No. of Printed Pages : 7

ET-105(B)

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

01304

Term-End Examination

June, 2013

ET-105(B) : CHEMISTRY

Time : 3 hours *Maximum Marks : 70*

Note : *Question no. 1 is* ***compulsory****. Answer* ***any five*** *questions from the remaining. Use of calculator is* ***permitted.***

1. Write the most appropriate answer out of the given alternatives for the following :

(a) The nearest distance between two atoms in a BCC unit cell with lattice parameter 'a' is : 2

(i) $a/2$ (ii) $\frac{a\sqrt{3}}{2}$

(iii) $a\sqrt{3}$ (iv) $\frac{a\sqrt{2}}{2}$

(b) Graphite : 2

(i) contains only covalent bonds

(ii) is used as a dry lubricant

(iii) has a BCC structure

(iv) is a bad conductor of electricity

(c) An ideal gas undergoing isothermal transformation, the energy : 2

(i) Increases as the pressure increases

(ii) increases as the volume increases

(iii) decreases as the volume decreases

(iv) Remains constant

(d) Which one of the following is a nucleophile ? 2

(i) $AlCl_3$ (ii) H^+

(iii) BF_3 (iv) NH_3

(e) In the compound : 2

$CH_2 = CH - CH_2 - CH_2 - C \equiv CN$

The $C_2 - C_3$ bond is of the type :

(i) $sp - sp^2$ (ii) $sp^3 - sp^3$

(iii) $sp - sp^3$ (iv) $sp^2 - sp^3$

(f) The monomer of natural rubber : 2

(i) Butadiene

(ii) Chloroprene

(iii) 2 – Methyl – 1,2 – butadiene

(iv) 2 – Methyl – 1,3 – butadiene

(g) Laughing gas is : 2

(i) NO (ii) N_2O

(iii) N_2O_5 (iv) NH_3

(h) Parke's process is used for : 2

(i) Manufacture of white lead

(ii) Manufacture of silver

(iii) Manufacture of sodium

(iv) Manufacture of NaOH

(i) In Cannizzaro reaction reagent and other conditions used are : 2

(i) Anhydrous $AlCl_3 + HCl$

(ii) Aq. or alc. alkali

(iii) Br_2 + alkali

(iv) Cu powder + HCl

(j) Dulong and Petit's law is related to : 2

(i) P° = Mole fraction × Total pressure

(ii) V α n at constant T and P

(iii) Sp. heat × At.wt. = 6.4

(iv) V α T

2. (a) What is the difference between a carnot heat engine cycle and a carnot refrigeration cycle ? 2

(b) What is the efficiency, η of a heat engine if it is operating between the temperatures T_1 and T_2, where $T_1 > T_2$? 4

(c) A heat engine operating between 600 K and 400 K. What is the percentage efficiency of this heat engine ? 4

3. (a) An organic compound C_8H_{18} on monochlorination gives a single monochloride. Write the structure of hydrocarbon. 3

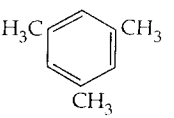
(b) Explain in not more than 2, 3 lines : "Aniline does not undergo Friedal – Craft reaction". 3

(c) Which of the following has larger dipole moment ? Explain. 2

1 - Butyne or 1 - Butene.

(d) SF_6 has octahedral structure. What is the hybridization state of sulphur ? 2

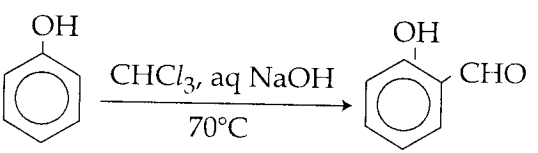
4. Name the following reactions :

(a) $3\,(CH_3)_2C{=}O \xrightarrow{\text{Conc. } H_2SO_4}$  2

(b) $CH_3COCl + H_2 \xrightarrow{\text{Pd-BaSO}_4} \text{Qunoline}$ 2

(c) $C_6H_5N_2Cl \xrightarrow[HCl]{\text{Cu powder}} C_6H_5Cl$ 2

(d) $2HCHO \xrightarrow{50\%\,NaOH} CH_3OH + HCOO^-\ Na^+$ 2

(e)  2

5. (a) Define solubility and solubility product. 2

(b) Calculate the solubility of CaF_2 in pure water at 25°C. The solubility product of CaF_2 at 25°C ; $K_{sp} = 1.7 \times 10^{-10}$ 4

(c) Calculate the solubility of AgCl in presence of 0.1 M $AgNO_3$. The solubility product of $AgCl = 2.8 \times 10^{-10}$. 4

6. (a) What is the relation between K_p and K_c for the gaseous reaction 4

$aA + bB \rightleftharpoons lL + mM$

The partial pressures of the gaseous species at equilibrium are P_A, P_B, P_L and P_M.

(b) At a total pressure of 2 atm, and 673 K the equillibrium constant K_p for the reaction. 6

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ is 1.64×10^{-4}.

Calculate K_c.

Given : $R = 0.082/\ dm^3\ atm\ K^{-1}mol^{-1}$.

7. (a) What is osmotic pressure ? How is it determined experimentally ? 5

(b) A 5.13% solution of cane sugar is isotonic with a 0.9% solution of an unknown solute. Calculate the molar mass of the solute. 5

Mol. wt. of sugar = 342 g mol^{-1}

8. (a) Define entropy. How is it related to standard Gibbs energy and standard enthalpy in Gibbs Helmholtz equation ? 4

(b) Calculate the value of $\log K_p$ for the reaction 6

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

at 25°C. The standard enthalpy of formation of $NH_3(g)$ is -46 kJ and standard entropies of N_2 (g), H_2 (g) and NH_3 (g) are 191, 130 and 192 $JK^{-1}\ mol^{-1}$ respectively. $R = 8.3\ JK^{-1}\ mol^{-1}$.

9. Explain the following :

(a) What is meant by coke and coal tar ? 2

(b) What is water gas ? How does it form ? 2

(c) How is soap prepared from natural fat or oil ? 2

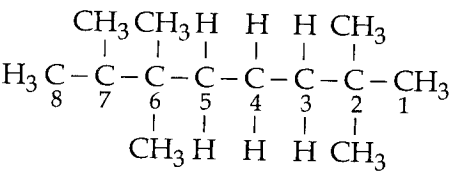
(d) What is LPG ? How is it obtained ? 2

(e) What are the differences between catalytic craking and hydrocraking ? 2

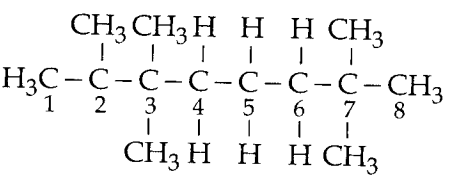
10. (a) What do you understand by IUPAC nomenclature ? 2

(b) Which numbering is correct according to IUPAC nomenclature for the same compound given below - (i) or (ii) ? 2

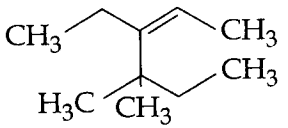
(i)

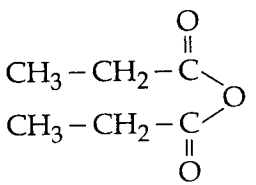


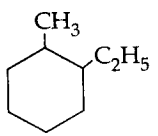
(ii)



(c) Give IUPAC name for the following :

(i)  2

(ii)  2

(iii)  2