

AMSE22 PRINCIPLES OF CHEMICAL ENGINEERING

UNIT-1 MATERIAL BALANCE

- 1.1 Introduction to chemical engineering,
- 1.2 Basic chemical calculations-mole concept,
- 1.3 Methods of expressing composition-mole fraction, weight fraction, volume fraction,
- 1.4 Concentration of liquid solutions- molarity, molality, normality, ppm.
- 1.5 Ideal gases and gas mixtures- ideal gas law, Amagat's law,
- 1.6 Dalton's law, Henry's law, average molecular weight, and density of gases, partial pressure and partial volume calculations.
- 1.7 Material balance involving chemical reactions and not involving chemical reactions,
- 1.8 Simple calculations involving recycle, bypass and purge streams.

UNIT-2 ENERGY BALANCE

- 2.1 Energy balance- heat capacity, specific heat and enthalpy,
- 2.2 Heat capacity of gases at constant pressure,
- 2.3 Heat capacity of gaseous mixtures, latent heats,
- 2.4 Enthalpy changes accompanying chemical reactions-
- 2.5 Standard heat of formation and standard heat of combustion, standard heat of reaction.

UNIT-3 CHEMICAL ENGINEERING THERMODYNAMICS

- 3.1 Chemical thermodynamics,
- 3.2 Fundamental concepts and definitions
- 3.3 Types of thermodynamic systems and properties-closed, open and isolated system-
- 3.4 Intensive and extensive properties path and state functions,
- 3.5 First law of thermodynamics, second law of thermodynamics,
- 3.6 Entropy, change in entropy,
- 3.7 Maxwell relations, heat capacity in terms of entropy,
- 3.8 Equation of state of gases, the principle of corresponding states,
- 3.9 Compression and expansion of fluids
- 3.10 Joule Thomson expansion.
- 3.11 Gibbs free energy change, equilibrium constant,
- 3.12 Effect of temperature on equilibrium constant.

UNIT-4 MECHANICAL OPERATIONS, SOLIDS

- 4.1 Properties of solids,
- 4.2 Methods of size analysis-differential and cumulative,
- 4.3 Screening, screening equipment, effectiveness of screens.
- 4.4 Size reduction of solids, types of equipment - jaw crushers,.
- 4.5 Gyratory crushers, hammer mills, ball mill,
- 4.6 Power requirement, laws of crushing.
- 4.7 Handling of solids
- 4.8 Principle of operation of belt conveyers,

- 4.9 Bucket elevators and pneumatic conveyers.
- 4.10 Fluids: Flow of solids through fluids
- 4.11 Maximum settling velocity.
- 4.12 Sedimentation- Laboratory batch sedimentation,
- 4.13 Calculation of area and depth for continuous thickeners.
- 4.14 Principle of centrifugal separation.
- 4.15 Filtration: equipment's for filtration
- 4.16 Plate and frame filter press, rotary drum filter,
- 4.17 Constant pressure and constant rate filtration, filter media, filter aids.

References Books:

1. W.L. McCabe, J.C. Smith & Peter Harriott, Unit Operations of Chemical Engineering, McGraw-Hill
2. K.V. Narayanan, Stoichiometry and Process Calculations, Prentice-Hall of India Pvt.Ltd.
3. K.V. Narayanan, A Text Book of Chemical Engineering Thermodynamics, Prentice Hall of India Pvt Ltd.
4. W.L.Badger & J.T. Banchero, Introduction to Chemical Engineering, Tata McGraw-Hill
5. Christe J. Geankoplis, Transport Process and Unit Operations, Prentice Hall India Pvt Ltd.

