SE- SEM III

CBCGS

Q. P. Code: 24089

Chemical - PC

[3 Hours] **[Total Marks: 80]**

(53)

(1) Q.1 is compulsory.
(2) Attempt any 3 from the remaining 5 questions.
(3) Use graph paper, if required.
(4) Assume suitable data if required and justify the same

Q1:A. A compound whose molecular weight is 103 analyzes as following on weight basis: C- 81.5%,H-4.9%, N-13.6% . What is its formula. [5]

B.The gas acetylene is produced according to the following reaction by treating calcium carbide with water. $CaC_2 + 2H_2O \rightarrow C_2H_2 + Ca(OH)_2$. Calculate the number of hours that can be derived from 1.0 kg carbide in an acetylene lamp burning 60 litres of gas per hour at 20 C and 740 mm Hg. [10]

C.Explain effect of temperature on heat of reaction. [5]

Q2A.100 kg of sodium carbonate solution containing 25 percent Na_2CO_3 is subjected to evaporative cooling, during which process 15% of the water present in the solution is evaporated. From the concentrated solution, Na_2CO_3 10 H_2O crystallizes out. Calculate how much crystals would be produced if the solubility of $Na_2CO_3 10 H_2O$ is 21.5 gm per 100 gm water. [10]

B. 2 litres of NH_3 at 303 K and 20.265 kPa is neutralized by 135 ml solution of H_2SO_4. Find normality of acid. [05]

C.The nitrogen(N) content of a sample of NH_4NO_3 is given as 34.5 percent by weight. Find actual ammonium nitrate content of sample. [05]

Q3:A.1000 m^3 of a mixture of H_2, N_2 and CO_2 at 150 ^{0}C was found to have the following ratio of partial pressure of the gases- $P_{H2}:P_{N2}:P_{CO2}=1:4:3$. If total pressure is 2 atm., find (a)Mole fraction of each gase(b)Average molecular weight. [10]

B.The ammonia air mixture containing 0.2 kg ammonia per kg air enters into an absorption system where ammonia is absorbed in water. The gas leaving the system is found to contain 0.004 kg ammonia per kg air. Find percentage recovery of ammonia. [10]

Q4:A.1000 kg of an impure limestone which analyses 96 % $CaCO_3$ and 4 % inert materials is reacted with sulphuric acid solution containing 70 percent sulphuric acid and 30 percent water. The reacting mass is heated and all the CO_2 generated is driven off together with some water. The analysis of final solid cake is $CaSO_4$-86.54%,$CaCO_3$-3.11%,H_2SO_4-1.35%, H_2O-6.23%,Inerts-2.77%. Calculate (i)degree completion of reaction(ii)Mass of acid solution fed(iii)Mass of gas driven off)iv)Composition of gases driven off. [16]

Turn Over

B.Define- Yield and Selectivity [04]

Q5:A.Calculate standard heat of formation of gaseous n heptane at 298.15 K using following data. [10]

Std.heat of formation of $CO_2(g)$= -393.51 kj/mol

Std. heat of formation of $H_2O(l)$ = -285.83 kj/mol

Std. heat of combustion of C_7H_{16} (g)= -4853.43kj/mol

B. Carbon dioxide gas flowing at a rate of 100 kmol/min is heated from 298 K to383 K. Calculate the heat transferred using Cp^0 data given below. [10]

$Cp= a+ bT+cT^2+dT^3$, kj/kmol.k

Gas	a	$bx10^3$	$C x10^6$	$dx10^9$
CO_2	21.3655	64.2841	-41.0506	9.7999

Q6:A.Explain concept of heat of reaction from heat of combustion of reactant and product. [5]

B. Explain the concept of steady state and unsteady state. [5]

C.Define normality, molarity, molality and gram equivalent. [5]

D.Differentiate between proximate and ultimate analysis of fuel. [5]
