

2053

M.Sc. (Applied Chemistry/Pharmaceutical) Fourth Semester
Paper – 402: Chemical Process Development

Time allowed: 3 Hours

Max. Marks: 60

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting one question from each Unit.

x-x-x

I. Attempt the following:-

- Differentiate between- Recycle and By Pass stream.
- Name any two pressure measuring devices.
- Differentiate between series and parallel reactions.
- Define a plug flow reactor
- What is Viscosity? Write its CGS and SI units.
- Define pressure transducers.

(6x2)

UNIT - I

II. a) Name some chemical process industries. Discuss the importance of utilities in chemical process industries.

b) Explain the various steps involved in material & energy balance calculations.

(2x6)

III. a) Discuss the effect of temperature and pressure on heat of reaction.

b) Calculate the specific enthalpy in J/mol of ethyl alcohol at 1 bar 200°C taking datum temperature as 0°C. C_p of liquid at 0°C is 24.65 cal /mol°C. At 100 °C C_p is 37.96 cal /mol°C. Boiling point of ethyl alcohol at 1 bar is 78.4°C. Latent heat of vaporization =9.22kcal/mol.

(2x6)

UNIT - II

IV. a) Differentiate between the following :

- Molecularity and order of the reaction
- Reaction rate constant and equilibrium constant
- Space time and mean residence time
- Homogeneous catalysis and Auto catalysis.

b) The gas reaction $2A \rightarrow R + 2S$ is approximately second order with respect to A, when pure A is introduced at 1 atm into a constant volume batch reactor, the pressure rises 40% in 3 min. For a constant pressure batch reactor find the time required for the same conversion and the fractional increase in volume at that time.

(2x6)

- V. a) Write a note on Differential method of analysis,
b) On doubling the concentration of reactant, the rate of reaction triples. Find the reaction order. (2x6)

UNIT - III

- VI. a) Derive the design equation for constant density for ideal Plug Flow reactor.
b) An aqueous feed containing A (1 mol/l) enters a 2 litre plug flow reactor and reacts away ($2A \rightarrow R$, $-r_A = 0.05 C_A^2$ mol/l.s). Find the outlet concentration of A for a feed rate of 0.5 lt/min. (2x6)
- VII. Discuss the factors to be considered in the selection of materials for pharmaceutical plant construction. (12)

UNIT - IV

- VIII. a) Explain with a neat sketch the working of a capillary viscometer.
b) Write a note on inclined manometer. (2x6)
- IX. a) Name any one pressure measurement device and explain the working of any one.
b) Write a note on rotating concentric cylinder viscometer. (2x6)

x-x-x

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