QP-CLA 2-Set 1-Answer Key

Chemistry (SRM Institute of Science and Technology)

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

SET 1

INTERNAL ASSESSMENT – II-Answer Key

Program: B. Tech.	Date: 19/11/2022
Course Code & Title: 21CYB101J & Chemistry	Duration: 12.30 – 1.30 pm
Year & Semester: I Year & I Semester	Max. Marks: 30 Marks

Part- A (10 x 1 = 10 Marks)

Answer ALL The Questions

1. The change of enthalpy in an endothermic reaction is
   (a) positive
2. Which of the following is an **incorrect** statement?
   (b) Corrosion is a non-spontaneous process
3. Rusting of iron in acidic aqueous solution of electrolyte occurs with the evolution of _____gas.
   (d) Hydrogen
4. A system absorbs 50 J of heat and does 11 J of work in a process. The system follows a different thermodynamic path between the same initial and final states and does 15 J work, the heat transferred in the process is
   (c) 54 J
5. Which of the following is **false** regarding galvanic cells?
   (c) The reactions taking place are non-spontaneous
6. ΔG for the reaction $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$ is
   (d) -2FE
7. For which of the following conditions a reaction will be spontaneous at all the temperature?
   (d) both (b) and (c)
8. Which of the following is the application of Pourbaix diagrams?
   (d) All of the above
9. Which of the following statements is **not** correct?
   (c) Fischer projection of the molecule is its most stable conformation
10. The compounds $C_2H_5OC_2H_5$ and $CH_3OCH_2CH_2CH_3$ are
    (c) metamers

Part- B (2 x 10 = 20 Marks)

11 a. i. What is Nernst Equation? Derive its expression and describe one application of Nernst equation in detail. (10 Marks)

The Nernst equation defines a relation between the cell potential of an electrochemical cell, the standard cell potential, temperature, and the reaction quotient. It is used for cell potential determination under non-standard conditions. **(1 Mark)**

Derivation of expression **(5 marks)**

Description of any one application **(4 Marks)**

OR

b. i. The cell in which the following reaction occurs:

$$2Fe^{3+}_{(aq)} + 2I^{-}_{(aq)} \rightarrow 2Fe^{2+}_{(aq)} + I_{2\,(aq)}$$

has E^{o}_{cell} = 0.236V at 298 K. Calculate the standard Gibbs free energy and the equilibrium constant of the reaction. (Given: F = 96,485 C/mol) (6 Marks)

Solution: The half cell reactions can be written as:

$$Anode: \ 2I^{-}_{(aq)} \rightarrow I_{2(s)} + 2e^{-}$$

$$Cathode: \ 2Fe^{3+}_{(aq)} + 2e^{-} \rightarrow 2Fe^{2+}_{(aq)}$$

$$Number\ of\ electrons\ exchanged,\ n = 2$$

Here, n = 2, E^{θ}_{cell} = 0.236 T = 298 K

We know that:

$$\triangle_r G^{\theta} = -nFE^{\theta}_{cell}$$

$$= -2 \times 96487 \times 0.236$$

$$= -45541.864 \text{ J mol}^{-1}$$

$$= -45.54 \text{ kJ mol}^{-1}$$

Writing half- cell reactions and calculating 'n' (2 Marks)
Calculation of Free energy (4 marks)

ii. Differentiate between Dry Corrosion and Wet corrosion (4 Marks)
Any 4 points of difference (each 1 mark)

12 a. i. What is Gibb's free energy? Derive its expression. (6 Marks)
Definition and explanation (2 Marks)
Derivation (4 Marks)

ii. Define entropy and give its significance. (4 Marks)
Definition (1 Mark)- Any two significance (3 Marks)

OR

b. i. Write a note on structural isomerism in organic compounds. (6 Marks)
Classification into (1) Chain isomerism (2) Position Isomerism (3) Functional group isomerism and (4) Metamerism with one example (each 1.5 marks)

ii. Draw Newman projections for the eclipsed and staggered conformations of ethane. Which of these conformations is more stable and why? (4 Marks)
Drawing of eclipsed and staggered conformation (3 Marks)
More stable conformation and its reason (1 Mark)