

Day : Tuesday  
Date : 11/06/2019

Time: 11.00 AM TO 02.00 PM  
Max. Marks : 60.

S-2019-3425

N.B.

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answer to both the sections should be written in **SAME** Answer book.
- 4) Assume suitable data if necessary.

SECTION – I

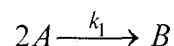
- Q.1** Consider A diffuses from an inert gas into a liquid film, where it reacts reversibly by the reaction  $A \xrightleftharpoons[k_2]{k_1} P$  (10)

Obtain the differential equations that describe the diffusion and reaction of component A. Assume that the solution is sufficiently dilute, such that diffusion coefficients are constant.

OR

Describe macroscopic material balances and its application to a chemical species. State the mole balance for component j if a mass transfer occurs with chemical reaction. Solve following problem based on it. (10)

The reversible reaction



is carried out at high temperature in a reactor with constant volume V. If the reactor is initially charged with a concentration  $C_{Ai}$ , obtain an expression for the concentration of A as a function of time. If we assume an elementary reaction, the rate of consumption can be expressed by  $R'_A = k_1 C_A^2$

- Q.2** Compare and contrast electrophoresis and dielectrophoresis. Discuss the equipments used for carrying out these processes. (10)

OR

What are the controlling factors of ionic separations? Discuss its applications in brief. (10)

- Q.3** Experiment on decolorization of oil yielded the following relationship (10)  
 $Y = 0.004X^2$

Y = gm color / gm color free oil

X = gm color / gm adsorbent

100 kg oil containing 1 part of color to 3 parts of oil is agitated with 25 kg of adsorbent. Calculate the % of color recovered if

- (a) All 25 kg adsorbent is used in one step
- (b) 12.5 kg adsorbent is used in 1 step followed by another 12.5 kg of adsorbent

OR

Describe in detail thermal swing and pressure swing adsorption. (10)

**SECTION – II**

- Q.4** a) Explain in brief the principles of molecular distillation. (06)
- b) How is the location of feed plate decided in a multicomponent distillation system? Explain in brief operating and minimum reflux. (04)

**OR**

Explain in detail with an example the principle and working of reactive distillation and its advantages. (10)

- Q.5** What are the different models in gas permeation? Explain the salient features of each. (10)

**OR**

What is dialysis? What are the various parameters affecting dialysis? What are the type of membranes used for dialysis? (10)

- Q.6** Give the working principle of thermal diffusion. Give the relevant equations and cite an example. (10)

**OR**

Write a note on : i) Zone Melting    ii) Adductive crystallization. (10)

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