(b) Calculate the solubility of gaseous oxygen in water at temperature of 293 K, when the partial pressure exerted by O_2 is 1 bar (K_H for O_2 is 34840 bar L Mol^{-1}).

(c) What is adsorption phenomenon? Discuss the application of adsorption in details. (6+4+5=15)

6. (a) Explain the principle and working of Jaw crusher.

(b) Discuss the filtration process in details.

(c) What is the purpose of material and energy balance? (6+5+4=15)

7. (a) Explain the diffusion phenomenon with suitable example? Discuss the Fick's law of diffusion in details.

(b) What is gas absorption? Discuss the Henry law of gas absorption in details.

(c) Discuss the "BET theory" of multilayer adsorption. (5×3=15)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1070 **D**

Unique Paper Code : 6092011103

Name of the Paper : Unit Operations

Name of the Course : **B.Sc. (H) Polymer Science (UGCF)**

Semester : I

Duration : 3 Hours Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Scientific calculator is allowed.
3. Attempt **six** questions in all.
4. Question No. **1** is compulsory.

1. (a) Explain Fourier's law of heat conduction.

(b) Discuss Schmidt number and its significance.

(c) Define Relative Humidity and Dry Bulb temperature.

(d) State Bond's Crushing Law. Define work Index.

(e) Give mechanism of gravity sedimentation.

(5×3=15)

2. (a) Carbon tetrachloride is made as follows :

$$CS_2 + 3Cl_2 \longrightarrow CCl_4 + S_2Cl_2$$

The product gases are found to contain

	CCl_4	S_2Cl_2	CS_2	Cl_2
Mol %	23.3	23.3	1.4	32.0

Calculate :

(i) The percentage of the excess reactants used.

(ii) The percentage of Conversion.

(iii) The Kg of CCl_4 produced per 100 Kg of Cl_2 converted.

(b) Explain material balances on single and multiple physical systems.

(c) Differentiate between crusher and grinder.

(6+5+4)

3. (a) Discuss plate type heat exchanger with sketch suitable diagram.

(b) Discuss Falling film evaporator in details.

(c) An approximate equation for Cp (cal/g mol °K) of gaseous HCl is

$$Cp = 6.6 + 0.96 \times 10^{-3} T.$$

Calculate the heat required to raise the temperature of lg mol of gas from 100 to 200°C. (6+5+4)

4. Write the short notes on :

(a) Drying in solids

(b) Types of Distillation

(c) Raoult's law and Dalton law (5×3=15)

5. (a) What is mass transfer phenomenon? Discuss the 'Boundary layer theory' in details.