CT-3 - paper

Chemistry (SRM Institute of Science and Technology)

SRM

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

Set-1

CLA – III

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

Date: 08.05.2023
Duration: 12.30 – 1.30 PM
Max. Marks: 30 Marks

Part – A (10 x 1 = 10 Marks)
Answer ALL the Questions

1. Markovnikov's law is applied in
   a) Addition of propylene with Cl_2
   b) Addition of propylene with HBr
   c) Addition of ethylene with Br_2
   d) Addition of ethylene with H_2

2. Which one of the following on reductio with Lithium Aluminium Hydride ($LiAlH_4$) yields a secondary amine?
   a) Methyl isocyanide
   b) Nitroethane
   c) Acetamide
   d) Methyl cyanide

3. Polydispersity index is defined as _____, where M_w and M_n are the weight average and number average molecular masses respectively.
   a) $M_w \times M_n$
   b) M_n/M_w
   c) $M_w - M_n$
   d) M_w/M_n

4. What is Teflon?
   a) $(CF_2)_n$
   b) $(C_2F)_n$
   c) $(C_2F_4)_n$
   d) $(C_4F_2)_n$

5. The characteristics of condensation polymerization are given below:
   I. only –C–C– linkages present in the polymer structure
   II. use of bifunctional or polyfunctional monomers
   III. elimination of a small by-product molecule

   Which of the following is true?
   a) I, II, III
   b) II and III
   c) I and III
   d) Only III

6. The non – metal used in the vulcanization of rubber is _____
   a) Phosphorous
   b) Graphite
   c) Silicon
   d) Sulphur

7. Which of the following statements is correct for ductile materials.
   a) Large deformation takes place between elastic limit and fracture point
   b) Have no proportional limit
   c) Break immediately after proportional limit
   d) Cannot be drawn into wires

8. The continuous phase of a composite material is known as its_____
   a) dispersed phase b) surrounding phase
   c) matrix phase d) fiber phase

9. In the hemispherical electron analyser of XPS, _____ is detected and plotted as a function of energy.
   a) Mass b) Charge
   c) Number of electrons striking the detector d) Mass to charge ratio

10. If (3 2 6) are the Miller Indices of a plane, the intercepts made by the plane on the three crystallographic axes are
   a) (a, b, c) b) (2a, 3b, c) c) (a, 2b, 3c) d) (2a, b, 3c)

Part – B (2 x 10 = 20 Marks)

11. a. i. Explain the mechanism of Nucleophilic Substitution reaction, S_N1 with an example. (6 Marks)
   ii. Write the preparation and uses of the medicinal drug, Paracetamol. (4 Marks)

(OR)

b. i. Discuss the different types of tacticity shown by the polymers with example. (6 Marks)
   ii. Write down the preparation, properties and uses of any one of the Polyamide fibres. (4 Marks)

12. a. i. Give the preparation, properties and uses of any one of the conducting polymers. (6 Marks)
   ii. Arrive the equation $\mathbf{n\lambda = 2dsin\theta}$ used to predict the structure of crystals. (4 Marks)

(OR)

b. Elaborate the stress – strain relationship of solids with a neat plot. (10 Marks)

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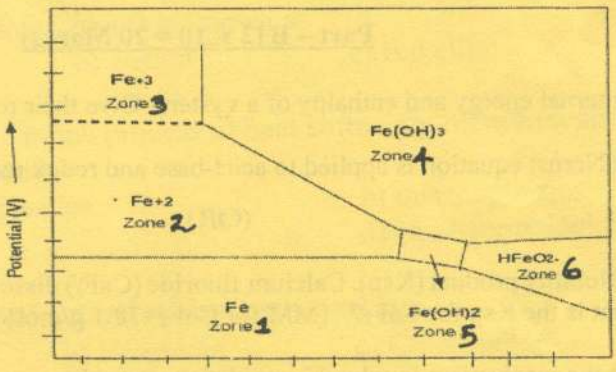
INTERNAL ASSESSMENT – II

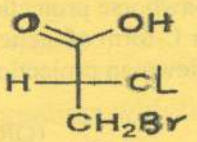
Program: B.Tech	Date: 27-03-2023
Course Code & Title: 21CYB101J & Chemistry	Time: 12.30 – 1.30 PM
Year & Sem: I Year & II Sem	Max. Marks: 30 marks

Part – A (10 x 1 = 10Marks)
Answer ALL The Questions

1. All the naturally occurring processes proceed spontaneously in a direction that leads to
   a. decrease of entropy b. increase of enthalpy c. an increase of free energy d. decrease of free energy
2. If spontaneity of a reaction is temperature dependent and endothermic, then
   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. $\Delta H>0$ and $\Delta S<0$.
3. The e.m.f and the standard e.m.f of a cell in the following reaction is 5 V and 5.06 V at room temperature, $Ni(s) + 2Ag^{+}_{(n)} \rightarrow Ni^{2+}(0.02M) + 2Ag_{(s)}$. What is the concentration of Ag^{+} ions?
   a) 0.0125 M b) 0.0314 M c) 0.0625 M d) 0.0174 M
4. Metals do not exist in nature in the form of-----
   a) Nitrates b) Sulphates c) Carbonates d) Oxides
5. Which of the following zone of the given Pourbaix diagram indicates the passive zone?



   a) Zone 1 and 2 b) Zone 2 and 3 c) Zone 2, 3 and 6 d) Zone 4 and 5
6. Assign R/S notation for the given compound:



   a) R b) S c) Neither R nor S d) R or S

7. Diastereomers are

   a) Geometrical isomers b) Mirror images c) Non-mirror images d) Unstable molecules

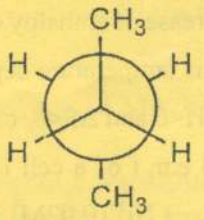
8. The water molecule exhibits .....rotation axis of symmetry.

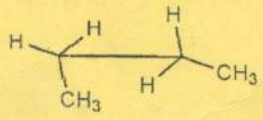
   a) C_3 b) C_2 c) C_4 d) C_n

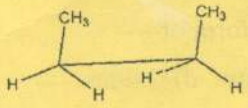
9. The potential energy of n-butane is maximum for _____

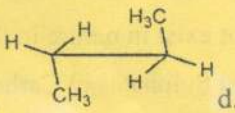
   a) Skew conformations b) Staggered conformations c) Eclipsed conformations d) Gauche

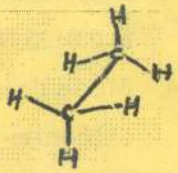
10. Which of the following sawhorse representations is correct for the given Newman projection?



a. 

b. 

c. 

d. 

Part – B (2 x 10 = 20 Marks)

11. a. i. Define internal energy and enthalpy of a system. Give their relation. (4 Marks)

    ii. How the Nernst equation is applied to acid-base and redox reactions. (6 Marks)

(OR)

b. i. Define solubility product (Ksp). Calcium fluoride (CaF_2) dissolves in water to the extent of 0.00170 g/100ml. What is the Ksp for CaF_2? [MM for CaF_2=78.1 g/mol] (4 Marks)

   ii. Explain the mechanism involved in oxidation corrosion. (6 Marks)

12. a. i. Give the differences between mesomers and racemic mixture. (4Marks)

    ii. Brief on the projections and sketch it for the following compounds. (6 Marks)
    A. Staggered form of Sawhorse projection for 2-butanol.
    B. Fisher projection for L-form of lactic acid.
    C. Staggered form of Newman projection for CH_3CH_3.

(OR)

b. Explicate structural isomerism exhibited by organic com pounds with suitable examples.

DEPARTMENT OF CHEMISTRY **Set-2**

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CLA – III

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

Date: 08.05.2023
Duration: 12.30 – 1.30 PM
Max. Marks: 30 Marks

Part – A (10 x 1 = 10 Marks)
Answer ALL the Questions

1. The rate of nucleophilic substitution reactions is higher in the presence of _____
   a) Electron withdrawing groups b) Electron releasing groups
   c) Both electron withdrawing and releasing groups d) Initiator

2. Oxidation of Ethene with cold alkaline $KMnO_4$ produces
   a) Formaldehyde b) CO_2 and H_2O
   c) Ethylene glycol d) Oxalic acid

3. Calculate the number average molecular mass of a polymer having four different monomers A, B, C and D present in equal number. The molecular masses of the monomers are 10000, 15000, 30000 and 50000 respectively.
   a) 10050 b) 17350 c) 26250 d) 35475

4. A polymer with amide linkage is known as
   a) Terylene b) Teflon c) Bakelite d) Nylon-6,6

5. For which plastics can the process of heat softening, moulding and cooling to rigidness be repeated?
   a) thermosetting plastics b) thermoplastics
   c) bakelite d) Urea-formaldehyde

6. The monomer unit of natural rubber (polymer) is
   a) Isoprene b) Neoprene c) Chloroprene d) Butadiene

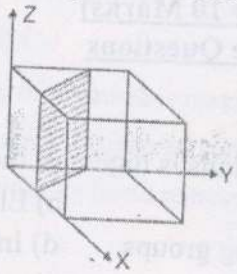
7. Which of the following statements is correct for brittle materials.
   a) It breaks soon after elastic limit is crossed
   b) It shows significant plastic deformation before breaking
   c) It is used to make wires
   d) Stress is never proportional to strain

8. Which of the following does not combine with fiber to give composites?
   a) Metals b) Ceramics
   c) Non-metals d) Polymers

9. Which of the following is the most commonly used detector in X-ray Photoelectron Spectroscopy?

a) Electron multiplier
b) Dynodes
c) Photovoltaic cell
d) Photomultiplier

10. Miller Indices for the plane shown in the below figure is



a) (1 2 0)
b) (2 1 0)
c) (2 2 0)
d) (0 0 2)

Part – B (2 x 10 = 20 Marks)

11. a. Write a short note on the following: (4+4+2 Marks)
    i. Dieckmann condensation
    ii. Oxidation of organic compounds by $KMnO_4$
    iii. Ring opening reactions of cyclopropane with H_2 and HBr

(OR)

b. Discuss the n and p – doping mechanism in conducting polymers. (10 Marks)

12. a. i. How crosslinked polymers and linear polymers differ? Give an example for each. (4 Marks)

    ii. Explain the principle of X-ray Photoelectron Spectroscopy and mention any two applications of it. (6 Marks)

(OR)

b. Brief about the particle reinforced and metal matrix composites with examples. (10 Marks)

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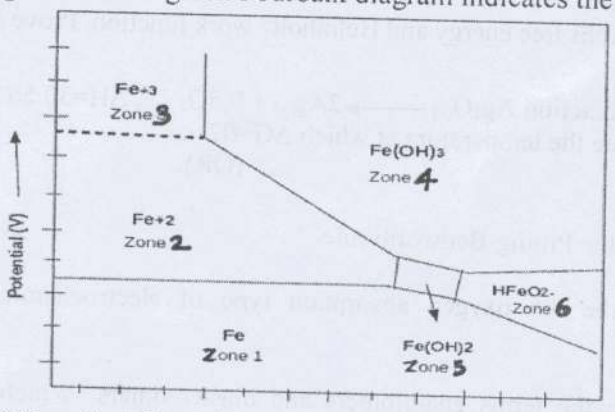
Max. Marks: 30 marks

Part – A (10 x 1 = 10Marks)
Answer ALL The Questions

1. Which of the following comes under wet corrosion?
a) Concentration cell corrosion b) Oxidation corrosion c) Liquid metal corrosion d) Corrosion by other gases
2. Which of the following zone in the given Pourbaix diagram indicates the immune zone?

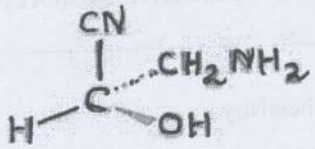


a) Zone 1 b) Zone 2 c) Zone 3 d) Zone 4
3. Calculate the Gibbs free energy for the reaction of conversion of ATP into ADP at 293 Kelvin the change in enthalpy is 19.07 kilocal and the change in entropy is 90 cal per Kelvin.
a) 7.3 Cal b) –5.3Kcal c) 7.3 Kcal d) –7.3Kcal
4. For a spontaneous process, the change in Gibbs function is equal to .....
a) the heat content of the system b) entropy change of the system c) work of expansion d) useful work
5. MoO_3 forms ..... type of layer in a dry atmosphere.
a) stable b) unstable c) volatile d) porous
6. Which of the following is NOT an example of a chiral object?

a)  b)  c)  d) 

7. When the compound n-butane is rotated to an angle of 240^0 then it forms------ conformation.
a. staggered b. fully eclipsed c. eclipsed form B d. Gauche

8. A center of symmetry is equivalent to _____ fold alternating axis of symmetry.
   a) One b) Two c) Three d) Four
9. Assign R/S notation for the following compound.



   a. R b. S c. Neither R nor S d. R or S
10. If our eyes travel in a counter-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) Z-Configuration

Part – B (2 x 10 = 20 Marks)

11. a. i. Define Gibbs free energy and Helmholtz work function. Prove $\Delta G = \Delta A + P\Delta V$. (6 Marks)

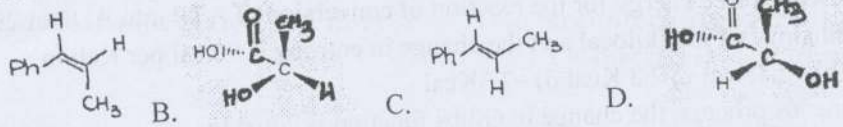
    ii. For the reaction $Ag_2O_{(s)} \longrightarrow 2Ag_{(s)} + 0.5O_{2\,(g)}$, $\Delta H = 30.56$ KJ/mol; $\Delta S = 6.66$ J/K/mol. Calculate the temperature at which $\Delta G = 0$? (4 Marks)

    (OR)

    b. i. Explain the Pilling-Bedworth rule. (4 Marks)

    ii. Describe the oxygen absorption type of electrochemical corrosion with a suitable mechanism. (6 Marks)

12. a. i. Explain the terms enantiomers and diastereomers. Which of the following the pair of compounds shown, best describes enantiomers, diastereomers? (6 Marks)



    ii. Write notes on Geometrical isomerism. (4 Marks)

    (OR)

    b. Explain the following with suitable examples.
    i. Plane of Symmetry ii. Axis of Symmetry iii. Tautomerism iv. Chain isomerism and v. Inversion Symmetry