

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) BaSO₄ **07**
(ii) Na₂CO₃ (iii) H₂SO₄ (iv) Mg(OH)₂

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

- (i) $\text{CaCl}_2 + \text{Na}_2\text{CO}_3 \rightarrow \text{CaCO}_3 + \text{NaCl}$
- (ii) $\text{FeS} + \text{HCl} \rightarrow \text{FeCl}_2 + \text{H}_2\text{S}$
- (iii) $\text{Cl}_2 + \text{KOH} \rightarrow \text{KCl} + \text{KClO}_3 + \text{H}_2\text{O}$

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

(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 Mn²⁺ form (b) manganese is in the Mn³⁺ 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 Na₂SO₄, 0.02 MgCl₂, and 0.03M CaCl₂ 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 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°C was found to produce resistance of 1000 ohms. A MgCl₂ solution was then placed in a cell, and the measured resistance at 25°C was 3000 ohms. Approximately what is the concentration of MgCl₂ in mg/l?
- (ii) The specific conductance of a CaCl₂ solution is 200×10^{-6} S. estimate the concentration of CaCl₂ 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 complied 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**
