



DEPARTMENT OF CHEMISTRY
College of Engineering and Technology
SRM Institute of Science and Technology
Kattankulathur – 603203

SET – 2

INTERNAL ASSESSMENT – II [FJ2]

Program: B.Tech
Course Code & Title: 21CYB101J & Chemistry
Year & Sem: I Year & I Sem

Date: 25/11/2024
Time: 8.00 - 9.00am.
Max. Marks: 30

ANSWER KEY

Part – A (10 x 1 = 10 Marks)

- For a hypothetical reaction at 1 atm pressure, the values of ΔH and ΔS are both positive, and the process is spontaneous at high temperatures. Which of the following statements about this reaction is true?
a) The change in entropy is the driving force for this reaction
- The Helmholtz function F is given by
a) $U - TS$
- Indicate which of the following has the lowest standard molar entropy (S°)
b) Na (s)
- For a potentiometric titration, in the curve of emf (E) vs. volume (V) of the titrant added, the equivalence point is indicated by
b) $|dE/dV| > 0, |d^2E/dV^2| = 0$
- For a reaction that has an equilibrium constant of 4.7×10^{-2} , which of the following statements must be true?
c) ΔG° is positive
- In the Pourbaix diagram, the form of iron that will predominate at pH 12 and at a potential of 1.86 V is
c) FeO_4^{2-}
- For an isolated system, $\Delta U = 0$, what will be ΔS ?
a) $\Delta S > 0$
- The hybridisation and geometry of the carbocation intermediate in S_N1 reaction is
c) sp^2 , trigonal planar
- In Newmann projection for ethane in the staggered conformation, the dihedral angle for the C—H bonds is deg?
a) 60
- The number of structural isomers for C_6H_{14} is
b) 5

Part – B (2 x 10 = 20 Marks)

11. a. i. Derive Gibbs-Helmholtz equation and give its significance (6 marks)

Derivation : 4 marks

Significance : 2 marks

- ii Write the solubility product expression for a) MgF_2 b) Ag_2CrO_4 c) PbBr_2 d) $\text{Ca}_3(\text{PO}_4)_2$ (4 marks)

Writing the correction expression – each one mark (4x1=4 marks)

(OR)

- b. i. $\text{N}_2(\text{g}) + 3 \text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$

Calculate $\Delta S^\circ_{\text{reaction}}$ for the above. The standard entropies of the substances involved in the above reaction are given below in the thermodynamic data table.

(3 marks)

Substances	$\Delta S \text{ (J/K.mol)}$
$\text{N}_2(\text{g})$	191.61
$\text{H}_2(\text{g})$	130.68
$\text{NH}_3(\text{g})$	192.45

$$\Delta S^\circ_{\text{reaction}} = \sum n_p S(\text{products}) - \sum n_r S(\text{reactants})$$

$$= [2 \text{ mol NH}_3 \times 192.45 \text{ J/mol-K}] - [1 \text{ mol N}_2 \times 191.61 \text{ J/mol-K} + 3 \text{ mol H}_2 \times 130.68 \text{ J/mol-K}] = -198.75 \text{ J/K}$$

- ii. With proper equations compare and contrast dry and wet corrosion. (7 Marks)

Mechanism of dry corrosion with equation: 2 marks

Three types of wet corrosion with equations: 5 marks

12. a. Explain in detail the potentiometric redox titration with an example and give its advantages. (10 marks)

Explanation on potentiometric titration with graphs – 8 Marks

Advantages – 2 marks

(OR)

- b. i. Define the terms Enantiomers and Diastereomers. Provide an example for each. (4 marks)

Definition of enantiomers and diastereomers with one example each – 2+ 2 Marks

- ii. Explain Cahn-Ingold-Prelog rules for the determination of absolute configuration (6 marks)

CIP rules and explanation – 4 marks

Each stage – one example – 2 marks
