Printed Pages—7 **EAS102**

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 9603 **Roll No.** | | | | | | | | | | |

B. Tech.

(SEM. I) ODD SEMESTER THEORY EXAMINATION
2010-11

ENGG. CHEMISTRY—I

Time : 3 Hours *Total Marks : 100*

SECTION—A

1. Choose/Fill correct answer : **(20×1=20)**

(a) o-nitrophenol is more volatile than p-nitrophenol due to :

(i) Inductive effect

(ii) Electromeric effect

(iii) Intermolecular hydrogen bonding in o-nitrophenol

(iv) Intramolecular hydrogen bonding in o-nitrophenol

(b) Which of the following possesses lowest energy ?

(i) NO (iii) N_2

(ii) O_2 (iv) CO

(c) The number of atoms per unit cell in a simple cubic, fcc and bcc arrangement are, respectively :

(i) 8, 14, 9 (iii) 1, 2, 4

(ii) 1, 4, 2 (iv) 4, 1, 2

(d) An electrophilic reagent is :

(i) Carbanion (iii) Alcohol

(ii) Chloride ion (iv) $FeCl_3$

(e) The formation of cyanohydrin from a ketone is an example of :

(i) electrophilic addition

(ii) nucleophilic addition

(iii) nucleophilic substitution

(iv) electrophilic substitution

(f) S_N1 reaction is facilitated by :

(i) Bulky groups

(ii) Simple non-bulky groups

(iii) Both (i) and (ii)

(iv) None of the above

(g) Which of the following compounds, will have zero dipole moment ?

(i) 1, 1-Dichloroethene

(ii) cis-1, 2-Dichloroethene

(iii) trans-1, 2-Dichloroethene

(iv) None of the compounds

(h) Glyptal is a polymer of :

(i) Alkanal and HCHO

(ii) Glycol and Phthalic acid

(iii) Glycerol and Phthalic acid

(iv) CH_3COOH and Phthalic acid

(i) Waker process uses the catalyst :

(i) Wilkinson catalyst

(ii) Zeigler Natta catalyst

(iii) Zeise's salt

(iv) Nickel

(j) Inflexion point is when :

(i) pH remain constant (iii) pH changes abruptly

(ii) pH changes slowly (iv) None of these

(k) Bragg's equation is based on :

(i) IR studies of crystals

(ii) UV studies of crystals

(iii) X-ray studies of crystals

(iv) Y-ray studies of crystals

(l) Number of signals obtained in the ^1H NMR of $CH_3CH_2OCH_2CH_3$ shall be :

(i) 10 (iii) 2

(ii) 1 (iv) 4

(m) Optical isomerism is shown by :

(i) Butanol-1 (iii) 3-Pentanol

(ii) Butanol-2 (iv) 4-Heptanol

(n) The angle between two covalent bonds is minimum in :

(i) BeF_2 (iii) H_2O

(ii) CH_4 (iv) NH_3

(o) On increasing the temperature, the vapour pressure of liquid :

(i) decreases

(ii) increases

(iii) remain constant

(iv) first increases then decreases

(p) The crystalline compound A_xB_y is characterized by a body-centred cell. The compound has the formula :

(i) AB (iii) A_8B

(ii) A_4B (iv) AB_4

(q) Eutectic point of a system and triple point are :

(i) identical (iii) always same

(ii) different (iv) both zero variant

(r) The role of salt bridge is :

(i) To keep e.m.f. of the cell positive

(ii) To keep e.m.f. of the cell negative

(iii) To maintain electrically neutrality of the solution in two half cells

(iv) None of the above

(s) With increased polarity of solvent the absorption band shifts to shorter wavelength for :

(i) $\pi \rightarrow \pi^*$ (iii) $n \rightarrow \pi^*$

(ii) $n \rightarrow \delta^*$ (iv) $\delta \rightarrow \delta^*$

(t) $E_{cell} + E_{anode} \longrightarrow ?$

SECTION—B

2. Attempt any **three** of the following : **(10×3=30)**

(i) (a) Describe in brief about conducting polymers with their applications.

(b) What are elastomers ? Give the preparation, structure and uses of Buna-S and Butyl rubber.

(ii) (a) With the help of molecular orbital diagram, calculate the bond order of O_2^-, O_2^{2-}, He_2^+, No^-. Also write their magnetic character.

(b) Derive an expression for the density (e) of a cubic crystal.

(iii) (a) Classify fuel cells. Give some examples with their electrode reactions.

(b) The activation energy for the reaction :

$$2N_2O_5(aq) \rightarrow 2N_2O_4(aq) + O_2(g) \text{ is } 100 \text{ kJ mol}^{-2}.$$

The rate constant of the reaction is $2{\cdot}35 \times 10^{-4}\ s^{-1}$ at 293 K. What is the rate constant of the reaction at 303 K ?

(iv) Write short notes on : E, Z Nomenclature, Conformation of n-butane.

(v) Show how does S_N2 reaction give rise to inverted product.

SECTION—C **(10×5=50)**

3. Attempt any **one** of the following :

(a) Write the method of preparation for the following compounds :

(i) Polyacrylonitrile

(ii) Polytetrafluoroethylene (PTFE)

(iii) Neoprene

(iv) Dacron.

(b) (i) Explain the term cathodic protection. Indicate how metal coatings can effectively prevent corrosion.

(ii) Explain why a pure metal rod half immersed vertically in water starts corroding at the bottom.

4. Attempt any **one** of the following :

(a) A sample of coal was found to have the following percentage composition : C = 75%, H = 5·2%, N = 3·2% and ash = 4·5%. Calculate the minimum air required for complete combustion of 1 kg of coal.

(b) Give the mechanism of following reactions :

(i) Hoffmann re-arrangement

(ii) Aldol Condensation

(iii) Canizzaro reaction.

5. Attempt any **one** of the following :

(a) (i) Outline the salient features of the phase diagram of water system highlighting the name of system (areas, curves and point), phases in equilibrium and degree of freedom in each case.

(ii) What are the advantages and disadvantages of gaseous fuels ?

(b) Describe the various types of liquid crystals. Distinguish between nematic and smectic liquid crystals.

6. Attempt any **one** of the following :

(a) What is the potential of a half-cell consisting of zinc electrode in 0·01 M $ZnSO_4$ solution at 25°C ? $E^o = 0·763$ V.

(b) (i) What is a reference electrode ? Describe the construction of normal hydrogen electrode.

(ii) Write short note on Galvanic cell.

7. Attempt any **one** of the following :

(a) (i) What are the properties of a good fuel ? Define, High and Low calorific values.

(ii) What is 'Optical activity' ? How do you specify a particular configuration as R and S ?

(b) (i) What is 'SHIELDING' and 'DESHIELDING' ?

(ii) An organic compound with molecular weight 130 shows the following bands in the infra-red spectrum : (i) 3082-2860 (m), (ii) 1825 (s), (iii) 1755 (m) and 1455 cm^{-1} (m).

In its NMR spectrum, two signal result (i) Triplet 8·7 τ (7·3 squares, J = 7·1 cps), (ii) quartet 7·8 τ (4·9 squares, J = 7·1 cps). Determine the structure of the compound.