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10CHE12/22

First/Second Semester B.E. Degree Examination, Dec.2016/Jan.2017
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 :
- The electrode with –ve sign for its SRP acts as,

A) Anode with respect to SHE	B) Cathode with respect to SHE
C) Act as both	D) None of these.
 - The emf of a concentration cell with 0.05m & 0.025m AgNO₃ solution is

A) 0.178V	B) 0.0295V	C) 0.0178V	D) 0.125V
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 - For a galvanic cell with spontaneous reaction, E_{cell} is assigned.

A) +ve sign	B) – ve sign	C) Zero	D) None of these
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 - Example of an ion selective electrode is

A) S.H.E	B) Platinum electrode
C) Glass electrode	D) Ag-AgCl electrode.
- b. What is single electrode potential? Derive Nernst equation for the same. (04 Marks)
- c. A galvanic cell is constructed by immersing a Cu rod in Cu(NO₃)₂ solution of 0.01 M and a silver rod in AgNO₃ solution of 0.1M ionic concentrations. Given E⁰ of the cell is 0.46V. Write the cell diagram cell reaction and calculate the emf of the cell. (06 Marks)
- d. Explain the application of glass electrode in determination of pH of a solution. (04 Marks)
- 2 a. Choose the correct answers for the following :
- The electrolyte used in Zn – Air battery is

A) Aqueous H ₂ SO ₄	B) Aqueous KOH	C) concentrate KCl	D) None of these.
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 - Which of the followings is a modern battery?

A) Zn – Air cell	B) Zn – MnO ₂ cell	C) Lead – Acid cell	D) None.
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 - Fuel cell is an electrochemical cell, which works,

A) In absence of fuel	B) with continuous consumption of fuel
C) Without an electrolyte	D) None of these.
 - The operation temperature of alkaline fuel cell is

A) 600°C	B) 60 - 80°C	C) 1000°C	D) 250°C
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- b. Discuss the following battery characteristics. (04 Marks)
- Capacity
 - Energy efficiency
 - Shelf life. (06 Marks)
- c. With a neat sketch, explain the construction and working of lead – Acid storage battery with discharging and recharging reactions. (06 Marks)
- d. What are fuel cells? How it differ from battery? (04 Marks)
- 3 a. Choose the correct answers for the following :
- Corrosion occurs in metal in a corrosive environment due to

A) Deposition of metal	B) Oxidation of metal
C) Reduction of metal	D) None of these.
 - In acidic medium, the corrosion reaction ends with

A) Liberation of N ₂	B) Absorption of O ₂	C) Liberation of H ₂	D) Absorption of H ₂
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Important Note: 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice.

- iii) Coating of Zn on iron is known as
 A) Galvanization B) tinning C) Cathodic protection D) None of these.
- iv) Water line corrosion is an example of
 A) differential aeration cell B) stress corrosion
 C) Galvanic corrosion D) None of these. (04 Marks)
- b. What is electro chemical corrosion? Discuss the electro chemical theory of corrosion by taking the iron as example. (06 Marks)
- c. Discuss the effect of the following on rate of corrosion.
 i) Nature of oxide film ii) polarization. (06 Marks)
- d. Explain the sacrificial anodic method of corrosion control. (04 Marks)
- 4 a. Choose the correct answers for the following :
- i) The electro chemical cell used for electroplating is
 A) Fuel cell B) Galvanic cell C) Electrolytic cell D) None.
- ii) The decomposition potential refers to,
 A) Minimum current a cell uses B) Minimum voltage to be applied
 C) Minimum concentration to be maintained D) None of these.
- iii) The reducing agent used in electroless plating of copper is
 A) Formaldehyde B) sodium hypophosphite
 C) Acetic acid D) Formic acid.
- iv) Electro less plating involves the deposition
 A) without the use of current B) By using the current
 C) By applying voltage and current D) None of the above. (04 Marks)
- b. What is metal finishing? Discuss the effect of over voltage and decomposition potential on electroplating. (06 Marks)
- c. Discuss the electroplating of chromium. (05 Marks)
- d. What is electroless plating? Discuss the electroless plating of copper. (05 Marks)

PART – B

- 5 a. Choose the correct answers for the following :
- i) The quantity of heat evolved by the complete combustion of unit quantity of fuel in air or oxygen is
 A) Calorific value B) Enthalpy C) Free energy D) None.
- ii) The process of breaking down of high molecular mass hydrocarbon to low molecular mass hydrocarbon is
 A) Refining B) Reforming C) Cracking D) None.
- iii) The octane number of fuel is measure of
 A) Ability to resist anti knocking B) offers no resistance to knocking
 C) Ability to resist knocking D) None of the above.
- iv) The device in which electricity is produced using solar energy is known as
 A) Fuel cell B) Voltaic cell C) Photovoltaic cells D) None. (04 Marks)
- b. Explain the Bomb calorimetric method of the determination of the calorific value of the fuel. (05 Marks)
- c. Explain the fluidized bed catalytic cracking. (06 Marks)
- d. Calculate the G.C.V and NCV of a fuel from the following data :
 Mass of fuel burnt: 0.75g; Mass of water taken = 1150g; water equivalent of calorimeter: 350g, Increase in temp = 3.02°C percentage of hydrogen in fuel is 2.8. (05 Marks)

- 6 a. Choose the correct answers for the following :
- The phase rule for heterogeneous system is
A) $C = P+2 - F$ B) $P+F = C+2$ C) $C+F = P+2$ D) $C+P = F+2$
 - The number of components in water system is
A) 1 B) 3 C) 2 D) 0
 - The composition of an eutectic of lead and silver is
A) 5g Ag 95% pb B) 1.5g Ag 98.5g pb C) 2.67g Ag 97.33 pb D) None.
 - Mathematical expression of Beers and Lambert's law.
A) $I_t = I_0 \cdot e^{-ect}$ B) $I_0 = I_t \cdot e^{-ect}$ C) $I_t = I_0 \cdot e^{-ec}$ D) $I_t = I_0 \cdot e^{Ect}$ (04 Marks)
- b. Discuss the applications of phase rule to water system. (05 Marks)
- c. What is reduced phase rule? Describe the phase diagram of lead silver system. (05 Marks)
- d. Explain the conductometric titrations. (06 Marks)
- 7 a. Choose the correct answers for the following :
- A polymer formed by direct addition of repeated monomers without elimination of byproduct is
A) condensation polymer B) Addition polymer
C) conducting polymer D) Elastomer
 - An example of natural polymer is
A) Plastic B) Rubber C) Nylon D) P.V.C.
 - Teflon is obtained by the polymerization of
A) Tetra fluoro ethane B) Isoprene C) Butadiene D) None.
 - Phenol formaldehyde is a
A) Thermosetting polymer B) Thermoplastic
C) Co-polymer D) None of these. (04 Marks)
- b. Discuss the mechanism of addition polymerization by taking ethylene as example. (05 Marks)
- c. Give the synthesis, properties and uses of the followings:
i) Neoprene ii) P.M.M.A (06 Marks)
- d. Explain the conduction mechanism in poly acetylene. (05 Marks)
- 8 a. Choose the correct answers for the following :
- The process of removing salts from sea water is called
A) Desalination B) Sedimentation C) Precipitation D) None of these.
 - A treatment involving the removal of phosphate is
A) Primary B) Secondary C) Tertiary D) All of these.
 - Permanent hardness of water is due to
A) CaCl_2 and MgCl_2 B) CaCO_3 C) MgCO_3 D) None of these.
 - Potassium chromate is used as an indicator in determination.
A) Hardness B) alkalinity C) Cl^- ions D) F^- ions. (04 Marks)
- b. Explain the estimation of alkalinity of water. (05 Marks)
- c. Calculate COD of effluent of sample when 25cm^3 of effluents requires 8.3cm^3 of 0.001M $\text{K}_2\text{Cr}_2\text{O}_7$ for complete oxidation. (05 Marks)
- d. Discuss the reverse osmosis method of water purification. (06 Marks)

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