CS/B.TECH(H)/EVEN/SEM-2/2002/2024 2024/2025

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Paper Code : BSCH201 Chemistry I (Gr A)

UPID : 002002

Time Allotted : 3 Hours *Full Marks :70*

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

[1 x 10 = 10]

1. Answer *any ten* of the following :
   (i) Write the reagents of nitration of benzene.
   (ii) Write the value of quantum numbers n, l and m for 2s orbital.
   (iii) MRI is the application of which spectroscopic method?
   (iv) London forces or dispersion forces operates between _____.
   (v) How the entropy of the system changes when water is frozen?
   (vi) What is Hard-soft acid base principle?
   (vii) If two stereoisomers of tartaric acid have 2S, 3R and 2S, 3S configurations, then they are _____.
   (viii) What are the conditions of Cannizzaro reaction?
   (ix) State whether naphthalene is aromatic, antiaromatic or nonaromatic and give reason.
   (x) Write the equation of rotational constant B of a molecule.
   (xi) What is the value of critical coefficient?
   (xii) Write the half-cell representation of saturated calomel electrode.

Group-B (Short Answer Type Question)

Answer *any three* of the following : [5 x 3 = 15]

2. What is the role of Lewis acid in halogenation of benzene? Write the structure of the substrate which on ozonolysis will provide acetone as the only product. [5]
3. Write the significance of van-der Waal's constants. [5]
4. What are conformational isomers? Explain by taking ethane as an example. Draw the potential energy diagram of ethane. [5]
5. Prove that for a constant pressure process, where work in only mechanical, the heat absorbed by the system (Q_p) is equal to the increase in enthalpy (ΔH). [5]

6. NO is paramagnetic while NO+ is diamagnetic. Justify using MO diagram. Write electronic configuration of NO. [5]

Group-C (Long Answer Type Question)

Answer *any three* of the following : [15 x 3 = 45]

7. (a) Define 'Standard cell' with example. [3]
   (b) Find the relation between ΔH and ΔU for an ideal gas undergoing a P-V type mechanical work as follows:
   $\Delta H=\Delta U+\Delta nRT$ [4]
   (c) Discuss any one statement of First law of thermodynamics and explain it mathematically. [4]
   (d) Explain 'Galvanic cell corrosion'. [4]
8. (a) Demonstrate the shape of the following compounds.
   (i) ClF_3 (ii) XeF_2 (iii) BrF_5 (iv) SCl_6 [8]
   (b) Arrange NH_3, H_2O, CH_4 according to increasing bond angle stating the reason. [4]
   (c) Dipole moment of BF_3 is zero while that of NF_3 is 0.24D. Justify. [3]
9. (a) Derive Schrodinger Equation. [5]
   (b) Write the conditions of acceptable wave function Ψ. [5]
   (c) Write short note on extrinsic semiconductor and its types. [5]
10. (a) What will be the product/ products if $CH_3CH=CH_2$ is reacted with HBr? Show the steps of reaction. [5]

(b) What change will be observed in the above reaction if peroxide is added along with HBr? [2]

(c) Choose the more suitable substrate of E1 reaction between tertiary-butyl chloride and methyl chloride. Give reason. [3]

(d) Explain the stereo chemical aspects of SN^1 and SN^2 reactions with suitable examples. [5]

11. (a) Calculate the CFSE and Magnetic moment of $K_3[FeF_6]$. [5]

(b) Calculate the CFSE of both high spin and low spin complexes of d^7 and d^4 complexes. [5]

(c) Give the molecular energy level diagram of CO. Comment on magnetic behaviour and bond order. [5]

*** END OF PAPER ***