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**06CHE12/22**

# First/Second Semester B.E. Degree Examination, June 2012

## Engineering Chemistry

Time: 3 hrs. Max. Marks:100

**Note: 1.** ***Answer any FIVE full questions, choosing at least two from each part.***
**2.** ***Answer all objective type questions only on OMR sheet page 5 of the answer booklet.***
**3.** ***Answer to objective type questions on sheets other than OMR will not be valued.***



## PART – A

**1** a. Choose the correct answers for the following : **(04 Marks)**

i) Which one of the following is not a primary fuel?
A) coal B) crude oil C) natural gas D) kerosene

ii) The method used for obtaining synthetic petrol is
A) catalytic cracking B) bergius process
C) refining D) none of these

iii) The knocking tendency of hydrocarbon decreases in the following order
A) straight chain > cyclo alkanes > aromatic > branched chain
B) straight chain > branched chain > cyclo alkanes > aromatic
C) aromatic > cyclo alkanes > branched chain > straight chain
D) cyclo alkane > aromatic > branched chain > straight chain

iv) In photo voltaic cell solar energy is utilized to transform
A) solar energy into light and heat energy
B) solar energy into electrical energy
C) solar energy into electrical and chemical energy
D) none of these

b. Describe the experimental method of determining calorific value of a solid fuel using bomb calorimeter. **(06 Marks)**

c. Calculate the gross and net calorific values of coke sample using the following data :
Mass of coke = $0.85 \times 10^{-3}$ kg, mass of water = 2.0 kg, water equivalent of calorimeter = 0.6 kg, sp.heat of water = 4.187 $kJkg^{-1}K^{-1}$, percentage of hydrogen in fuel sample = 5%, increase in temperature = 3.5 K, latent heat = 2457 $kJkg^{-1}$. **(04 Marks)**

d. Explain the process of doping of silicon. Give two applications of photovoltaic cells. **(06 Marks)**

**2** a. Choose the correct answers for the following : **(04 Marks)**

i) Daniel cell is a combination of standard electrodes of
A) Cu and Ag B) Zn and Cd C) Zn and Cu D) Cu and Cd

ii) The concentration cell stops working when
A) $M_1 > M_2$ B) $M_2 > M_1$ C) $M_2 = M_1$ D) None of these

iii) Calomel is the commercial name of
A) mercuric chloride B) mercurous chloride
C) mercuric sulphate D) mercurous sulphate

iv) The potential of the calomel electrode varies with the concentration of
A) mercuric chloride B) mercurous sulphate
C) mercurous chloride D) potassium chloride

**2** b. What are reference electrodes? Explain the construction of Ag/AgC*l* electrode. Give half-cell reactions. **(05 Marks)**

c. An electrochemical cell consists of iron electrode dipped in 0.01M $FeSO_4$ solution and copper electrode dipped in 0.1M $CuSO_4$ solution. Write the cell representation, cell reaction and calculate emf of the cell at 298 K. Given standard reduction potentials of iron and copper electrodes are -0.44 V and 0.34 V respectively. **(05 Marks)**

d. Define single electrode potential. Explain the determination of potential of Zn-electrode dipped in 0.5M $ZnSO_4$, using standard hydrogen electrode. **(06 Marks)**

**3** a. Choose the correct answers for the following : **(04 Marks)**

i) Which of the following is not a rechargeable battery?
A) lead acid B) Ni-metal hydride C) Ni-Cd D) Zn-$MnO_2$

ii) Which of the following is a reserve battery?
A) Zn-air B) Ni-metal hydride C) Zn-$Ag_2O$ D) Li-$MnO_2$

iii) In hydrogen-oxygen fuel cell which of the following electrolyte is used?
A) $H_2SO_4$ B) $NH_4OH$ C) KOH D) $CH_3COOH$

iv) The concentration of sulphuric acid to be maintained in lead-acid battery is
A) 10 M B) 5 M C) 15 M D) 2 M

b. What are primary, secondary and reserve batteries? Explain the construction and working of Zinc-air battery. **(08 Marks)**

c. Explain the construction and working of methanol-oxygen fuel cell. **(05 Marks)**

d. Give the advantages of fuel cells over batteries. **(03 Marks)**

**4** a. Choose the correct answers for the following : **(04 Marks)**

i) Water-line corrosion can be explained on the basis of
A) stress corrosion B) differential aeration corrosion
C) centralized corrosion D) all of these

ii) Differential metal corrosion is
A) galvanic corrosion B) differential aeration corrosion
C) stress corrosion D) pitting corrosion

iii) Which of the following metal is used as _____ anode protection to iron?
A) Zn B) Cu C) Ni D) none of these

iv) Which of the following acts as oxygen scavenger in cathodic inhibition?
A) $Na_2SO_3$ B) $Na_2SO_4$ C) $ZnSO_4$ D) $NiSO_4$

b. Explain differential metal corrosion, with a suitable example. **(06 Marks)**

c. Discuss the effect of the following on the rate of corrosion :
i) Anodic and cathodic areas ii) Corrosion product iii) Temperature **(06 Marks)**

d. Write a note on anodic protection. **(04 Marks)**

## PART – B

**5** a. Choose the correct answers for the following : **(04 Marks)**

i) For an electrolyte mixture containing $Cu^{2+}$, $Zn^{2+}$ and $Cd^{2+}$ the order of electro deposition is
A) Cu, Cd, Zn B) Cu, Zn, Cd C) Zn, Cd, Cu D) Cd, Cu, Zn

ii) When the object to be plated is irregular, the process employed is
A) electroplating B) electroless plating
C) electrophoreting D) electropolishing

iii) Addition of buffer to the plating bath is to
A) increase the pH of the bath B) decrease the pH of the bath
C) control the pH of the bath D) none of these

**5** a. iv) In electroplating of chromium, inert anode is used in place of chromium because
A) wide difference between anode and cathode efficiencies
B) imbalance of the bath composition with respect to Cr(III) and Cr(VI)
C) to avoid poor quality deposition
D) all of these

b. Explain the decomposition potential and over-voltage. **(04 Marks)**

c. Explain the role of the following factors on the nature of electro deposit :
i) Current density
ii) Throwing power **(06 Marks)**

d. Explain the electroless plating of copper. **(06 Marks)**

**6** a. Choose the correct answers for the following : **(04 Marks)**
i) Para Azoxy Anisole is an example for
A) nematic B) smectic C) chiral nematic D) cholesteric
ii) Which of the following is a lyotropic liquid crystal?
A) para azoxy anisole B) para azoxy phenetole
C) cholesteryl benzoate D) soap-water mixture
iii) Which of the following is a reference electrode?
A) glass electrode B) calomel electrode
C) platinum electrode D) none of these
iv) Calorimetry involves the measurement of absorbance using monochromatic light in the
A) visible range B) IR range C) UV range D) all of these

b. Explain with suitable examples the liquid crystalline behaviour in homologues of PAA. **(04 Marks)**

c. Explain the molecular ordering in the following liquid crystal phases :
i) Nematic phase
ii) Chiral nematic phase **(06 Marks)**

d. State Lambert's law and Beer's law. Explain the colorimetric estimation of copper using $NH_3$ as the complexing agent. **(06 Marks)**

**7** a. Choose the correct answers for the following : **(04 Marks)**
i) The emulsion polymerization of chloroprene gives
A) butyl rubber B) epoxy resin C) neoprene rubber D) styrene
ii) Te polymer having highest Tg is
A) polypropylene B) polyethylene C) pvc D) polystyrene
iii) The monomer ethylene is
A) monofunctional B) bifunctional C) trifunctional D) poly functional
iv) Which of the following polymer is used as substitute for glass?
A) teflon B) polyurethane C) PMMA D) PVC

b. Explain the free radical mechanism of addition polymerization taking ethylene as an example. **(04 Marks)**

c. Give the synthesis and applications of the following :
i) PMMA
ii) Butyl rubber
iii) Teflon **(09 Marks)**

d. Give the structure and applications of conducting polyaniline. **(03 Marks)**

**8** a. Choose the correct answers for the following : **(04 Marks)**

i) Temporary hardness of water is caused due to the presence of

A) $MgCl_2$ B) $Ca(HCO_3)_2$ C) $CaCO_3$ D) all of these

ii) The secondary treatment of sewage involves

A) biological treatment B) physical treatment

C) chemical treatment D) all of these

iii) The method used for desalination of water is

A) lime-soda process B) permutit process

C) flash evaporation D) ion-exchange process

iv) Which of the following method is used for the estimation of chloride content in water

A) Winkler's method B) argentometric method

C) PDA method D) SPADNS method

b. 100 ml of water sample required 4 ml of N/50 $H_2SO_4$ for neutralization to phenolphthalein end point. Another 15 ml of the same acid was needed for further titration to methyl orange end point. Determine the type and amount of alkalinity. **(04 Marks)**

c. Explain Winkler method of determining dissolved oxygen. Give the reaction involved. **(06 Marks)**

d. What is potable water? Give the characteristics of potable water. Explain desalination of water by reverse osmosis process. **(06 Marks)**

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