213542 **12122**

Reg. No. | | | | | | | | |

I Semester B.Sc. Degree Examination, August - 2021

CHEMISTRY

(CBCS New Scheme 2020-21 Onwards)

Paper : I

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates :

1) Question paper has Two sections. Answer both the sections.
2) Write Chemical equations & diagrams wherever necessary.

SECTION - A

Answer any **FIVE** of the following questions. Each question carries **SEVEN** marks: **(5×7=35)**

1. a) Derive an expression for the radius of n^{th} orbit of hydrogen atom using Bohr's postulates. **(3+2+2)**

b) Calculate the ionization energy of H atom. Energy of the electron in first Bohr orbit of hydrogen $= -2.17\times10^{-18} J$.

c) Give any Two limitations of Bohr's theory.

2. a) Explain the terms: **(4+3)**

i) Hamiltonian operator

ii) Laplacian operator

b) Calculate the Rydberg constant for hydrogen, from the fundamental constants.

$h = 6.625\times10^{-34} Js$, $c = 3\times10^{8} ms^{-1}$

$m = 9.1\times10^{-31} kg$, $e = 1.602\times10^{-19} c$ and $\varepsilon_0 = 8.85\times10^{-12} c^2 J^{-1} m^{-1}$

3. a) Give the significance of quantum numbers n, l and m_ℓ **(3+2+2)**

b) Define atomic orbital. What is the shape of p orbital.

c) Write de-Broglie's equation and indicate the terms involved.

[P.T.O.

4. a) State and explain the following: (4+3)
   i) Aufbau's principle.
   ii) $(n+l)$ rule.
   b) Explain the shape of water molecule based on VSEPR theory.

5. a) Set up Born- Haber cycle for ionic solids of type Mo and write the expression for lattice energy. (4+3)
   b) Explain the terms polarizing power and polarizability taking a suitable example.

6. a) Discuss the structure of cuprammonium ion using the concept of hybridization. (3+2+2)
   b) Write Born - Lande equation and indicate the terms involved.
   c) Write resonance structures of the molecule, carbon monoxide.

7. a) Set up molecular orbital diagram for oxygen molecule. Calculate the bond order and explain its magnetic property. (4+3)
   b) What is doping? Explain p-type semiconductors taking a suitable example.

SECTION-B

Answer any **FIVE** of the following questions. Each question carries **SEVEN** marks: (5×7=35)

8. a) What are Carbanions? Give an example. How are they formed? (3+2+2)
   b) Explain elimination reaction with an example.
   c) What is a chiral centre? Give an example of a molecule containing a chiral centre.

9. a) Draw the Newman projection formulae of different conformations of butane. Explain their relative stabilities. (4+3)
   b) What is geometrical isomerism? Write the geometrical isomers of but -2- ene.

10. a) Discuss the mechanism of addition of HX to an unsymmetrical alkene. (4+3)
    b) Explain the preparation of an alkene by Corey -House synthesis.

11. a) Explain the following reactions with a suitable example: (4+3)
    i) Birch reduction.
    ii) Preparation of alkynes from vicinal dihalides.
    b) Explain Ozonolysis with an example. Mention its significance.

12. (a) What happens when .....? (4+3)
    (i) Ethane is reacted with Br_2 in the presence of sunlight.
    (ii) Toluene is treated with hot alkaline $KMnO_4$ solution.
    (b) What are dienes? Explain Diels- Alder reaction with an example.

13. (a) Explain the mechanism of nitration of Benzene. (3+2+2)
    (b) State and explain Huckel's rule with a suitable example.
    (c) Explain sandmeyer's reaction with an example.

14. (a) Explain the orienting influence of -OH group in phenol towards Electrophilic substitution reactions. (4+3)
    (b) How is styrene prepared from ethyl benzene? Mention any one of its uses.
