

INTERNAL ASSESSMENT – II [CLA1-T2]

Program: B.Tech

Course Code & Title: 21CYB101J & Chemistry
Year & Sem: I Year & I SemDate: 17-10-2023
Time: 8.00-9.00AM
Max. Marks: 30 marksAnswer ALL the QuestionsPart – A (10 x 1 = 10 Marks)

1. For the second-period elements the correct increasing order of first ionization energy is :
 - (a) Li < Be < B < C < O < N < F < Ne
 - (b) Li < Be < B < C < N < O < F < Ne
 - (c) Li < B < Be < C < O < N < F < Ne
 - (d) Li < B < Be < C < N < O < F < Ne
2. The group of metals having positive value of electron gain enthalpy is :
 - (a) Cr, Fe
 - (b) Mn, Zn
 - (c) Fe, Zn
 - (d) Cr, Mn
3. An atom with high electronegativity has:
 - (a) Large size
 - (b) High ionisation potential
 - (c) Low electron affinity
 - (d) Low ionisation potential
4. Which of the following complex is the most stable?
 - (a) $[\text{AlBr}_6]^{3-}$
 - (b) $[\text{AlI}_6]^{3-}$
 - (c) $[\text{AlF}_6]^{3-}$
 - (d) $[\text{AlCl}_6]^{3-}$
5. Consider the diagram beside, for a reaction $\text{A} \rightarrow \text{C}$. The Nature of the reaction is:

 - (a) Exothermic
 - (b) Endothermic
 - (c) Reaction at equilibrium
 - (d) None of the above
6. What will be the Gibbs free energy for the reaction of conversion of ATP into ADP at 293 Kelvin, if the change in enthalpy is 19.07 Kcal and the change in entropy is 90 cal per Kelvin.
 - (a) 7.3 cal
 - (b) -5.3 cal
 - (c) 7.3 Kcal
 - (d) -7.3 Kcal
7. When equilibrium is reached inside the two half-cells of the electrochemical cells, what is the net voltage across the electrodes?
 - (a) > 1
 - (b) < 1
 - (c) = 0
 - (d) Not defined
8. The equilibrium constant for a cell reaction, $\text{Cu}_{(\text{g})} + 2\text{Ag}^{+}_{(\text{aq})} \leftrightarrow \text{Cu}^{2+}_{(\text{aq})} + 2\text{Ag}_{(\text{s})}$ is 4×10^{16} . Find

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Q. 9. In the cell reaction:

- (a) 0.02 V (b) 0.48 V (c) 1.23 V (d) 3.24 V

Q. 10. An oxide layer is considered as protective if ratio of volume of oxide layer to volume of base metal

- (a) > 1 (b) > 10 (c) < 1 (d) > 3

Q. 11. Passivity is not observed for inertness of the following:

- (a) Cu (b) Al (c) Ti (d) Ni

Q. 12. ~~Q. 13.~~

Part - B (2 x 10 = 20 Marks)

i. Explain why CsF reacts with LiI to give LiF and CsI? (6 Marks)

ii. Arrange M, M⁺ and M²⁺ in increasing order of atomic/ionic size and justify the order. (4 Marks)

(OR)

Calculate the total entropy change for the transition at 368 K of 1 mol of sulphur from the monoclinic to the rhombic solid state. Given $\Delta H = -401.7 \text{ J mol}^{-1}$ for the transition. Assume the surrounding to be an ice-water bath at 0°C.

Explain construction and working of an electrochemical cell with an example.

Four identical containers have equal amounts of helium gas that all start at the same initial temperature. Containers of gas also have a tightly fitting movable piston that does not allow any of the gas to escape. Each sample of gas is taken through different process as described below:

Sample 1: 500 J heat exits the gas and the gas does 300 J of work $= -800 \text{ J}$

Sample 2: 500 J of heat enters the gas and the gas does 300 J of work $= +200 \text{ J}$

Sample 3: 500 J of heat exits the gas and 300 J of work is done on the gas $= -200 \text{ J}$

Sample 4: 500 J of heat enters the gas and 300 J of work is done on the gas $= +800 \text{ J}$. 4 > 2 >

Arrange the samples in increasing order of their temperature. (6 Marks)

ii. Differentiate between dry corrosion and wet corrosion.

(4 Marks)

(OR)

b. Applying Nernst equation, describe the following potentiometric titrations. (10 Marks)

- i. Redox reactions ii. Acid-base reactions

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Set-2

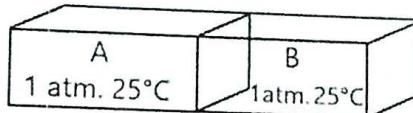
INTERNAL ASSESSMENT - II [CLA1 T2]

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

Date: 17/10/2023
 Time: 8.00-9.00AM
 Max. Marks: 30 marks

Answer ALL the QuestionsPart - A (10 x 1 = 10 Marks)

- The incorrect statement about the ionization energy is -
 - Ionization energy increases for each successive electron
 - Noble gases have the highest ionization energy
 - A big jump in ionization energy indicates a stable configuration
 - Ionization energy of oxygen is higher than that of nitrogen
- Among halogens, the correct order of amount of energy released in electron gain is -
 - $F > Cl > Br > I$
 - $F < Cl < Br < I$
 - $F < Cl > Br > I$
 - $F < Cl < Br < I$
- On-going from right to left in a period in the periodic table, the electronegativity of the elements
 - Increases
 - Decreases
 - Remains unchanged
 - Decreases first then increases
- Suggest in each of following pairs, which of the ions is harder.

(i) Zn(II) or Hg(II)	(ii) K(I) or Cu(I)	(iii) Fe(II) or Fe(III)
(a) Zn(II), K(I), Fe(III)	(b) Hg(II), Cu(I), Fe(II)	
(c) Zn(II), Cu(I), Fe(III)	(d) Hg(II), K(I), Fe(III)	
- An isolated box, equally partitioned, contains two ideal gasses A and B as shown. When the partition is removed, the gases mix. The changes in enthalpy (ΔH) and entropy (ΔS) in the process respectively are:
 

- | | |
|--------------------|--------------------|
| (a) Zero, positive | (b) Zero, negative |
| (c) Positive, zero | (d) Negative, zero |

- In a reaction, the change in entropy is given as 2.4 cal/K and the change in Gibbs free energy is given as 3.4 kcal, then the change in heat at the temperature of 20 °C is:
 - 4.1 cal
 - 3.4 cal
 - 3.4 Kcal
 - 4.1 Kcal
- Which of the following factors does not affect the electrode potential of an electrode?

(a) Nature of the electrode (metal)	(b) Temperature of the solution
(c) Molarity of the solution	(d) Size of the electrode
- Mercury covered by a layer of mercurous chloride in contact with saturated potassium chloride solution is a description of which of the following types of electrodes?

9. If an alloy of Au and Zn is immersed in HCl, which among the following will be feasible?
- (a) Chlorine (b) Potassium (c) Calomel (d) Silver/Silver chloride
 - (a) H₂ evolution (b) Zn dissolution
 - (c) Formation of nonporous Au (d) All of the above
10. When Pt and Co are electrically connected, which one gets corroded?
- (a) Pt (b) Co (c) None (d) Can't decide

Part - B (2 x 10 = 20 Marks)

11. a. Define Ionization energy, discuss factors affecting it and its variation across the period, down the group in the periodic table. (10 marks)

(OR)

- b. i. Calculate the change in the enthalpy of the following reaction if the heat of formations of H₂O_{2(aq)} and H₂O_(l) are -188 kJ/mol and -286 kJ/mol respectively. (4 Marks)
- $$\Delta H = \Delta G_P - \Delta G_T$$
- $$= [2(-286) + 0] - [2(-188)]$$
- $$2\text{H}_2\text{O}_{2(l)} \rightarrow 2\text{H}_2\text{O}_{(l)} + \text{O}_2(g)$$
- $$= -196 \text{ kJ/mole}$$
- ii. Derive expression for Helmholtz Free energy and give its significance. (6 marks)

12. a. i. For a Daniel Cell involving a cell reaction, $\text{Zn}_{(s)} + \text{Cu}^{2+}_{(aq)} \leftrightarrow \text{Zn}^{2+}_{(aq)} + \text{Cu}_{(s)}$. The standard free energy of formation of Zn_(s), Cu_(s), Cu²⁺_(aq), Zn²⁺_(aq) are 0, 0, 64.4 kJ/mol and -154 kJ/mol respectively. Calculate the standard EMF of the cell. (6 Marks)
- $$\Delta G = \Delta G_P - \Delta G_T$$
- $$= (-154 + 0) - (0 + 64.4)$$
- $$= -218.4$$
- ii. Define entropy and give its physical significance. (OR) (4 Marks)
- b. With a neat sketch of Pourbaix diagram for Iron system, explain redox and acid-base reactions. (10 Marks)

$$E^\circ = -\Delta G / nRT$$

$$= -1.13$$

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INTERNAL ASSESSMENT - II [CLAS1-T2]

SET 2

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

Date: 13/10/2023
Time: 12.30-1.30PM
Max. Marks: 30 marks

Part - A (10 x 1 = 10 Marks)

Answer ALL The Questions

1. The electron affinity of
a) Carbon is greater than oxygen b) Sulphur is less than oxygen c) Iodine is greater than bromine
d) Bromine is less than chlorine
2. Ionization potential is lowest for
a) Halogens b) Inert gases c) Alkali metals d) Alkaline earth metals
3. Which among the following element has the largest atomic radii?
a) Na b) K c) Mg d) Be
4. Among the following, which one is the hard acid?
a) Li^+ b) Pt^{2+} c) Ag^+ d) Hg^{2+}
5. 110 joule of heat is added to a gaseous system, whose internal energy is 40J. Then the amount of external work done is
a) 150J b) 70J c) 110J d) 40J
6. A system which can exchange energy with the surroundings but not matter is called _____
a) A heterogeneous system b) An open system c) A closed system d) An isolated system
7. An example for path variable is
a) Density b) Internal energy c) Enthalpy d) Work
8. Entropy change depends on
a) Heat transfer b) Change of pressure c) Thermodynamic state d) Pressure.
9. Volatile oxidation corrosion product of a metal is
a) Fe_2O_3 b) MoO_3 c) Fe_3O_4 d) FeO
10. Thermos flask is an example for-----.
a) Isolated system b) Diathermic system c) Only closed system d) Only adiabatic system.

$\text{IE metal} < \text{IE non metal}$.

11. $\text{EA metal} < \text{EA non metal}$ Part - B (2 x 10 = 20 Marks)

i. Contrast Ionization energy and Electron affinity. How do these values vary for metals and non-metals? (6 marks)

ii. Give reasons for the following $\text{Mg}^{2+} < \text{Mg}$ and $\text{Cl}^- > \text{Cl}$ in size. (4 Marks) Size.

[Z for Mg - 12 and Cl - 17]

(OR)

$$K_{\text{eq}} = 2 \times 10^7$$

$$\Delta G^\circ = -2.303 RT \log K_{\text{eq}}$$

b. i. The equilibrium constant at 25°C for the given process is 2×10^7 .
 $\text{Co}^{3+}(\text{aq}) + 6\text{NH}_3(\text{aq}) \leftrightarrow [\text{Co}(\text{NH}_3)_6]^{3+}(\text{aq})$

Calculate the value of ΔG° at 25°C ($R=8.314 \text{ J/K/mol}$). Predict the feasibility of the reaction. (6 Marks)

b. ii. Explain Pilling-Bedworth rule. (4 Marks)

With a neat sketch of Pourbaix diagram for Iron system, explain the following: [10 Marks]

A. Immunity zone.

B. Passivity Zone

C. Lines that are both pH and Potential dependent

(OR)

b. i. Given the reaction of diamond converting to graphite. (6 Marks)

$2\text{C}_{(\text{diamond})} \rightarrow 2\text{C}_{(\text{graphite})}$

A. Determine ΔG at 298 K and determine if this reaction is spontaneous or not.

B. What does ΔG say about the rate of this reaction? Spontaneous.

$$\Delta G^\circ = \Delta H^\circ - T\Delta S$$

$$\Delta H^\circ = H_p - H_2$$

$$= -2 \times 19 = -3.8$$

$$\Delta S^\circ = 2(5.74) - 2(2.386)$$

$$= 6.72 \text{ J/mol}\cdot\text{K}$$

$$\Delta H^\circ_{\text{C(diamond)}} = 1.9 \text{ kJ/mol}$$

$$\Delta S^\circ_{\text{C(diamond)}} = 2.386 \text{ J/(mol}\cdot\text{K)}$$

$$\Delta H^\circ_{\text{C(graphite)}} = 5.74 \text{ kJ/mol}$$

$$\Delta S^\circ_{\text{C(graphite)}} = 5.74 \text{ J/(mol}\cdot\text{K)}$$

$$= 6.72 \text{ J/mol}\cdot\text{K}$$

$$\Delta G^\circ = -3.8 \times 10^3 -$$

$$298(6.72)$$

$$= -551 \text{ kJ}$$

ii. From the given reactions, determine whether the ΔS increases or decreases or stays the same at 25°C : (2 Marks)

A. $\text{H}_2\text{SO}_4(\text{l}) \rightarrow \text{H}_2\text{SO}_4(\text{s})$ (1 atm) — decreases. (phase change).

B. $\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l})$ — decreases. (no of gas phase decrease)

iii. Predict the change in internal energy for an isolated system at constant volume. (2 Marks)

There is no energy transfer to work,

$$\Delta E = q + w = 0 + 0 = 0.$$

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INTERNAL ASSESSMENT - II [CLA1-T2]

SET I

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

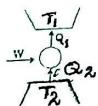
Date: 13/10/2023
Time: 12.30-1.30PM
Max. Marks: 30 marks

Part - A (10 x 1 = 10 Marks)

Answer ALL The Questions

1. Which of the following reaction will need maximum amount of energy?
a) $\text{Na} \rightarrow \text{Na}^+ + \text{e}^-$ b) $\text{Ca} \rightarrow \text{Ca}^{++} + \text{e}^-$ c) $\text{K} \rightarrow \text{K}^{++} + \text{e}^-$ d) $\text{C} \rightarrow \text{C}^{++} + \text{e}^-$
2. Which of the following cation has the smallest radius?
a) Na^+ b) Li^+ c) Be^{2+} d) K^+
3. When an electron is added in the valence shell, then
a) Energy is absorbed b) Energy is released c) Energy remains the same d) Force of attraction increases
4. Species having strong tendency to accept electrons and form ionic bond with base are called --
a) Hard acid b) Hard base c) Soft acid d) Soft base
5. In a reversible process, the system absorbs 600KJ heat and performs 250KJ work on the surroundings. What is the increase in the internal energy of the system?
a) 850KJ b) 600KJ c) 350KJ d) 250KJ
6. Which thermodynamic function relates both enthalpy and entropy?
a) Helmholtz free energy b) Internal energy c) Work function d) Gibbs free energy
7. A system that would not allow exchange of heat between the system and surroundings through its boundary is considered as
a) Adiabatic b) Isochoric c) Isothermal d) Isobaric
8. Which of the following is an example of extensive property?
a) Mass b) Temperature c) Density d) Pressure.
9. Which of the following is not true about corrosion?
a) Corrosion is only restricted to metallic materials b) Corrosion is chemical and electro chemical in nature c) Material selection is essential in corrosion prevention d) Environmental factors have a considerable influence on corrosion.

10. Consider a heat engine as shown on the figure. Q_1 is heat added to heat bath T_1 and Q_2 is the heat taken from T_2 in one cycle of the engine respectively. W is the mechanical work done on the engine. If $W > 0$, then possibilities are:



CSIR

- I. $Q_1 > Q_2 > 0$ II. $Q_2 > Q_1 > 0$ III. $Q_2 < Q_1 < 0$ IV. $Q_1 < 0, Q_2 > 0$

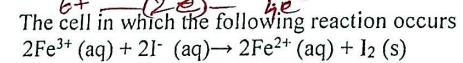
- a. only I b. only IV c. both I and II d. both I and III

Part - B (2 x 10 = 20 Marks)

11. a. What are atomic radii? Give its variation along the period and down the group taking examples. Arrange the following in the increasing order of atomic radii and give reasons: N, S, P and O. (Z for N-7, S - 16, P - 15 and O- 8) (OR)

$$\begin{array}{c} \text{S} \\ \text{P} \\ \text{O} \\ \text{N} \\ \text{P} < \text{S} \\ \text{N} < \text{O} \end{array}$$

- Derive Nernst equation and give its applications. 8+2



- $E^\circ_{\text{cell}} = 0.236 \text{ V}$ at 298K. Calculate the standard free energy and equilibrium constant of the reaction. (Given F= 96485 C/mol)

- Differentiate between Dry and Wet corrosion.

(OR)

- b. i. Define thermodynamic state variables. What are the different types of state variables? A boy jogs along a beach and he does $4.3 \times 10^5 \text{ J}$ of work and give off $3.8 \times 10^5 \text{ J}$ of heat. What is the change in his internal energy?

boy - System $\Delta E = q - w$

$$= (-3.8 \times 10^5) - (4.3 \times 10^5)$$

$$= -8.1 \times 10^5 \text{ J}$$

Program: B.T
Course Code:
Year & Sem:

1. c) K^+
2. c) Be^2+
3. b) En^+
4. a) Ha
5. c) 35
6. d) G
7. a) A
8. a)
9. a)
10. c)

11
At
a

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Internal Assessment - II

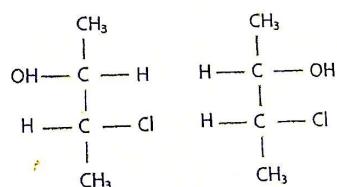
Program: B.Tech
Course Code & Title: 21CYB101J/Chemistry
Year & Sem: I/II

Date: 29-03-2023
Time: 12.30-1.30 pm
Max. Marks: 30 Marks

Answer ALL the MCQs Part-A (10*1=10 Marks)

1. Mixture of ice and water form a
a) Closed system b) Open system c) Isolated system d) Heterogenous system
2. Which of the following is not an intensive property?
a) Pressure b) Temperature c) Density d) Heat
3. The enthalpy change of a system is the heat supplied at
a) Constant P b) Constant T c) Constant V d) Constant S
4. Calculate the internal energy change for a system that absorbs 25KJ of heat and does 15KJ of work.
a) 40 b) 10 c) 30 d) 5
5. Which of the following is the correct criteria for a spontaneous process?
a) ΔS system - ΔS surroundings b) ΔS surroundings > 0 only c) ΔS system + ΔS surroundings > 0 d) ΔS system > 0 only
6. Ammonia molecule has ----- rotation axis of symmetry.
a) C_2 b) C_3 c) C_4 d) No symmetry

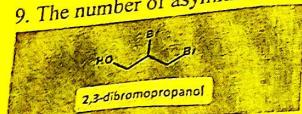
7. Identify the pair given below and choose the correct answer:



- a) d,l isomers b) diastereomers c) geometrical isomers. d) mesomers.

8. Select the correct statement from the following option.
- a) Enantiomer rotate plane of polarised light in opposite direction and to different extent
 - b) Enantiomer rotate plane of polarised light in same direction but to different extent
 - c) Enantiomer rotate plane of polarised light in same direction and to same extent
 - d) Enantiomer rotate plane of polarised light in opposite direction but to same extent

9. The number of asymmetric carbon atoms present below the structure is



- a) 1 b) 2 c) 3 d) 4

10. Identify the chiral molecule among the following.

- a) Isopropyl alcohol b) 2-pentanol c) 1-bromo-3-butane d) Isobutyl alcohol

Part-B (2x 10= 20 Marks)

11. a) Explain how Nernst equation is applied in determining the potential of redox and acid-base reactions
 (OR)

1. WI

a)

b) i) Comment on the statement "the entropy of the universe is increasing."

2. In

a)

ii) Construct an Electrochemical cell and give its representations.

(5marks)

a)

12. a) i) Convert the following Newmann projection formula into Fischer projection.

(4marks)

b)

c)

d)

e)

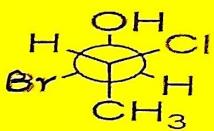
f)

g)

h)

i)

j)



ii) Give an account of Hydrogen evolution type of wet corrosion

(6marks)

5.

(OR)

ir

c)

b)

a)

d)

e)

f)

g)

h)

i)

j)

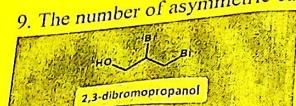
b) Explain the following with examples:

(10 marks)

€

- i. Metamerism ii. Geometrical isomerism iii. Enantiomers
 iv. Staggered Conformation

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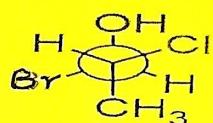
11. a) Explain how Nernst equation is applied in determining the potential of redox and acid-base reactions (10 marks)

(OR)

- b) i) Comment on the statement "the entropy of the universe is increasing." (5 marks)
ii) Construct an Electrochemical cell and give its representations. (5marks)

12. a) i) Convert the following Newmann projection formula into Fischer projection.

(4marks)



ii) Give an account of Hydrogen evolution type of wet corrosion (6marks)
(OR)

b) Explain the following with examples:

- i. Metamerism ii. Geometrical isomerism iii. Enantiomers
iv. Staggered Conformation

(10 marks)

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Kattankulathur - 603203**SET 2****Internal Assessment - II****Program: B.Tech****Course Code & Title: 21CYB101J/Chemistry****Year & Sem: I/II****Date: 29-03-2023**
Time: 12.30-1.30 pm
Max. Marks: 30 Marks**Answer ALL the MCQs Part-A (10*1=10 Marks)**

1. Which of the following is not a state function
a) ΔG b) ΔE c) W d) H
2. Internal energy does not include
a) Nuclear energy b) Vibrational energy c) Rotational energy d) Energy of gravitational pull
3. Gibbs energy change ΔG is related to equilibrium constant K as:
a) $\Delta G^\circ = -RT \ln K$ b) $\Delta G^\circ = RT \ln K$ c) $\ln K = -RT/\Delta G^\circ$ d) $\ln K = \Delta G^\circ/RT$
4. The conductivity of electrolytic conductors is due to _____
a) Flow of free mobile electrons b) Movement of ions c) Either movement of electrons or ions d) Cannot be said
5. The process of deterioration of a metal due to unwanted chemical or electrochemical interaction of the metal with its environment is called _____
a) Electrolysis b) Electrodialysis c) Corrosion d) Deposition
6. Chemical used in salt bridge is
a) KOH b) KCl c) KNO_3 d) KBr
7. If a compound has 3 chiral carbons What is the number of optically active isomers?
a) 9 b) 3 c) 4 d) 8
8. The potential energy of n-butane is minimum for
a) Skew conformations b) Staggered conformations c) Eclipsed conformations d) Gauche
9. Optical isomerism is a type of _____
a) metamerism b) stereoisomerism c) geometrical isomerism d) tautomerism

10. A compound with the same molecular formula exists in two forms one is alcohol and the other is Ether, what type of isomerism does it show?
a) metamerism b) positional isomerism c) functional isomerism d) chain isomerism

(Q)

Part-B (2x 10= 20 Marks)

11. a. Derive Gibbs-Helmholtz and write its applications.

b + h

(OR)

- b. Draw a neat sketch of Pourbaix diagram and explain the zone and lines.

12. a) Explain the various conformations of n-butane in detail.

(OR)

- b) Explain the elements of symmetry with suitable examples.

(Q)



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

Date: 27-03-2023
 Time: 8.00-9.00am
 Max. Marks: 30 Marks

Progr
Cours
Year

Answer ALL the MCQs Part-A (10*1=10 Marks)

1. Gibbs function G is given by
 - a) H-TS
 - b) U+PV
 - c) E+PV
 - d) U-TS
2. In a reversible process, entropy of the system
 - a) Increases
 - b) Decreases
 - c) Zero
 - d) Remains constant
3. What is meant by corrosion?
 - a) Chemical reaction between anode, cathode and electrolyte, which leads to loss of metal
 - b) Deterioration of metals due to reaction with its environment
 - c) Both a. and b.
 - d) None of the above
4. The process of transmitting electric current through an electrolyte solution is known as
 - a) Electrolyte
 - b) Electrode
 - c) Electrolysis
 - d) Electrochemical cell
5. The name of the equation showing relation between electrode potential standard potential (E°) and concentration of ions in solution is
 - a) Kohlrausch equation
 - b) Nernst equation
 - c) Faraday's equation
 - d) Ohm's equation
6. If our eyes travel in clockwise direction from the ligand of highest priority to the ligand of lowest priority, the configuration is
 - a) R-Configuration
 - b) S-Configuration
 - c) E-Configuration
 - d) C-Configuration

bef

7. Identify the chiral molecule among the following

- a) 1-butanol
- b) 2-pentanol
- c) 1-bromo 3-butene
- d) Isobutyl alcohol

8. 2-Chloro propane and 1-Chloro propane exhibit....Isomerism

- a) Chain
- b) Position
- c) Ionization
- d) Linkage

9. The potential energy of n-butane is minimum for

- a) Skew conformation
- b) Staggered conformation
- c) Eclipsed conformation
- d) Gauche

10. Chiral molecules which are non-super-imposable mirror images of each other are called

- a) Diastereomers
- b) Meso compounds
- c) Metamers
- d) Enantiomers

Part-B (2x 10= 20 Marks)

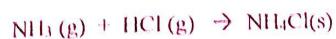
11(a) (i) Define the terms

(6Marks)

1. Entropy
2. Enthalpy
3. Internal energy

(ii) Calculate ΔG° for the following reaction at 25 °C. Will the reaction occur spontaneously?

(4Marks)



$$\Delta H = -176.0 \text{ kJ}$$

$$\Delta S = -284 \text{ J/K}$$

$$\begin{aligned}\Delta G^\circ &= \Delta H - T\Delta S \\ &= -176.0 - (298)(-284) \\ &= -176.0 + 84.3 \\ &= -91.7 \text{ kJ}\end{aligned}$$

(OR) (10 Marks)

(b) With a neat sketch explain Pourbaix diagram for Iron.

12. (a) Explain CIP priority rules to determine R/S Configuration on a chiral center taking an example

(OR)

(5Marks)

- (b) i. Write a note on Optical isomerism
- ii. Differentiate between Enantiomers and Diasteromers.

(5Marks)

Part-B (2x 10= 20 Marks)

11. (a) i Define the terms

1. Entropy-Definition

Ans: Entropy is defined as a measure of randomness or disorder of a system

(6 Marks)
[3 x 2=6 Marks]

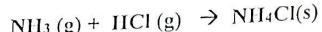
2. Enthalpy-Definition

Ans: Enthalpy is the measurement of energy in a thermodynamic system. The quantity of enthalpy equals to the total content of heat of a system, equivalent to the system's internal energy plus the product of volume and pressure

3. Internal energy-Definition

Ans: An energy form inherent in every system is the internal energy, which arises from the molecular state of motion of matter. The symbol U is used for the internal energy and the unit of measurement is the joules (J).
(ii) Calculate ΔG for the following reaction at 25 °C. Will the reaction occur spontaneously?

(4 Marks)



$$\Delta H = -176.0 \text{ kJ}$$

$$\Delta S = -284 \text{ J/K}$$

Ans: Convert $\Delta S = \text{kJ/K}$ (OR) ΔH into J, Temperature into Kelvin

The definition of Gibbs energy can then be used directly

$$\Delta G = \Delta H - T\Delta S$$

$$\Delta G = -176.0 \text{ kJ} - (298 \text{ K})(-0.284 \text{ kJ/K})$$

$$\Delta G = -176.0 \text{ kJ} - (-84.9 \text{ kJ})$$

$\Delta G = -91.1 \text{ kJ}$ Yes, this reaction is spontaneous at room temperature since ΔG is negative.
(OR)

(b) With a neat sketch explain Pourbaix diagram for Iron.

[8+2=10 marks]

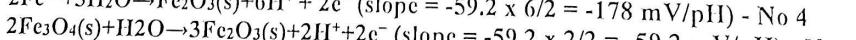
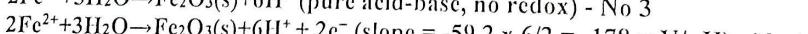
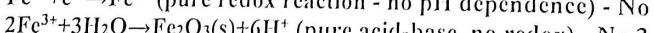
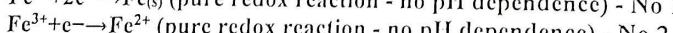
Explanation with diagram and equations.

Some important points are highlighted:

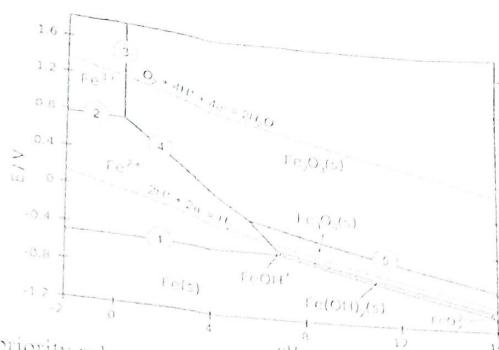
12. (a),
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- Pourbaix Diagrams plot electrochemical stability for different redox states of an element as a function of pH. As noted above, these diagrams are essentially phase diagrams that plot the map the conditions of potential and pH (most typically in aqueous solutions) where different redox species are stable.
- Areas in the Pourbaix diagram mark regions where a single species ($\text{Fe}^{2+}(\text{aq})$, $\text{Fe}_3\text{O}_4(\text{s})$, etc.) is stable. More stable species tend to occupy larger areas.
- Lines mark places where two species exist in equilibrium.
- Pure redox reactions are horizontal lines - these reactions are not pH-dependent
- Pure acid-base reactions are vertical lines - these do not depend on potential
- Reactions that are both acid-base and redox have a slope of $-0.0592 \text{ V/pH} \times (n\text{H}^+/\text{me})$

Examples of equilibria in the iron Pourbaix diagram (numbered on the plot):



example - Each 2
example. (6)



12. (a). Explain CIP priority rules to determine R/S Configuration on a chiral center taking an example [8+2=10 marks]

Rule 1

First, examine at the atoms directly attached to the stereocenter of the compound. A lower atomic number takes precedence over a substituent with a higher atomic number. Hydrogen is the lowest possible priority substituent, because it has the lowest atomic number.

- When dealing with isotopes, the atom with the higher atomic mass receives higher priority.
- When visualizing the molecule, the lowest priority substituent should always point away from the viewer (a dashed line indicates this). To understand how this works or looks, imagine that a clock and a pole. Attach the pole to the back of the clock, so that when looking at the face of the clock the pole points away from the viewer in the same way the lowest priority substituent should point away.
- Then, draw an arrow from the highest priority atom to the 2nd highest priority atom to the 3rd highest priority atom. Because the 4th highest priority atom is placed in the back, the arrow should appear like it is going across the face of a clock. If it is going clockwise, then it is an R-enantiomer; If it is going counterclockwise, it is an S-enantiomer.

Rule 2

If there are two substituents with equal rank, proceed along the two substituent chains until there is a point of difference. First, determine which of the chains has the first connection to an atom with the highest priority (the highest atomic number). That chain has the higher priority.

If the chains are similar, proceed down the chain, until a point of difference.

Rule 3

If a chain is connected to the same kind of atom twice or three times, check to see if the atom it is connected to has a greater atomic number than any of the atoms that the competing chain is connected to.

- If none of the atoms connected to the competing chain(s) at the same point has a greater atomic number; the chain bonded to the same atom multiple times has the greater priority

SET I



SET 2

SRM Institute of Science and Technology
College of Engineering and Technology
Department Of Chemistry
SRM Nagar, Kattankulathur - 603203

Internal Assessment - II

Program: B.Tech

Course Code & Title: 21CYB101J/Chemistry

Year & Sem: I/II

Date: 27-03-2023

Time: 8.00-9.00am

Max. Marks: 30 Marks

Answer ALL the MCQs Part-A (10*1=10 Marks)

1. Which thermodynamic function accounts for enthalpy and entropy?
a) Helmholtz free energy
b) Internal Energy
c) Gibbs free energy
d) Heat of formation
2. Based on 1 law of thermodynamics, which one of the following is correct?
a) $\Delta E = q - w$
b) $\Delta E = -w$
c) $\Delta E = q + w$
d) $\Delta E = -q$
3. The enthalpy change in a reaction does not depend upon
a) The rate of the reactants and products
b) The intermediate steps in the reaction
c) The nature of the reactants and products
d) The initial enthalpy of the reaction
4. What is the change in entropy (in J/K/mol) when 1 mole of ice is converted into water at 0°C ($q = 8 \text{ kJ/mol}$)
a) 20.13
b) 21.90
c) 2.130
d) 29.30
5. Which of the following is an incorrect statement?
a) Corrosion is an irreversible process
b) Corrosion is a non-spontaneous process
c) Corrosion is a degradation process
d) Corrosion is a spontaneous process
6. Which of the following compound would show optical isomerism?
a) $\text{CH}_3 - \text{CH}(\text{OH}) \text{ COOH}$
b) $\text{H}_2\text{N CH(CH}_3)_2$
c) $(\text{CH}_3)_2 \text{ CHCHO}$
d) $\text{H}_2\text{N CH}_2 \text{ COOH}$
7. The relative instability of any of the eclipsed conformations is due to
a) Lateral strain
b) Shear strain

- a. Complicated reaction
 b. Tenuous bonds
 c. A series of symmetrical structures will be
 d. Generally active
 e. Relatively inactive
 f. Reactivities
 g. Reactivities
 h. According to ESR the increasing order of reactivities is
 a. $\text{CH}_3 > \text{C}_2\text{H}_5 > \text{CH}_2\text{Cl}_2 > \text{C}_2\text{H}_4$
 b. $\text{CH}_3 > \text{C}_2\text{H}_5 > \text{CH}_2 = \text{CH}_2$
 c. $\text{CH}_3 > \text{CH}_2\text{Cl}_2 > \text{C}_2\text{H}_5 > \text{CH}_2 = \text{CH}_2$
 d. $\text{C}_2\text{H}_5 > \text{CH}_2\text{Cl}_2 > \text{CH}_3 > \text{CH}_2 = \text{CH}_2$
 i. None of the following compound will form radical intermediate
 a. Benzene
 b. Cyclopropane
 c. Cyclohexadiene
 d. Ethane

Part B | Q No. 20 Marks

- II. a. Define Intramolecular and write its applications
 CR.

- b. Find out the following reaction a substitution or not.



$$\Delta H = -174 \text{ kJ/mol} \quad \Delta S = -154 \text{ J/K}$$

b. Distinction between α - and ω - carbanion

- III. a. Carry out conformational analysis of α -acetoin with a new method and illustrate the stability of the structure with potential energy diagram

CR.

- b. i. Write a note on i. d. isomers and alternating and of symmetry with examples

- ii. Mention the type of isomerism exhibited by the following pairs

a) 2-methyl pentane & 2,2-dimethyl butane

b) Propane & Propenal \rightarrow $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$

c) Dicarla acid & L-carla acid \rightarrow $\text{CH}_3\text{CH}_2\text{COOH}$

d) Dipropyl amine & Butyl ethyl amine \rightarrow $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_2$

DR.

Example 10
Part B

Example 11
Part B

INTERNAL ASSESSMENT - II

Program: B.Tech
Course Code & Title: 21CYB101J & Chemistry
Year & Sem: 1 Year & 1 Sem

Date: 16/11/2022
Duration: 12:30 - 1:30 PM
Max. Marks: 30

Part - A (10 x 1 = 10 Marks)

Answer all the questions

- 1 Helmholz free energy A is expressed as
a) $A=U+TS$ b) $A=H+TS$
c) $A=U-TS$ d) $A=H-TS$
- 2 The following are state functions except
a) enthalpy b) heat
c) internal energy d) entropy
- 3 Which molecule has zero standard molar enthalpy of formation at 298 K
a) $\text{Cl}_2(\text{g})$ b) $\text{H}_2\text{O}(\text{l})$
c) $\text{Br}_2(\text{g})$ d) $\text{CH}_4(\text{g})$
- 4 If the enthalpy change for a reaction is zero, ΔG° is equal to
a) $T\Delta S^\circ$ b) $-T\Delta S^\circ$
c) $-\Delta H^\circ$ d) $\ln K_{\text{eq}}$
- 5 A process is carried out at constant volume and at constant entropy. It will be spontaneous if:
a) $\Delta H < 0$ b) $\Delta U < 0$
c) $\Delta A < 0$ d) $\Delta G < 0$
- 6 The standard electrode potentials (E°) for $\text{Fe}^{3+}/\text{Fe}^{2+}$ and Fe^{2+}/Fe electrodes are + 0.77 V and - 0.44 V respectively at 300 K. The E° of Fe^{3+}/Fe electrode at the same temperature is
a) - 0.11 V b) 1.21 V
c) 0.33 V d) - 0.04 V
- 7 Corrosion of metals involves
a) Physical reaction b) Chemical reaction
c) Physical and Chemical reaction d) biochemical reaction
- 8 The cell potential for a Zn/Cu cell when $[\text{Zn}^{2+}] = 1 \text{ M}$ and $[\text{Cu}^{2+}] = 1 \text{ M}$ at 25°C , where for $\text{Cu}^{2+}(\text{aq}) + 2e^- \rightarrow \text{Cu}(\text{s})$, $E^\circ = + 0.34 \text{ V}$ and $\text{Zn}(\text{s}) \rightarrow \text{Zn}^{2+}(\text{aq}) + 2e^-$, $E^\circ = - 0.76 \text{ V}$.
a) 1.07 V b) 2.14 V
c) 1.10 V d) 2.20 V

- Ques.**
- Anhydrous magnesium liquid metal surface in absence of moisture undergoes
 - Wet corrosion
 - Dry corrosion
 - Galvanic corrosion
 - Pitting corrosion
 - Chloropropane and 1-chloropropane exhibit
 - chain
 - position
 - functional
 - metamerism

Part - B ($2 \times 10 = 20$ Marks)

- Derive Nernst equation and give its application in acid base and redox reactions. (10 Marks)
- a. Calculate the enthalpy change for methane combustion. (5 Marks)
 ΔH°_f values for $\text{CH}_4(g) = 75$, $\text{O}_2(g) = 0$, $\text{H}_2\text{O}(l) = 286$, $\text{CO}_2(g) = -394 \text{ kJ mol}^{-1}$ respectively
 b. Define enthalpy and internal energy and its relation. (5 Marks)
- a. With a neat sketch explain Pourbaix diagram for iron (10 Marks)
- b. Write a note on stereo and structural isomerism by taking suitable examples. (10 Marks)

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SRM

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

Set-I

INTERNAL ASSESSMENT - II

Program: B.Tech
Course Code & Title: 2ICYB101J & Chemistry
Year & Sem: I Year & I Sem

Date: 16/11/2022
Duration: 12:30 - 1:30 PM
Max. Marks: 30

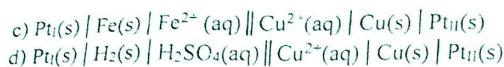
Answer all the questions

Part - A (10 x 1 = 10 Marks)

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- 1 In a reversible process, entropy of the system
a) increases b) decreases
c) zero d) remains constant
- 2 The name of the equation showing relation between electrode potential standard potential (E°) and concentration of ions in solution is
a) Kohlrausch equation b) Nernst equation
c) Faradays equation d) Ohm's equation
- 3 Which of the following statement is incorrect?
a) At constant pressure, $\Delta H = \Delta E + P\Delta V$ b) thermodynamic symbol for entropy is S.
c) Gibbs free energy is a state function. d) For an endothermic process, ΔH is negative.
- 4 All of the following have a standard heat of formation value of zero at 25 °C and 1.0 atmosphere except:
a) N₂(g) b) Fe(s)
c) Ne(g) d) H₂(g)
- 5 Passivity is due to
a) Higher EMF b) Lower EMF
c) Oxide film d) Carbon film
- 6 How many aromatic isomers of dibromobenzene exist?
a) 2 b) 3
c) 4 d) 6
- 7 For the reduction of silver ions with copper metal the standard cell potential was found to be +0.46 V at 25° C. The value of standard Gibbs energy, ΔG° will be ($F = 96500 \text{ C mol}^{-1}$) -----.
a) -44.5 kJ b) -98.0 kJ
c) -89.0 kJ d) -89.0 J
- 8 The Daniel Cell is:
a) Pt_I(s) | Zn(s) | Zn²⁺(aq) || Cu²⁺(aq) | Cu(s) | Pt_{II}(s)
b) Pt_I(s) | Zn(s) | Zn²⁺(aq) || Ag⁺(aq) | Ag(s) | Pt_{II}(s)



- 9 In Pourbaix diagram the redox reaction, $\text{Fe}^{2+} + 2e^- \rightarrow \text{Fe}_{(\text{s})}$ is
a) pH dependent b) pH independent
c) solvent dependent d) solvent independent
- 10 For a potentiometric titration, in the curve of EMF (E) vs. volume (V) of the titrant added, the equivalence point is indicated by
a) $|dE/dV| = 0, |d^2E/dV^2| = 0$
b) $|dE/dV| > 0, |d^2E/dV^2| = 0$
c) $|dE/dV| = 0, |d^2E/dV^2| > 0$
d) $|dE/dV| > 0, |d^2E/dV^2| > 0$

Answer all
1 In
c)

Part - B (2 x 10 = 20 Marks)

2 T
3

11. a. Derive Gibbs-Helmholtz equation and give its importance. (10 Marks)
(OR)
- b. Explain the mechanism involved in dry and chemical corrosion. (10 Marks)
12. a. i. Calculate the entropy change for methane combustion. (5 Marks)
From the Thermodynamic Data, the Standard entropies of the substances involved in the above reaction are: $\Delta S^\circ(\text{J/K. mol})$ of $\text{CH}_4(\text{g}) = 186$, $\text{O}_2(\text{g}) = 205$, $\text{CO}_2(\text{g}) = 214$ and $\text{H}_2\text{O}(\text{l}) = 70$ $\Delta S^\circ = -242.3 \text{ J/K.}$ (5 Marks)
- ii. Write a short note on Galvanic cell with diagram (5 Marks)
(OR)
- b. Discuss about different structural isomers with examples. (10 Marks)

4
5
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7

11. 3. *Posterior* gluteal muscle and bone of sacrum. (D) Section posterior to the sacrum. A section taken through the gluteal muscle and sacrum. In section

- 52
- ✓ 1. Explain the construction methods & site specific characteristics of dams, distinguishing the relevant categories - i) concrete
circular and arch dams - 2 marks
ii) Gravity dams or gravity type dams - 2 marks
iii) earth and rockfill dams during construction (Ex. Infill, Blanket - 2 marks)
- Q. 2. Explain the stages of design for hydroelectric powerplants - 5 marks
Ans. for hydroelectric dams, the typical stages of the process may include:
i) Feasibility studies and economic analysis of Dam - 2 marks
ii) Detailed design - 3 marks
- $\Sigma 2 + 2 + 3 = 7$
- TOTAL - 7 marks
- Business Planing of hydropower
 Q. 3. Explain the various types of turbines used in hydropower - 5 marks
 i) Pelton wheel - 2 marks
 ii) Francis turbine - 2 marks
 iii) Kaplan turbine - 1 mark
 iv) Pumped storage turbines - 1 mark
- 53.
- Q. 1. Define different types of dams with examples - 10 marks
 Dams will be classified by their function. Diversion, Irrigation, Flood control and Water storage with explanation - 4 x 2.5 = 10 marks
 Dams will be classified by materials - 1 x 2.5 = 2.5 marks
- TOTAL - 10 marks

INTERNAL ASSESSMENT – II

Program: B.Tech

Course Code & Title: 21CYB101J & Chemistry
Year & Sem: I Year & I Sem

Date: 16/11/2022

Duration: 12:30 – 1:30 PM
Max. Marks: 30

Part – A (10 x 1 = 10 Marks)

Answer all the questions

- 1 Helmholz free energy A is expressed as
c) $A=U-TS$
- 2 The following are state functions except
b) heat
- 3 Which molecule has zero standard molar enthalpy of formation at 298 K
a) $\text{Cl}_2(\text{g})$
- 4 If the enthalpy change for a reaction is zero, ΔG° is equal to
b) $-T\Delta S^\circ$
- 5 A process is carried out at constant volume and at constant entropy. It will be spontaneous if:
b) $\Delta U < 0$
- 6 The standard electrode potentials (E°) for $\text{Fe}^{3+}/\text{Fe}^{2+}$ and Fe^{2+}/Fe electrodes are + 0.77 V and - 0.44 V respectively at 300 K. The E° of Fe^{3+}/Fe electrode at the same temperature is
d) - 0.04 V
- 7 Corrosion of metals involves
b) Chemical reaction
- 8 The cell potential for a Zn/Cu cell when $[\text{Zn}^{2+}] = 10 \text{ M}$ and $[\text{Cu}^{2+}] = 1 \text{ M}$ at 25°C , where for $\text{Cu}^{2+}(\text{aq}) + 2\text{e}^- \rightarrow \text{Cu}(\text{s})$, $E^\circ = + 0.34 \text{ V}$ and $\text{Zn}(\text{s}) \rightarrow \text{Zn}^{2+}(\text{aq}) + 2\text{e}^- E^\circ = - 0.76 \text{ V}$.
a) 1.07 V
- 9 Anhydrous inorganic liquid metal surface in absence of moisture undergoes -----
b) Dry corrosion
- 10 2-chloropropane and 1-chloropropane exhibit ----- isomerism
b) position

Part – B (2 x 10 = 20 Marks)

11. a. i. Derive Nernst equation and give its application in acid-base and redox reactions.
(10 Marks)

Nernst equation derivation – 6 marks

Applications in acid base and redox reactions – 4 marks

$$E = E^\circ + \frac{RT}{nF} \ln \frac{[\text{Ox}]}{[\text{Red}]}$$

$$E = 0.059 \times \text{pH}$$

(OR)

- i. Calculate the enthalpy change for methane combustion. (5 Marks)
Given values for $\text{CH}_4(g) = 75$, $\text{CO}_2(g) = 1$, $\text{H}_2\text{O}(l) = 265$, $\text{CO}(g) = 104$ KJ/mol respectively



Enthalpy change of the reaction:

$\Delta H_{\text{reaction}} = [\text{Summation of } \Delta H^{\circ} \text{ of reactants} - \text{Summation of } \Delta H^{\circ} \text{ of products}] - 1 \text{ marks}$

$$\Delta H = [75 - (2 \times 104) - 265] = -291 \text{ KJ mol}^{-1} - 2 \text{ marks}$$

Units - 1 marks

- ii. Define enthalpy and internal energy and its relation. (5 Marks)

Definition of enthalpy and internal energy - $2 \times 2 = 4$ marks

$$\text{Relation } H = E + PV - 1 \text{ marks}$$

12. a. With a neat sketch explain Pourbaix diagram for Iron (10 Marks)

Salient features - 2 marks

Diagram - 3 marks



Redox reactions related to areas, vertical, horizontal and diagonal lines/explanation based on immunity, corrosion and passivity domains - 5 marks

Limitations (Optional)

(OR)

- b. Write a note on stereo and structural isomerism by taking suitable examples. (10 Marks)

Stereo isomers (geometrical and enantiomers) with explanation - 4 marks
Examples - 2 marks

Structural isomers types (any two) with examples - 4 marks



INTERNAL EXAMINATION-II

Program: B.Tech.

Course Code & Title: E103YH1013 & Chemistry
Year & Sem: I Year & I Sem

Date: 13.11.2023

Duration: 11.30-01.30 PM

Max. Marks: 30 Marks

Part A (10 x 1 = 10 Marks)

Answer ALL The Questions

1. Nernst equation for an electrode is based on the variation of electrode potential of an electrode with:
(a) temperature (b) concentration of electrolyte (c) both a and b (d) density of electrons
2. Which of the following condition is satisfied when the cell reaction in the electrochemical cell is spontaneous?
(a) $\Delta G^\circ < 0$ (b) $E^\circ_{cell} < 0$ (c) $E^\circ_{cell} = 0$ (d) $\Delta G^\circ > 0$
3. During an adiabatic expansion of 3 moles of a gas, the change in internal energy was found to be equal to +100 J. The work done during the process is equal to:
(a) 122 J (b) 100 J (c) -300 J (d) 300 J
4. Which of the following is correct for the net entropy change in an irreversible process?
(a) It is positive (b) It is negative (c) It is zero (d) All of the above
5. Which of the following option describes the limitations of Pourbaix diagrams?
(a) Rate of reaction is can't be predicted
(b) It neglects the impurities of working conditions
(c) Stability of metallic species is predicted
(d) Rate of reaction is not predicted and it neglects the impurities of working conditions
6. Anhydrous inorganic liquid metal surface in absence of moisture undergoes:
(a) Wet corrosion
(b) Dry corrosion
(c) Galvanic corrosion
(d) Pitting corrosion
7. Which of the following materials will undergo corrosion?
(a) Metals only
(b) Metals and Non-metals
(c) Metals, Non-metals, Ceramics and Plastics
(d) Metals, Non-metals, Ceramics, Plastics and Rubbers

8. In an isothermal process, the internal energy of gas molecules
 (a) Increases (b) decreases (c) remains constant (d) none of these
9. The isomerism which exists between CH_3CHCl_2 and $\text{CH}_2\text{ClCH}_2\text{Cl}$ is
 (a) Chain (b) Functional (c) Position (d) geometrical isomers
10. Which of the following is true about Fischer Projection?
 (a) The vertical lines are oriented away from you and the horizontal lines are oriented toward you.
 (b) The vertical lines are oriented towards you and the horizontal lines are oriented away from you.
 (c) Both the horizontal and vertical lines are oriented away from you.
 (d) Both the horizontal and vertical lines are oriented towards you.

Part- B (2 x 10 = 20 Marks)

11. a. i. What is an electrochemical cell? Explain with an example and neat diagram. Give cell notation and reactions involved for a given example. (10 Marks)

OR

- b. i. Calculate the standard free-energy change (ΔG°) at 25°C for the reaction
 $\text{H}_{2(g)} + \text{O}_{2(g)} \rightleftharpoons \text{H}_2\text{O}_{2(l)}$
 At 25°C , the standard enthalpy change (ΔH°) is -187.78 kJ/mol , and the absolute entropies of the products and reactants are:
 $S^\circ(\text{H}_2\text{O}_2) = 109.6 \text{ J/(mol.K)}$, $\Delta S = P - R = -226.3 \text{ J/K}$
 $S^\circ(\text{O}_2) = 205.2 \text{ J/(mol.K)}$, and $\Delta G = -187.78 - (298.15)(-226.3) = -120.31 \text{ kJ/mol}$

Is the reaction spontaneous as written? What does ΔG say about the rate of this reaction?

- ii. Compare and contrast wet and dry corrosion. (6 Marks)
 (4 Marks)

12. a. i. What is isomerism? How is it classified? Write a note on geometrical isomerism. (6 Marks)
 ii. Draw Sawhorse projections for the eclipsed and staggered conformations of ethane. Which of these conformations is more stable and why? (4 Marks)

OR

- b. i. Derive the expression and explain the significance of Helmholtz function. (6 Marks)
 ii. What are intensive and extensive properties? Give two examples of each. (4 Marks)



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

SET 1

INTERNAL ASSESSMENT - II

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

Date: 12-11-2022
Duration: 12 30-01.30 PM
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 (b) negative (c) constant (d) can be any of the above
2. Which of the following is an incorrect statement?
(a) Corrosion is an irreversible process
(b) Corrosion is a non-spontaneous process
(c) Corrosion is a degradation process
(d) Corrosion is a spontaneous process
3. Rusting of iron in acidic aqueous solution of electrolyte occurs with the evolution of gas.
(a) Nitrogen
(b) Chlorine
(c) Oxygen
 (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
(a) 39 J (b) 65 J (c) 54 J (d) 46 J
5. Which of the following is false regarding galvanic cells?
(a) It converts chemical energy into electrical energy
(b) The electrolytes taken in the two beakers are different
(c) The reactions taking place are non-spontaneous
 (d) To set up this cell, a salt bridge is used
6. ΔG for the reaction $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$ is
(a) -FE (b) FE (c) 2FE (d) -2FE
7. For which of the following conditions a reaction will be spontaneous at all the temperature?
 (a) $\Delta H < 0$ and $\Delta S < 0$
(b) $\Delta H < 0$ and $\Delta S = 0$
(c) $\Delta H < 0$ and $\Delta S > 0$

- (d) both (b) and (c)
8. Which of the following is the application of Pourbaix diagrams?
- Predicting the spontaneous direction of reactions
 - To reduce corrosion attack
 - To estimate the composition of corrosion product
 - All of the above
9. Which of the following statements is **not** correct?
- Fischer projection represents the molecule in an eclipsed conformation
 - Newman projection can be represented in eclipsed, staggered and skew conformations
 - Fischer projection of the molecule is its most stable conformation
 - In Sawhorse projections, the lines are inclined at an angle of 120° to each other
10. The compounds $C_2H_5OC_2H_5$ and $CH_3OCH_2CH_2CH_3$ are
- chain isomers
 - geometrical isomers
 - metamers
 - conformational isomers

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)

OR

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

$$2Fe^{3+}_{(aq)} + 2I^{-}_{(aq)} \rightarrow 2Fe^{2+}_{(aq)} + I_2_{(aq)}$$

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

$$\Delta G = -45.54 \text{ kJ/mole}$$

(6 Marks)

ii. Differentiate between Dry Corrosion and Wet corrosion

(4 Marks)

12. a. i. What is Gibb's free energy? Derive its expression.

ii. Define entropy and give its significance.

(6 Marks)

(4 Marks)

OR

b. i. Write a note on structural isomerism in organic compounds.

(6 Marks)

ii. Draw Newman projections for the eclipsed and staggered conformations of ethane. Which of these conformations is more stable and why?

(4 Marks)