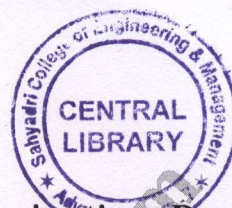


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First/Second Semester B.E. Degree Examination, Dec.2019/Jan.2020
Engineering Chemistry

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, choosing at least TWO from each part.

PART - A

- 1 a. Choose the correct answers for the following : (04 Marks)**
- In a concentration cell, the electrode kept in contact with a solution of lower concentration acts as
 A) Anode
 B) Cathode
 C) Both anode and cathode
 D) None of these
 - The standard reduction potentials of Zn and Fe are -0.76V and -0.44V respectively. The emf of the cell formed by combining the above two electrodes will be
 A) $+0.32\text{V}$
 B) -0.32V
 C) $+1.2\text{V}$
 D) -1.2V
 - Example of an ion-selective electrode is
 A) Calomel electrode
 B) Glass electrode
 C) Platinum electrode
 D) Ag-AgCl electrode
 - The potential of the standard Hydrogen electrode is taken as
 A) 1 Volt
 B) 0 Volt
 C) 10 Volt
 D) None of these
- b. Define Standard electrode potential. Derive Nernst equation for single electrode. (07 Marks)**
- c. Explain the construction and working of a glass electrode. (05 Marks)**
- d. An electrochemical cell consists of an iron electrode dipped in 0.1M FeSO_4 and Silver electrode dipped in 0.05M AgNO_3 solution. Write the cell representation, cell reactions and calculate the EMF of the cell at 298K . Given the standard reduction potentials of iron and silver electrode are -0.44V and $+0.8\text{V}$ respectively. (04 Marks)**
- 2 a. Choose the correct answers for the following : (04 Marks)**
- In which of the following, the net cell reaction is irreversible?
 A) Zn - MnO_2 battery
 B) Pb - H_2SO_4 battery
 C) Ni - MH battery
 D) Ni - Cd battery
 - The cathodic material of lead acid battery is
 A) Pb_3O_4
 B) PbO_2
 C) PbO
 D) Pb
 - The electrolyte used in Ni-MH battery is
 A) H_2SO_4
 B) NH_4Cl
 C) KOH
 D) ZnCl_2
 - The product of electrochemical reaction in $\text{H}_2 - \text{O}_2$ fuel cell is
 A) Methanol
 B) KOH
 C) H_2SO_4
 D) Water
- b. Explain the construction and working of Zn - air battery. (06 Marks)**
- c. Explain the following battery characteristics: (04 Marks)**
 (i) Capacity (ii) Cycle life
- d. Explain the construction and working of Methanol - O_2 fuel cell. (06 Marks)**
- 3 a. Choose the correct answers for the following : (04 Marks)**
- Caustic embrittlement is an example of
 A) Pitting corrosion
 B) Stress corrosion
 C) Galvanic corrosion
 D) None of these.



- ii) Insoluble corrosion product formed during corrosion process leads
A) The enhance further corrosion B) To prevent further corrosion
C) Has no effect on corrosion D) None of these
- iii) Galvanizing is a process of coating iron with
A) Tin B) Zinc C) Copper D) Nickel
- iv) Sacrificial anode method of protecting a metal is an example of
A) Anodic protection B) Cathodic protection
C) Metal coating D) Organic coating
- b. Write a short note on "Differential aeration corrosion". (06 Marks)
- c. Explain the effect of following factors on the rate of corrosion:
(i) anodic and cathodic areas (04 Marks)
(ii) pH (04 Marks)
- d. What is cathodic protection? Explain the 'Impressed current method' of cathodic protection. (06 Marks)
- 4 a. Choose the correct answers for the following : (04 Marks)
- i) For a electrolytic mixture containing Zn^{2+} , Cu^{2+} and Ag^+ , the ion which is going to be discharged first is
A) Zn^{2+} B) Cu^{2+} C) Ag^+ D) None of these
- ii) In electroplating of chromium the anode used is
A) Chromium B) Pb-Sb alloy C) Nickel D) Copper
- iii) Electroless plating process is possible only on
A) Activated surface B) Inactive surface C) Any surface D) None of these
- iv) Reducing agent used in electroless plating of copper is
A) Formaldehyde B) Sodium hypophosphite
C) EDTA D) Sodium succinate
- b. Explain the effect of following factors on nature of electrodeposit.
(i) Current density (ii) Throwing power (06 Marks)
- c. Explain electroplating of gold. (04 Marks)
- d. Explain electroless plating of copper. Mention its applications. (06 Marks)

PART - B

- 5 a. Choose the correct answers for the following : (04 Marks)
- i) Which of the following is not a secondary fuel?
A) Coal gas B) water gas C) Producer gas D) Natural gas
- ii) Reformation of petrol involves
A) Hydrogenation B) Oxidation C) Hydrocracking D) None of these
- iii) Gasohol is a blend of Gasoline with
A) Ethanol B) Methanol C) Propanol D) Butanol
- iv) An element used in solar cell construction is
A) Boron B) carbon C) Aluminium D) Silicon.
- b. Calculate gross and net calorific value of a coal sample from the following data:
Weight of coal sample = 0.98g Weight of water taken in calorimeter = 2600g
Water equivalent of calorimeter = 368g Latent heat of steam = 2454 J/g
Specific heat of water = 4.187 J/g/K Rise in temperature = 2.8 K
Percentage of hydrogen in coal sample = 5.8 (06 Marks)
- c. What is knocking? Explain its mechanism with chemical reactions. (06 Marks)
- d. Write a short note on 'Power Alcohol'. (04 Marks)



- 6 a. Choose the correct answers for the following : (04 Marks)
- The equation of condensed phase rule is
A) $F = C - P + 2$ B) $F = C - P + 3$
C) $F = C - P + 1$ D) None of these
 - In a single component system, if degrees of freedom are zero, maximum number of phases that can coexist is
A) 0 B) 1 C) 2 D) 3
 - In potentiometric measurements, platinum electrode is combined with
A) Glass electrode B) calomel electrode C) Zinc electrode D) None of these
 - Lambert's law states that intensity of monochromatic light decrease exponentially with
A) Concentration B) Path length C) Time D) Density
- b. Draw and explain the phase diagram of Pb – Ag system. (06 Marks)
- c. What is an eutectic and eutectoid point in Fe – C system? (04 Marks)
- d. Explain the instrumentation of flame photometry. Mention its applications. (06 Marks)
- 7 a. Choose the correct answers for the following : (04 Marks)
- Which of the following is a copolymer?
A) Polythene B) Polyurethane C) Teflon D) Plexi glass
 - As flexibility of polymer increases, T_g
A) Increases B) ceases C) Decreases D) None of these
 - The monomer tetrafluoro ethylene can be used for the preparation of
A) PMMA B) Polyurethane C) Teflon D) Polyethylene
 - Phenol-formaldehyde resin is commercially called as
A) PVC B) Bakelite C) Elastomer D) Nylon
- b. Explain the mechanism of conduction in Poly-acetylene. (04 Marks)
- c. Explain the manufacture and applications of
(i) PMMA (ii) Neoprene (06 Marks)
- d. What is polymerization? Explain the addition and condensation polymerization. (06 Marks)
- 8 a. Choose the correct answers for the following : (04 Marks)
- The buffer solution used in the determination of total hardness of water is
A) $\text{NaCl} + \text{NH}_4\text{Cl}$ B) $\text{NH}_4\text{OH} + \text{NaOH}$
C) $\text{CaCl}_2 + \text{NH}_4\text{OH}$ D) $\text{NH}_4\text{OH} + \text{NH}_4\text{Cl}$
 - Alkalinity of water is not due to
A) H^+ ions B) OH^- C) CO_3^{2-} ions D) HCO_3^- ions
 - The indicator used in the determination of chloride content of water sample by Mohr's method
A) Potassium chromate B) Phenolphthalein
C) Starch D) Ferroin
 - Winkler method is used to determine
A) AOD B) BOD C) COD D) DO
- b. Explain the determination of COD of the waste water sample. (06 Marks)
- c. Write a short note on 'Electrodialysis'. (04 Marks)
- d. Explain the estimation of sulphate present in the water sample. (06 Marks)
