

**B.Tech. Civil (Construction Management) /
B.Tech. Civil (Water Resources Engineering)**

Term-End Examination 01869

June, 2012

ET-105(B) : CHEMISTRY

Time : 3 hours

Maximum Marks : 70

Note : Question no. 1 is compulsory. Attempt any five questions from the remainings. Use of calculator is permitted.

1. (a) The relative stability of various 2
conformation of ethane follows the order :
- (i) skew > staggered > Eclipsed
 - (ii) staggered > skew > Eclipsed
 - (iii) Eclipsed > skew > staggered
 - (iv) staggered > Eclipsed > skew
- (b) During Sulphonation of Benzene the 2
reacting electrophile formed is :
- (i) HSO_4^\oplus
 - (ii) SO_2
 - (iii) SO_3
 - (iv) SO_3^\oplus
- (c) Hybridisation found in Clf_3 molecule is : 2
- (i) SP^2
 - (ii) SP^3
 - (iii) SP^3d
 - (iv) SP^3d^2

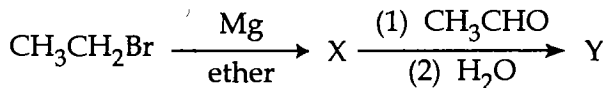
- (d) Which one of the following is most thermal stable compound ? 2
- (i) MgCO_3 (ii) SrCO_3
(iii) CaCO_3 (iv) BaCO_3
- (e) The acidic character of oxyacids of chlorine increases in order : 2
- (i) $\text{HClO} < \text{HClO}_2 < \text{HClO}_3 < \text{HClO}_4$
(ii) $\text{HClO}_2 < \text{HClO}_3 < \text{HClO}_4 < \text{HClO}$
(iii) $\text{HClO} > \text{HClO}_2 > \text{HClO}_3 > \text{HClO}_4$
(iv) $\text{HClO}_3 < \text{HClO}_2 < \text{HClO} < \text{HClO}_4$
- (f) Bond order in O_2^- is : 2
- (i) 1 (ii) 2
(iii) 1.5 (iv) 2.5
- (g) Complete the reaction : 2
- $${}^{40}_{20}\text{Ca} + \text{X} = \text{Y} + {}^{37}_{18}\text{Ar}$$
- (h) During isothermal expansion of an ideal gas the value of ΔV and ΔH are : 2
- (i) $\Delta V > 0, \Delta H > 0$
(ii) $\Delta V < 0, \Delta H < 0$
(iii) $\Delta V = 0, \Delta H = 0$
(iv) $\Delta V > 0, \Delta H < 0$

- (i) Which one of the following is correct for reversible adiabatic process ? 2
- (i) $TP^{1-\frac{\gamma}{\gamma}} = \text{constant}$
- (ii) $TP^{\frac{\gamma}{\gamma}-1} = \text{constant}$
- (iii) $TP^{\frac{\gamma}{1-\gamma}} = \text{constant}$
- (iv) $T^{\gamma}P^{1-\gamma} = \text{constant}$
- (j) When 3 moles of an ideal gas at 200°C are subjected to an increase of pressure from 1 bar to 10 bar, what is ΔG ? 2
($R = 8.314 \text{ JK}^{-1}\text{mole}^{-1}$)
2. (a) Calculate the ground state energy of the electron (in eV) for Li^{2+} ion. 3
- (b) Calculate the short and long wavelength limits of Lyman series in the spectrum of Hydrogen atom. [$R_{\text{H}} = 109,677 \text{ cm}^{-1}$] 4
- (c) A ball having weight 100 g is to be located within 0.1 \AA . What is the uncertainty in its velocity ? 3
3. (a) Calculate the number of atoms contained within : 6
- (i) A primitive cubic unit cell
- (ii) A Body-centered cubic unit cell
- (iii) A Face-centered cubic unit cell

- (b) Atomic Aluminium Al (At. wt = 26.98g/mol) 4
crystallizes into a FCC structure with a density of 2698 kg/m³. When X-rays of wavelength 0.1537 nm diffracted from the (111) planes of this lattice, gave a maximum intensity at an angle of 19.2°. Calculate the Avogadro number using the above information $\sin(19.2) = 0.328866$.
4. (a) A Zinc rod is dipped into O.M solution of ZnSO₄ at 25°C. Assuming that the salt is 95% dissociated at this dilution, calculate the potential of the electrode at the given temperature. $E^\circ_{(Zn^{2+}, Zn)} = 0.76 \text{ V}$. 5
- (b) The standard EMF of the Daniell cell involving the cell reaction $Zn(s) + Cu^{2+}(aq) \rightleftharpoons Zn^{2+}(aq) + Cu(s)$ is 1.10 V. Calculate the equilibrium constant of the cell reaction at 25°C. 5
[R = 8.314 JK⁻¹ mol⁻¹]
5. (a) What is Phase rule? 2
(b) What is eutectic mixture? 2
(c) Draw Phase diagram for a two component system forming a compound. 6

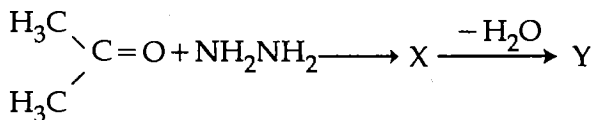
6. (a) What is Raoult's law ? 2
 (b) What is common ion effect ? 2
 (c) What is Buffer action and Buffer solution ? 2
 (d) Define equivalent conductance. 2
 (e) What is order of a reaction ? 2
7. (a) Name the monomers required for the synthesis of Nylon-6, 6. Write down the reaction involved. 3
 (b) Name the monomers required for the synthesis of Terylene. Write down the reaction involved. 3
 (c) What is natural rubber ? 1
 (d) Name the reaction center Chlorophylls of Photosystem I and Photosystem II. 1
 (e) What are hybridoma cells ? Give one important benefit of monoclonal antibody. 2
8. (a) Name any two aromatic amino acids. 2
 (b) Outline different strategies applied during genetic engineering. 4
 (c) What are the advantages of immobilized enzymes over raw enzymes. 4
9. (a) Show the splitting of d-orbitals energies in octahedral and tetrahedral crystal field. 4
 (b) Calculate the CFSE for d^4 configuration in a weak ligand octahedral environment. 2
 (c) Draw the possible geometrical isomers formed by $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ 2
 (d) Write the IUPAC name for $[\text{Co}(\text{en})_3]\text{Cl}_3$. 2

10. (a) Complete the reaction sequence : 2

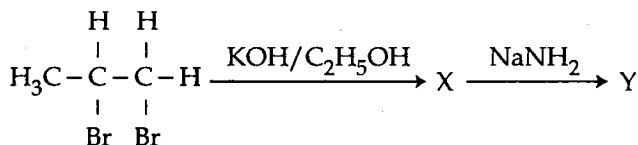


- (b) Draw the Newman projection of Butane using the C-2 to C-3 bond as reference in the eclipsed forms. 2

- (c) Complete the reaction sequence : 2



- (d) Complete the reaction sequence : 2



- (e) Write the IUPAC name of 2

