Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E –Ist SEMESTER–EXAMINATION – JULY- 2012

Subject code: 711702N **Date: 07/07/2012**

Subject Name: Environmental Chemistry

Time: 2:30 pm – 05:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Calculate the gram molecular weight and equivalent weight of (i) $BaSO_4$ (ii) Na_2CO_3 (iii) H_2SO_4 (iv) $MgOH_2$ **07**

(b) Balance the following equations. **07**

(i) $CaCl_2 + Na_2CO_3 \rightarrow CaCO_3 + NaCl$

(ii) $FeS + HCl \rightarrow FeCl_2 + H_2S$

(iii) $Cl_2 + KOH \rightarrow KCl + KClO_3 + H_2O$

Q.2 **(a)** Discuss in brief: (i) Common ion effect (ii) Solubility product constant (iii) Homogeneous equilibrium. **07**

(b) Solve following: **07**

(i) Calculate the pH required to decrease the manganese concentration in a water supply to 0.01mg/l if (a) manganese is in the Mn^{2+} form (b) manganese is in the Mn^{3+} form.

(ii) Calculate the concentration in (a) moles per liter (b) milligrams per liter (c) number of ions per liter, for the chloride ion in a saturated solution of silver chloride to which silver nitrate is added until [Ag+] = 0.0001M.

OR

(b) Solve following: **07**

(i) If 6 grams of ethane gas (CH3CH3) is burned in oxygen, (a) how many moles of water are formed; (b) how many moles of carbon dioxide are formed; (c) what is the volume in liters of carbon dioxide formed at 1 atm pressure and 20°C?

(ii) A 30 – liter volume of gas at 25° C contains 12 g of methane, 1 g of nitrogen, and 15 g of carbon dioxide. Calculate (a) the moles of each gas present (b) the partial pressure exerted by each gas (c) the total pressure exerted by mixture.

Q.3 **(a)** Write short note on: (Any Two) **07**

(i) Surface tension (ii) Osmosis (iii) Dialysis

(b) Solve the following: **07**

(i) What approximate osmotic pressure would be created across a semipermeable membrane if water containing 0.01M Na_2SO_4, 0.02 $MgCl_2$, and 0.03M $CaCl_2$ were placed on one side of the membrane and distilled water were on the other?

(ii) Phenol is approximately 12 times more soluble in 1 volume of isopropyl ether than it is in 1 volume of water. How many extractions are required to reduce the con concentration of phenol below 100mg/l in a waste containing 2000mg/l of phenol if an ether-to-wastewater ratio of 0.2 by volume is used in each extraction?

OR

Q.3 **(a)** Discuss in detail adsorption processes. **07**

(b) Solve the following: **07**

(i) A standard KCl solution (0.01N), when placed in a conductivity cell at $25^{o}c$ was found to produce resistance of 1000ohms. A $MgCl_2$ solution was then placed in a cell, and the measured resistance at $25^{o}C$ was 3000 ohms. Approximately what is the concentration of $MgCl_2$ in mg/l?

(ii) The specific conductance of a $CaCl_2$ solution is 200 X 10^{-6} S. estimate the concentration of $CaCl_2$ in mg/l.

Q.4 **(a)** Explain in detail: Limitations of equilibrium calculations. **07**

(b) Explain mononuclear complexes in detail. **07**

OR

Q.4 **(a)** Solve the following: **07**

(i) A solution is prepared by diluting 10-3 mol of propionic acid to 1 liter with distilled water. Calculate the equilibrium concentration for each chemical species in the water.

(ii) Using logarithmic concentration diagram, determine the pH of a solution containing 10^{-2} M acetic acid and $2X10^{-2}$ M sodium acetate.

(b) Define with suitable illustrations the terms primary alcohol, secondary alcohol, and tertiary alcohol, and indicate their relative ease of biodegradation. **07**

Q.5 **(a)** What use is made of the BOD test in water pollution control? List five requirements that must be compiled with in order to obtain reliable BOD data. **07**

(b) What different instrumental methods are available for analysis of metals, and what are the advantages and disadvantages of each? **07**

OR

Q.5 **(a)** What is soil? Explain composition of soil in detail. **07**

(b) Enumerate sources of soil pollution. Discuss effects of modern agro-technology. **07**

****