No. of Printed Pages : 6

**ET-105(B)**

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

## Term-End Examination

**December, 2013** 00560

## ET-105(B) : CHEMISTRY

*Time : 3 hours* *Maximum Marks : 70*

***Note :*** *Question no. **1** is **compulsory**. Attempt **any five** questions from question numbered from **2** To **11**. Use of calculator is **allowed**.*

**1.** (a) In the titration between $k_2Cr_2O_7$ and $FeSO_4$ in acid medium which element gets reduced : **3**

(i) Sulphur (ii) Chromium

(iii) Iron (iv) Oxygen

(b) In a strong acidic solution, containing a second group element and a fifth group element, $H_2S(g)$ is passed but no precipitate occurs, when this solution is diluted a yellow precipitate appears, the element is : **3**

(i) Mercury

(ii) Chromium

(iii) Cadmium

(iv) Nickel



...

(c) The equivalent weight of $I_2$ in the following reaction $I_2 + 2Na_2S_2O_3 \rightarrow Na_2S_4O_6 + 2NaI$ is : 3

(i) 254 (ii) 127

(iii) 63.5 (iv) 31.6

(At.wt. of I = 127)

(d) The molecule, is  called : 3

(i) 1, 2 - cyclobenzene

(ii) Cyclohexene

(iii) Cyclohexyne

(iv) Cyclohexane

(e) Which statement is correct for diamond and graphite : 3

(i) All bonds are equal in the both

(ii) Both are bad conductor of electricity

(iii) Both are used as lubricant

(iv) Carbon in graphite is $sp^2$ hybridized but in diamond carbon is $sp^3$ hybridized.

(f) NaCl is having a FCC structure. If $Na^+$ ions are present at octahedral voids then $Cl^-$ ions will be present in a unit cell at : 3

(i) Tetrahedral voids

(ii) Lattice points

(iii) Face centered positions only

(iv) Corners only

(g) PVC (Polyvinyl chloride) is a polymer. Each mer contains : 3

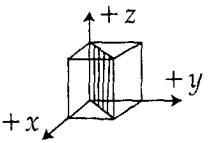
(i) 1 Chlorine atom

(ii) 2 Chlorine atoms

(iii) 3 Chlorine atoms

(iv) 4 Chlorine atoms

(b) The miller indices of the shaded plane in a unit cell with reference to the given axes is _____ .




**11.** (a) Which relates to photon both as wave motion and particle ? **2, 2, 2, 2**

(i) Interference (ii) $E = MC^2$

(iii) Diffraction (iv) $E = h\nu$

(b) Which of the following sets of quantum numbers represent an impossible arrangement

| | n | $l$ | $m_l$ | $m_s$ | | n | $l$ | $m_l$ | $m_s$ |
|---|---|---|---|---|---|---|---|---|---|
| (i) | 3 | 2 | −2 | $\frac{1}{2}$ | (ii) | 3 | 2 | −3 | $\frac{1}{2}$ |
| (iii) | 4 | 0 | 0 | $\frac{1}{2}$ | (iv) | 5 | 3 | 0 | $\frac{1}{2}$ |

(c) The triad of nuclei that is isotonic is :

(i) ${}^{14}_{6}C,\ {}^{15}_{7}N,\ {}^{17}_{9}F$

(ii) ${}^{12}_{6}C,\ {}^{14}_{7}N,\ {}^{19}_{9}F$

(iii) ${}^{14}_{6}C,\ {}^{14}_{7}N,\ {}^{17}_{9}F$

(iv) ${}^{14}_{6}C,\ {}^{14}_{7}N,\ {}^{19}_{9}F$

(d) How is soap prepared from natural fats/oil ? Which Compound is obtained as by - product ?

(h) During bessemerisation process impurities are : 3

(i) Oxidised

(ii) Reduced

(iii) Remains unchanged

(iv) Vaporised

(i) The rate constant k of a reaction has the unit mol - $lit^{-1}$ $min^{-1}$. The order of reaction is : 3

(i) Zero order

(ii) First order

(iii) Second order

(iv) None of these

(j) Which of the following is tetrabasic acid ? 3

(i) $H_4P_2O_6$ (ii) $H_4P_2O_7$

(iii) $HPO_3$ (iv) $H_3PO_4$

**2.** (a) Mention two main causes for non - ideal behaviour of gases. 4, 4

(b) Indicate the state of hybridisation of the central atom in the following molecules :

(i) $BCl_2$ (ii) $BF_3$

(iii) $NH_3$ (iv) $PCl_5$

**3.** (a) The enolic form of acetone contains : 4, 4

(i) 9 sigma bonds, 1 pibond and 2 lone pairs

(ii) 8 sigma bonds, 2 pibonds and 2 lone pairs

(iii) 10 sigma bonds, 1 pibonds and 1 lone pair

(iv) 9 sigma bonds, 2 pibonds and 1 lone pair

(b) Human blood is isotonic with 0.9% NaCl solution at 27°C. What is the osmotic pressure ? $\left(R=0.082\frac{l\text{ - atm}}{\text{deg - mol}}\right)$

(At.wt.: Na = 23, Cl = 35.5)

(i) 8.6 atm (ii) 3.8 atm

(iii) 15.2 atm (iv) 7.6 atm

**4.** The equilibrium constant for the reaction : $CO(g)+H_2O(g) \rightleftharpoons CO_2(g)+H_2(g)$ at 960K is 1.873. The partial pressures of CO, $H_2O$, $CO_2$ and $H_2$ in a reaction vessel are 0.3, 0.25, 0.2 and 0.25 bar respectively. In which direction will the reaction proceed at 960K and what is value of $\Delta g$ ? ($R = 8.3\ JK^{-1}\ mol^{-1}$) **8**

**5.** Give IUPAC names for the following : **2, 2, 2, 2**

(a) $CH_3-CH=CH-CH=CH-C\equiv C-CH_3$

(b) $CH_3-\underset{\underset{Cl}{|}}{CH}-CH_2-\overset{\overset{O}{||}}{C}-O-C_2H_5$

(c) $CH_3-CH_2-\underset{\underset{CN}{|}}{CH}-CH_2-\overset{\overset{O}{||}}{C}-NH_2$

(d) $CH_3-CH_2-\underset{\underset{Br}{|}}{CH}-COOH$

6. (a) For which of the following equations will $\Delta H$ be equal to $\Delta E$ ? **4, 4**

(i) $H_2(g)+\frac{1}{2}O_2(g) \rightarrow H_2O(l)$

(ii) $H_2(g)+I_2(g) \rightarrow 2HI(g)$

(iii) $2NO_2(g) \rightarrow N_2O_4(g)$

(iv) $4NO_2(g)+O_2(g) \rightarrow 2N_2O_5(g)$

(b) The molar heat capacity of water in equilibrium with ice at constant pressure is _____ .

7. 28g of $N_2$ gas at 300K and 20 atm was allowed to expand isothermally against a constant external pressure of 1 atm, calculate $\Delta E$, q and w for the gas ($R = 8.34\ JK^{-1}\ mol^{-1}$) **8**

8. (a) How much maximum quantity of alum in grams can you make with 200g $K_2SO_4$, 342g $Al_2(SO_4)_3$ and 24 moles of water ? **4, 4**

(b) Which salt will remain in excess as unused and how much ?

(At.wt.: H = 1, O = 16, K = 39, S = 32, Al = 27)

9. Calculate the solubility product of a saturated solution of $Ag_2CrO_4$ in water at 298K, if the e.m.f of the concentration cell. **8**

$Ag|Ag^+(satd.Ag_2CrO_4)||Ag^+(0.1M)|Ag$

is E = 0.164 volt at 298K.

10. (a) A metal crystallises in two phases – FCC and BCC. The unit cell length are 3.5Å for FCC and 3.0Å for BCC. Calculate the density FCC|BCC. **4, 4**