Code : 231101

B.Tech 1st Semester Exam., 2015

ENGINEERING CHEMISTRY

Time : 3 hours *Full Marks* : 70

Instructions :

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

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

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

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

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

(a) What do you mean by hardness of water?

(b) Name the two ways of analysis of coal.

(c) An example of phenolic resin is _____

(d) Name two chief methods to synthesize petrol.

(e) What are the main colligative properties associated with ideal solutions?

(f) Analysis of flue gas is carried out with the help of _____ apparatus.

(g) Water gas is a mixture of _____ and _____

(h) What is the basic difference in a primary and secondary cell?

(i) Name two most common methods for softening of water.

(j) Why is it impossible to determine the electrode potential for a single half cell?

2. Write down the causes and disadvantages of the following : 3½×4=14

(a) Scale formation

(b) Sludge formation

(c) Caustic embrittlement

(d) Priming and foaming

3. *(a)* Distinguish between cold lime-soda process and hot lime-soda process. 4

(b) Calculate the amount of lime (92% pure) and soda (98% pure) required for treatment of 30,000 litres of water whose analysis is as follows : 6

$Ca(HCO_3)_2 = 40 \cdot 5$ ppm

$Mg(HCO_3)_2 = 36 \cdot 5$ ppm

$MgSO_4 = 30 \cdot 0$ ppm

$CaSO_4 = 34 \cdot 0$ ppm

$CaCl_2 = 27 \cdot 75$ ppm

$NaCl = 10 \cdot 0$ ppm

(c) Explain the types of hardness of water. 4

(a) Calculate the osmotic pressure of a solution obtained by mixing 100 ml of 4·5 % solution of urea (mol. mass = 60) and 100 ml of 3·42 % solution of cane sugar (mol. mass = 342) at 300 K. (Given $R = 0{\cdot}0821$ L atm K^{-1} mol^{-1}) 6

(b) What is molal elevation constant? What are its units? 4

(c) What are isotonic, hypertonic and hypotonic solutions? What happens when such solutions are separated by a semipermeable membrane? 4

5. (a) Write down the electrodes, electrolytes and the cell reactions involved in dry cell or Leclanche cell. 6

(b) Write in Nernst equation and calculate the e.m.f. of the following cell at 298 K : 4

$Cu\,(s)\,|\,Cu^{2+}\,(0{\cdot}130\ M)\,||\,Ag^{+}\,(1{\cdot}0\times10^{-4}\ M)\,|\,Ag\,(s)$

Given

$E^{\circ}_{Ag^{+}/Ag} = 0{\cdot}80$ V,

$E^{\circ}_{Cu^{2+}/Cu} = 0{\cdot}34$ V

(c) Describe the working of simple galvanic cell. 4

5. (a) What is a fuel? How are fuels commonly classified? 4

(b) What is meant by calorific value of a fuel? Explain gross and net calorific value. 6

(c) What is the significance of volatile matter in coal? 4

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

(b) Distinguish between addition and condensation polymerisation. 4

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

(i) PVC

(ii) Nylon

(iii) Teflon

8. (a) Describe various types of protective coatings used for controlling corrosion. 5

(b) Compare chemical corrosion and electrochemical corrosion. 5

(c) What are the factors which affect corrosion? 4

9. Write short notes on the following : 3½×4=14

(a) Galvanic corrosion

(b) Thermoplastics

(c) Boiler corrosion

(d) Electrode potential

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