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 : **20**

   a) Define :

   i) Partial pressure   ii) Pure component volume.

   b) Name any two petroleum industries.

   c) Define :

   i) yield   ii) conversion

   d) Name any two oxidising agents.

   e) Convert the following temperature values to °C.

   i) 32°F   ii) 100°F

   f) Define sedimentation with one example.

   g) Define vapour pressure and boiling point of liquid.

   h) Define weight% and mole%.

   i) Give SI unit of viscosity and density.

   j) Give the value of R in $KPa.m^3/kmol°K$.

   k) Define molality and molarity.

   l) Convert 88 kg of CO_2 into its kmol.

2. Attempt **any four** : **16**

   a) Give the purpose and any three applications of drying operations.

   b) Define sulphonation and nitration with one example.

   c) Give any four physical properties of nitric acid.

Marks

d) A gas mixture contains 7 kg H_2, 14 kg NH_3 and 40 kg N_2 at 300°K and 150 KPa pressure. Calculate the partial pressure of each component.

e) Give any four features of unit operations.

f) Explain gas absorption operation. Give its one industrial example.

3. Attempt **any four** : **16**

a) Explain the scope of chemical engineer in industry.

b) Explain filteration operation in detail.

c) Explain different temperature scales with their interrelations.

d) Give any four uses of sulphuric acid.

e) Define equivalent and molecular weight. Calculate equivalent weight and molecular weight of $CaCl_2$.

(Atomic weight of Ca – 40, Cl – 35.5).

f) Differentiate between unit operation and unit processes (any four points).

4. Attempt **any four** : **16**

a) Explain sight glass method for liquid level measurement with neat diagram.

b) Explain chlorination of methane with reactions involved.

c) Draw the symbols of
   i) Jaw crusher   ii) Ball mill
   iii) Packed column   iv) Centrifugal pump.

d) Draw the flow sheet for the manufacturing of sulphuric acid.

e) The analysis of a magnesite ore is given below in weight percent

   $MgCO_3$ – 81%, SiO_2 –14 and H_2O – 5%, Convert the analysis into mole%, (Atomic wt .of Mg – 24, C – 12, O – 16, H – 1, Si – 28).

f) Explain the working of U tube manometer with neat sketch.

5. Attempt **any four** : **16**

a) State Dalton's law and Amagat's law. Give their mathematical expressions.

b) Convert a pressure of 800 mm of Hg to the following units.
   i) KPa   ii) atm
   iii) psi   iv) bar

c) List different personal protective equipments (any four). Give their uses.

d) Name any two size reduction and size separation equipments.

e) Draw the flow sheet for the manufacturing of HNO_3 acid.

f) Explain pyrolysis or cracking.

6. Attempt **any four** :   **16**

a) A chemist is interested in preparing 500 ml of 1 normal and 1 molar solution of H_2SO_4.

   Calculate the quantities of H_2SO_4 to be taken to prepare these solutions.

b) Explain different modes of heat transfer with suitable example.

c) Name the unit operation used to separate liquid mixture based on their difference in boiling points. Explain its working with diagram.

d) Draw the flow sheet symbols of

  i) Burner   ii) Heat exchanger

 iii) Condenser   iv) Blower

e) Explain the working of Redwood viscometer.

f) Explain the working of rotameter, with neat sketch.

_____