Question Bank (I scheme)

Name of Course: Industrial Stoichiometry Subject code: 22315

Semester : Third Programme: Chemical

Unit test I

Unit 1- Dimension and units (6 marks)

2 marks question

1. Define Pressure and write its SI unit.
2. Define force and write its SI unit.
3. List out any four fundamental quantities.
4. Make conversion of $1N/m^2$ Pressure to $Dyne/cm^2$
5. List out any four derived quantities.

4marks question

6. Convert 0.8 kg/m^3 into gm/cm^3
7. Convert 100 lit/min into m^3/hr.
8. Express 100^0C in ^0F and K
9. Convert 10 kg/hr into gm/sec.

Unit 2- Laws of gases and gas mixtures (10 marks)

2 marks question

1. Define partial pressure.
2. Define pure component volume.
3. Write the expression for average molecular weight and density of gas mixtures.
4. Define Raoult's law and Henry's law.
5. Define Boyle's law and Charle's law.
6. Give the value and unit of 'R' in MKS and SI

4 marks question

7. Explain Amagat's law and Dalton's law with mathematical expressions.
8. Prove volume%=Mole%=Pressure%.
9. Air contains 21% O_2 and 79% N_2 by volume. Calculate average molecular weight and density of air at NTP.
10. Calculate the volume occupied by 20 kg of chlorine gas at a pressure of 100 kPa and 298 K
11. A sample of gas having volume of $1m^3$ is compressed in such a manner so that its pressure is increased by 85%. The operation is done for a fixed mass of gas at constant temperature. Calculate the final volume of gas.

12. The Henry's law constant for CO_2 in water at 313 K is 7.05 *10^6 kPa/ mole fraction. Find partial pressure of CO_2 in the gas phase if mole fraction of CO_2 is 4.2*10^{-6}.

Unit 3- Material balance without chemical reaction (18 marks)

2 marks question

1. Define law of conservation of mass.
2. Draw block diagram for evaporation and write down overall balance.
3. Draw block diagram for distillation and write down overall balance and component balance.

4marks question

4. A single effect evaporator concentrating a weak liquor containing 4% solids to 55% solids is fed with 5000 kg/hr of weak liquor. Calculate
   i)Water evaporated per hour.
   ii)Flow rate of thick liquor
5. 10,000kg/hr of a solution containing 20% methanol is fed to distillation column. Distillate is found to contain 98% methanol and waste solution from column carries 1% methanol)by weight). Calculate
   i) mass flow rates of distillate and residue
   ii) % loss of methanol.
6. A sample of coal is found to contain 63% carbon and 24% ash on weight basis. The analysis of refuse after combustion shows 7% Carbon and rest ash. Calculate % of original carbon unburnt in the refuse..
7. It is desired to have a mixed acid containing 40% HNO_3, 43% H_2SO_4 and 17% water by weight. Sulfuric acid of 98% is readily available. Calculate the weight ratio of H_2SO_4 to HNO_3.