3 Hours / 100 Marks   Seat No. ☐☐☐☐☐☐☐☐

Instructions: (1) *All questions are **compulsory**.*
(2) *Illustrate your answers with **neat** sketches **wherever** necessary.*
(3) *Figures to the **right** indicate **full** marks.*
(4) *Assume **suitable** data, if **necessary**.*

Marks

1. Attempt **any ten** of the following :   **(2×10=20)**

   a) Write statement and formula for Bond's law.

   b) Define desorption with example.

   c) Define unit operation with example.

   d) Define unit process with example.

   e) Define conversion.

   f) Convert 500°C to Kelvin.

   g) Define specific gravity.

   h) Convert 98 gm H_2SO_4 into moles [At. wts H = 1 S = 32 O = 16].

   i) Define vapour pressure.

   j) Give any two names of public sector-chemical industries.

   k) Convert 1000 mm Hg into atmosphere (atm).

   l) Convert 10 lit/hr to lit/s.

2. Attempt **any four** :   **(4×4=16)**

   a) A mixture contains 80 gms of NaOH and 120 gm KOH. Express the composition by

   i) Wt %   ii) Mole % [At. wt. Na = 23 O = 16 H = 1 K = 39]

   b) How will you prepare 1 lit of 1N solution from one lit of 1 molar solution of H_2SO_4 ?

   c) 10 mole of A react to give 3 mole of B and 7 mole of C. B is desired product. If 15 moles of A were initially charged. Find yield and conversion.

   d) If mass flow rate of water is 200 kg/sec. Calculate the volumetric flow rate in m^3/s and LPS. (Assume $\rho H_2O = 1000$ kg/m^3).

   e) Write down properties and uses of H_2SO_4.

   f) Define crading/pyrolysis. Write down the chemical reaction involved in it.

Marks

3. Attempt **any four** :   (4× 4=16)

   a) Draw the flowsheet of manufacturing of HNO_3. (with IS 3232 symbols).

   b) Draw the block diagram of manufacturing of H_2SO_4 with chemical reaction involved in it.

   c) What do you mean by sulphonation ? Write down the chemical reaction for sulphonation.

   d) Define chlorination. Explain with chemical reaction.

   e) Give statement and mathematical expression of Dalton's law and Amagat's law.

   f) Explain scope of chemical engineering.

4. Attempt **any four** :   (4× 4=16)

   a) Write down the names of PPE (Personal Protective Equipment) for protective Ear, Head, Eyes and Hands.

   b) Explain Bob and Tape method for level measurement.

   c) On which factor, size of industries can be defined ? Compare large, medium and small scale industries.

   d) Explain distillation with neat diagram.

   e) Define with example – conduction, convection, radiation.

   f) What is esterification ? Explain with chemical reaction.

5. Attempt **any four** :   (4× 4=16)

   a) Explain with neat diagram – Rotameter.

   b) Draw the symbols of (i) Jaw crusher (ii) Ball mill (iii) Centrifugal pump (iv) Plate column.

   c) Define-Molality and gm-equivalent weight.

   d) Explain sedimentation and filtration.

   e) Explain with example SI, MKS, CGS, FPS system.

   f) Write a short note on Fluid handling (Fluid flow).

6. Attempt **any four** :   (4× 4=16)

   a) 2000 cm^3 of NaOH solution containing 40 g of dissolved NaOH. Find the molarity [density = 1 gm/cm^3].

   b) How to measure viscosity by using Redwood viscometer ?

   c) Write a short note on -History of chemical engineering.

   d) Calculate average molecular weight of air. [At. wt. N = 14 O = 16].

   e) Write down the contribution of chemical industry in development of world.

   f) Write down chemical reactions involved in hydrogenation and hydration.

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