Sessional Exam 2025

North Gauhati College

Semester : II (FYUGP)

Subject : Chemistry II

Paper Code: CHE0200104

Total marks: 30 **Time: 1hr 30 mins**

PART A (INORGANIC CHEMISTRY)

1. What is the cause of unusual high boiling point of NH_3 and H_2O ? 1

2. Why $ZnCl_2$ is more covalent than $MgCl_2$? 2

Or

According to Fajan's Rules, covalent bonding is favoured by which types of cations and anions? 2

3. Using VSEPR theory, predict the geometry of **any two** of the following molecules:

a) H_2O b) ClF_3 c) XeF_4 d) PCl_5 1.5x2=3

4. Draw the molecular orbital energy level diagram and find out the bond order for **any one** of the following molecules? 3+1=4

a) O_2 b) CN^-

PART B (ORGANIC CHEMISTRY)

5. What is the hybridisation state of the following -ve carbon atoms: 1

$CH_3\text{-}\overline{C}H\text{-}CH_3$ $CH_2{=}CH\text{-}\overline{C}H_2$

6. What do you mean by K_a value? How does it affect the acidity of an acid? 2

7. Explain why chloroacetic acid is more acidic than acetic acid? 3

Or

Explain why aromatic amines are less basic than aliphatic amines? 3

8. Explain the structure of carbocation and arrange the following in increasing order of stability. 3+1=4

CH_3^+ $CH_2{=}CH{-}CH_2^+$, $CH_3{-}CH_2^+$, $CH_3{-}CH^+{-}CH_3$

PART C (PHYSICAL CHEMISTRY)

9. Define extensive and intensive properties. Give one example of each. 1

10. Deduce the relationship between temperature and volume for reversible adiabatic expansion. 3

$$TV^{\gamma-1} = \text{Constant}$$

Or

Six moles of an ideal gas expands isothermally and reversibly from a volume of 1 dm^3 to a volume of 10 dm^3 at 27 ^{0}C. What is the maximum work done? 3

11. Define Joule-Thomson co-efficient. Deduce the relationship: 3

$$\mu_{J,T} = -\frac{1}{C_P}\left(\frac{\delta H}{\delta P}\right)_T$$

12. Define Hess's law of constant heat summation. Calculate the standard enthalpy of formation of methane (CH_4) from the following thermochemical reaction:

$$CH_4\,(g) + 2O_2\,(g) \longrightarrow CO_2\,(g) + 2H_2O\,(l)$$

$$\Delta H^0 = -890.4\ kJmol^{-1}$$

Give the ΔH^0 for CO_2 (g) and H_2O (g) are -393.7 $kjmol^{-1}$ and -285.8 $kJmol^{-1}$ respectively.

1+2=3

Or

Define Kirchoff equation. The enthalpy of reaction (ΔH) for the formation of ammonia according to the reaction $N_2 + 3H_2 \longrightarrow 2NH_3$ at 27 ^{o}C was found to be -91.94 kJ. What will be the enthalpy of the reaction at 50 ^{o}C. The molar heat capacities at constant pressure and at 27 ^{o}C for N_2, H_2 and NH_3 are 28.45, 28.32 and 37.07$JK^{-1}mol^{-1}$ respectively. 1+2=3

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