Code : 231201

2012

ENGINEERING CHEMISTRY

Time : 3 hours *Full Marks* : 70

Instructions :

(i) Marks are indicated in right-hand margin.

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

*(iii) Attempt any **FIVE** questions.*

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

1. Answer/Fill in the blanks (any *seven*) : 2×7

(a) Why are gaseous fuels better than solid fuels (four characters)?

(b) What is tacticity in polymers?

(c) Hardness of water containing 8·1 mg/lit $Ca(HCO_3)_2$, 1·11 mg/lit $CaCl_2$ and 0·585 mg/lit NaCl is —— p.p.m.

(d) Why is ethylene glycol added to water used in car radiator in cold countries?

(e) Arrange octane, isotane, benzene and cyclohexane in increasing order of octane number.

(f) Absorbent of oxygen in Orsat's apparatus is ——.

(g) Colligative properties of solution depends on -

(h) The monomer of PVC is ——.

(i) Arrange LPG, water gas, producer gas and hydrogen in the increasing order of calorific value.

(j) Define isotonic solutions.

2. (a) What is the significance of salt bridge in galvanic cell? 3

(b) Can we store with suitable explanation?

(i) $CuSO_4$ solution in nickel vessel

(ii) $FeSO_4$ solution in copper vessel

(iii) H_2O_2 solution in silver vessel

$E^\circ_{Cu^{+2}/Cu} = 0 \cdot 34$ V $\quad E^\circ_{Zn/Zn^{+2}} = 0 \cdot 76$ V

$E^\circ_{Fe/Fe^{+2}} = 0 \cdot 44$ V $\quad E^\circ_{Ag^+/Ag} = 0 \cdot 80$ V 2×3

(c) Calculate the EMF of a Daniel cell at 25 °C when the concentration of $ZnSO_4$ and $CuSO_4$ solution are 0·01 *M* and 0·1 *M* respectively. The E° cell is 0·12 volt. 5

3. (a) Write about the following : 3×2

(i) Stress corrosion and (ii) Pitting corrosion.

(b) Explain with suitable examples, Pilling and Bedworth law. 4

(c) What are cathodic and anodic protection for controlling corrosion? Discuss their merits and demerits. 4

4. (a) What is ideal solution? Explain positive and negative deviation from the ideal behaviour of liquids pairs. 6

(b) What are colligative properties? 4

(c) Find the molality of solution containing non-volatile solute if its vapour pressure is 3% below the vapour pressure of pure water. 4

5. (a) Compare addition polymerisation and condensation polymerisation. 4

(b) Write the mechanism of free radical polymerisation. 4

(c) Mention engineering application of thermosetting and thermoplastic resins. 6

6. (a) What is flue gas? Describe the analysis of flue gas using Orsat's apparatus. 6

6. (b) Calculate the gross and net calorific value of coal sample having following composition : 4

C = 78%, H = 6%, O = 4·2%, S = 3·2%, N = 3·2%, rest ash.

(c) Find the volume of air for combustion of 1 kg of above coal sample (air contains 21% oxygen). 4

7. (a) What are the disadvantages of hard water? 4

(b) Describe the method of softening of water by a ion-exchange process. 6

(c) How are spent resins regenerated? 4

8. (a) Write the Fischer-Tropsch process. 4

(b) How are nitrogen and sulphur estimated in coal sample? 6

(c) Write the significance of proximate analysis of coal. 4

9. Write short notes on the following : 3½×4

(a) Scale and slug formation

(b) Caustic embrittlement

(c) Octane number

(d) Bio-diesel

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