

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

First/Second Semester B.E. Degree Examination, June/July 2018
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)
- A redox reaction taking place in a galvanic cell is always. D) None of these
 A) Spontaneous B) Non spontaneous C) Irreversible
 - When the concentration of chloride ions in calomel electrode decreases, the reduction potential of the electrode. D) Becomes zero
 A) Increases B) Decreases C) Does not alter
 - An ion selective electrode used in the determination of pH is, D) None of these
 A) Calomel electrode B) Silver-Silver chloride electrode
 C) Glass electrode
 - The standard reduction potential of copper and silver electrodes are 0.34 and 0.80 V respectively. The emf of the cell formed is, D) 1.94 V
 A) 1.14 V B) 0.46 V C) 1.26 V
- b. Give the differences between a galvanic cell and an electrolytic cell. (04 Marks)
- c. Explain the construction and working of the following: (06 Marks)
- Silver - Silver chloride electrode and
 - Glass electrode.
- d. Define single electrode potential. Calculate the potential of Ag-Zn cell at 298 K, if the concentrations of Ag^+ ions and Zn^{2+} ions are $5.2 \times 10^{-2} \text{ m}$ and $1.3 \times 10^{-2} \text{ m}$ respectively. Given $E_{\text{Ag}^+/\text{Ag}}^\circ = 0.80 \text{ V}$ and $E_{\text{Zn}^{2+}/\text{Zn}}^\circ = -0.76 \text{ V}$ (06 Marks)
- 2 a. Choose the correct answers for the following : (04 Marks)
- In a rechargeable battery the net cell reaction is, D) None of these
 A) Irreversible B) Reversible C) Non spontaneous
 - The cathodic material of lead-acid battery is, D) Pb
 A) Pb_3O_4 B) PbO C) PbO_2
 - The electrolyte used in Zn-Air cell is, D) KOH
 A) H_2SO_4 B) HCl C) KCl
 - Super capacitors are also referred to as, D) None of these
 A) Electrical layer capacitor B) Single layer capacitor
 C) Electrical double layer capacitor
- b. What are fuel cells? Distinguish between a fuel cell and a battery. (05 Marks)
- c. Describe the construction and the working of Ni-Cd storage battery. (06 Marks)
- d. Describe the construction and working of a Hydrogen-Oxygen fuel cell. (05 Marks)
- 3 a. Choose the correct answers for the following : (04 Marks)
- If Iron is coated with Zinc, which metal gets corroded in corrosive environment. D) None of these
 A) Iron B) Zinc C) Both Iron and Zinc
 - A steel water tank is half filled with water for storage, which portion of the tank gets corroded in due course of time. D) No corrosion
 A) Below the water line B) Above the water line
 C) Entire area of the tank
 - The flux used in Galvanizing is, D) Palm oil
 A) NH_4Cl B) BaCl_2 C) NaCl

- iv) Caustic embrittlement is an example of,
 A) Galvanic corrosion B) Water line corrosion
 C) Stress corrosion D) None of these
- b. Discuss the influence of the following factors on the rate of corrosion:
 (i) Nature of corrosion product and (04 Marks)
 (ii) pH (06 Marks)
- c. Discuss : (i) Galvanic corrosion and (ii) Pitting corrosion (06 Marks)
- d. Explain the following methods of control of corrosion: (i) Phosphating and (ii) Tinning (06 Marks)
- 4 a. Choose the correct answers for the following : (04 Marks)
- i) For an electrolytic mixture containing Z_n^{2+} , C_u^{2+} , A_g^+ ions, which ion going to be discharged first is,
 A) Z_n^{2+} B) C_u^{2+} C) A_g^+ D) Z_n^{2+} and C_u^{2+}
- ii) In electroplating the article to be plated is subjected to pickling. This is to,
 A) Increase the rate of plating B) Get a bright deposit
 C) Remove grease D) Remove oxide scaling
- iii) In an electrolytic cell, anode of the cell is,
 A) -ve B) +ve C) No change D) \pm
- iv) The double sided printed circuit board is manufactured by using the process,
 A) Electroforming B) Phosphating C) Electroplating D) Electroless plating
- b. What is electroplating? Give the differences between electroplating and electroless plating. (04 Marks)
- c. Give a brief account of the following plating processes:
 (i) Electroplating of chromium and (06 Marks)
 (ii) Electroless plating of Nickel.
- d. Explain the effect of following factors on the nature of electrodeposite:
 (i) Complexing agent, (ii) Levellers and (iii) Brightners (06 Marks)
- PART - B**
- 5 a. Choose the correct answers for the following : (04 Marks)
- i) A reference mixture used to find the octane number of gasoline is,
 A) Isooctane-Pentane B) Isooctane-Butane
 C) Isooctane-Heptane D) Isooctane-Hexane
- ii) Power alcohol is a belnded mixture of gasoline and
 A) Butanol B) Ethanol C) Propanol D) Methanol
- iii) A renewable fuel obtained from a variety of agricultural resources such as soy beans or rapeseeds is known as,
 A) Biopetrol B) Diesel C) Biodiesel D) Biogas
- iv) Photovoltaic cell consists of,
 A) P-n junction B) n-type junction C) P-junction D) None of these
- b. What is reforming? Explain the reactions occurring during reforming process. (04 Marks)
- c. What is a photovoltaic cell? Explain its construction and working. (05 Marks)
- d. Define the terms GCV and NCV. Calculate the gross and net calorific value of a coal sample from the following data:
 (i) Weight of coal = 0.65 kg
 (ii) Weight of water taken in calorimeter = 1200 kg
 (iii) Water equivalent of calorimeter = 400 kg
 (iv) Latent heat of steam = $587 \times 4.2 \text{ KJkg}^{-1}$
 (v) Hydrogen in the coal sample = 2%
 (vi) Rise in temperature = 1.8°C
 (vii) Specific heat of water = $4.187 \text{ KJ/kg}^\circ\text{C}$ (07 Marks)

- 6 a. Choose the correct answers for the following : (04 Marks)
- Reduced phase rule for two component system is,
 - $P + F = C + 3$
 - $P + F = C - 2$
 - $P + C = F + 1$
 - $P + F = C + 1$
 - Pb-Ag system is a case of,
 - One component
 - Two component
 - Three component
 - Four component
 - The number of phase that coexist in the equilibrium at tripple point in water system,
 - 0
 - 1
 - 2
 - 3
 - In potentiometric redox titrations the reference electrode used is,
 - SHE
 - Calomel electrode
 - Glass electrode
 - None of these
- b. Draw and explain the phase diagram of Lead-Silver system. (05 Marks)
- c. Define the following terms : Give one example for each, (06 Marks)
- Phase
 - Component
 - Degrees of freedom
- d. State Beer-Lambert's law. Explain how this law can be used to determine the concentration of coloured solution. (05 Marks)
- 7 a. Choose the correct answers for the following : (04 Marks)
- An example of thermoshetting plastic is,
 - PVC
 - Teflon
 - PMMA
 - Backelite
 - Which of the following is essential for a conducting polyer:
 - Linear structure
 - Branched structure
 - Conjugated double bonds
 - None of these
 - The process of heating a rubber with sulphur is known as,
 - Sulphonation
 - Vulcanization
 - Combustion
 - None of these
 - The trade name of polytetrafluoroethylene is,
 - Plexiglass
 - Buna-S
 - Teflon
 - None of these
- b. Give the synthesis and applications of, (i) Teflon and (ii) Neoprene. (06 Marks)
- c. What is polymerization? Explain addition and condensation polymerization with example. (05 Marks)
- d. What are conducting polymers? Explain the mechanism of conduction in polyacetylene. (05 Marks)
- 8 a. Choose the correct answers for the following : (04 Marks)
- The reagent used in colorimetric determination of fluoride content in water is,
 - PDA
 - SPADNS
 - K_2CrO_4
 - H_2SO_4
 - In the activated sludge process of sewage treatment the impurities are oxidized by,
 - Potassium dichromate
 - Ozone
 - Aerobic bacteria
 - None of these
 - Alkalinity in water is not due to,
 - H^+
 - OH^-
 - CO_3^{--}
 - HCO_3^-
 - Temporary hardness of water is due to,
 - $CaCO_3$
 - $MgCO_3$
 - $Ca(HCO_3)_2$
 - $CaCl_2$
- b. Explain argentometric method of determination of chloride content in water. (05 Marks)
- c. What is desalination? Explain desalination of water by electrodialysis. (06 Marks)
- d. Define the terms BOD and COD. Calculate the BOD value of a sewage sample containing 9.2 mg/l of organic matter with formula $C_6H_{12}O_6$. (C = 12, H = 1 and O = 16) (05 Marks)

* * * * *