\text{CH}_2) = -74.8 \text{ kJ mol}^{-1}$.

(6 × 4 = 24 Marks)

SECTION – D

Long essay

Answer **any two** questions from the following.

Each question carries **15** marks.

32. (a) Write the merits and demerits of Bohr atom model.
(b) Explain the concept of quantum numbers.
33. (a) Give a brief account of molecular orbital theory.
(b) Draw the MO diagram for NO and O₂ molecule.
34. (a) Describe how enthalpy of reaction can be determined by Hess's law.
(b) Find the ΔG formation of methane from the given data. The entropy of formation of CH₄(F) = -74.8 J mol^{-1} , standard entropies of H₂(g), C(g), CH₄(g) are 130.68, 5.74 and $186.26 \text{ J mol}^{-1}$ respectively.
35. (a) Explain how free energy varies with temperature and pressure.
(b) Calculate the free energy change when 1 mole of an ideal gas is expands reversibly and isothermally at 25°C from an initial volume 55dm³ to 1000dm³.

(2 × 15 = 30 Marks)