Code : 231101

B.Tech 1st Semester Exam., 2014

ENGINEERING CHEMISTRY

Time : 3 hours   Full Marks : 70

Instructions :

(i) The marks are indicated in the right-side margin.

(ii) There are **NINE** questions in this paper.

(iii) Attempt **FIVE** questions in all.

(iv) Question No. **1** is compulsory.

1. Fill in the blanks/Answer any *seven* of the following :   2×7=14

   (a) Calculate the weight of calcium nitrate required to prepare 500 ml solution having hardness of 500 ppm.   154

   (b) $0·1M$ formic acid solution is —— to $0·1M$ sucrose solution.

   (c) Coal sample is heated —— °C for —— minute for determination of moisture.

   (d) What is lather factor?

   (e) Why does impure metal corrode faster than pure metal?

   (f) Natural rubber is polymer of ——.

(**2**)

   (g) Arrange in increasing order of freezing point of $0·1M$ solution of $CaCl_2$, $NaCl$, $AlCl_3$ and urea.

   (h) What is power alcohol?

   (i) Write the function of salt bridge.

   (j) Write four characteristics of good fuel.

2. (a) Write on electrolytes, electrodes and reaction involved in lead storage battery.   5

   (b) Calculate the reduction potential at 25 °C for Fe^{+3}/Fe^{+2} electrode if concentration of Fe^{+2} ion is ten times than Fe^{+3} ion. $E°Fe^{+3}/Fe^{+2} = 0·77$ volt.   4

   (c) A cell

   $Ag|Ag^{+1}(1M, 500\,ml\|Cu^{+2}(1M, 500\,ml)|Cu$

   calculate the change of cell potential after passing of 9·65 ampere current for 1 hr.   5

3. Give the methods for prevention of the following :   3½×4=14

   (a) Boiler corrosion

   (b) Scale formation

   (c) Caustic embrittlement

   (d) Knocking

(3)

4. (a) What are the reasons for the formation of anodic and cathodic regions on the surface of melat? 　5

(b) Discuss the importance of design and material selection in controlling corrosion. 　5

(c) What is imprest current cathodic protection? 　4

5. (a) How is petrol synthesised by Bergius process? http://www.akubihar.com 　6

(b) Describe the method of production, composition and uses of water gas. 　4

(c) How analysis of flue gas is done by Orsat apparatus? 　4

6. Write short notes on : 　$3\frac{1}{2} \times 4 = 14$

(a) Priming and foaming

(b) Colligative properties

(e) Stress corrosion

(d) Fuel cell

7. (a) Describe free-radical polymerisation mechanism of vinyl acetate. 　4

(b) Differentiate between thermosetting and thermoplastic resins with suitable example. 　4

(4)

(c) Give the methods of preparation and uses of the following : 　$2 \times 3 = 6$

(i) Neoprene

(ii) Bakelite

(iii) Plexiglas

8. (a) State Raoult's law of lowering of vapour pressure. How can be used for determination of molecular weight of a compound? What are the limitations of Raoult's law? 　$2+3+2=7$

(b) At 100 °C the vapour pressure of a solution of 7·6 gm of a non-volatile solute in 108 gm water is 735 mm of Hg. What is molecular weight of solute? Also calculate the boiling point of solution ($K_b = 0.52Kb$, $P^0_{H_2O} = 760$ mm at 100 °C). 　$3+4=7$

9. (a) What is hardness of water? How is it express? What are various units used for its expression? 　4

(b) 100 ml of a sample water neutralized 6·2 ml 0·12 M H_2SO_4 using methyl orange indicator. Find hardness of water sample. 　4

(5)

(c) Find the amount of lime (74% pure) and soda (90% pure) required for softening $100 \, m^3$ water containing following in mg/lit : 6

$Ca(HCO_3)_2 = 4.05,$ $Mg(HCO_3)_2 = 3.65,$
$MgCl_2 = 0.95,$ $Ca(NO_3)_2 = 3.28,$
$CaCl_2 = 3.33,$ $MgSO_4 = 1.2,$ $CO_2 = 2.2,$
$NaHCO_3 = 2.1,$ $HCl = 3.65$

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