Reg. No. : | | | | | | | | | | |

Question Paper Code: 55903

B.E./B.Tech. DEGREE EXAMINATION, DEC 2020

Fifth Semester

Chemical Engineering

19UCH305- CHEMICAL PROCESS CALCULATIONS

(Regulation 2015)

Duration: One hour Maximum: 30 Marks

PART A - (6 x 1 = 6 Marks)

(Answer any six of the following questions)

1. N.T.P corresponds to CO1- R

   (a) 1 atm. Absolute pressure and 0^oC (b) 760 mm Hg gauge pressure and 0^oC

   (c) 760 torr and 15^0C (d) 101.325 kPa gauge pressure and 0^oC

2. Number of gram moles of solute dissolved in one litre of solution is called its CO1- R

   (a) equivalent weight (b) molarity (c) molality (d) normality

3. 10 moles of O2 is added to 10 moles of H2, how many moles of H2O will it produce? CO2- R

   (a) 5 (b) 10 (c) 15 (d) 20

4. Distillation is a separating process based on _____ of liquid mixture. CO2- U

   (a) Vaporizing (b) Condensation

   (c) Freezing (d) None of the mentioned

5. In humidification the gas is _____ in the liquid for the mass transfer to take part. CO3- R

   (a) Soluble (b) Insoluble (c) Partially soluble (d) Inert

6. At the gas temperature, the liquid is in equilibrium with vapour for _____ CO3- R

(a) Saturated gas (b) Unsaturated gas

(c) Partially saturated gas (d) None of the mentioned

7. Enthalpy (H) is CO4- R

(a) H = U + PV (b) H = U – PV (c) H = U*PV (d) None of the mentioned

8. For ideal gases, Enthalpy and Internal energy is only the function of _____ CO4- R

(a) Pressure (b) Volume

(c) Temperature (d) None of the above

9. For the given combustion reaction CO5- U

a C_4H_{10} + b O_2 → c CO_2 + d H_2O

What is the value of a?

(a) 1 (b) 4 (c) 5 (d) 6.5

10. Coal is a good example of CO5- U

(a) Solid Fuel (b) Liquid fuel

(c) Gaseous fuel (d) None of the above

PART – B (3 x 8= 24 Marks)

(Answer any three of the following questions)

11. A natural gas has the following by volume : CH_4 = 82%, C_2H_6 = 12% and N_2 = 6%. Calculate the density of gas at 288 K (15^0C) and 101.325 kPa and composition in weight percent CO1- App (8)

12. The dilute acid containing 25% H_2SO_4 is concentrated by commercial grade sulphuric acid containing 98%H_2SO_4 to obtain desired acid containing 65% H_2SO_4. Find the quantities of acids required to make 1000kg of desired acid. CO2- App (8)

13. A mixture of acetone vapor and nitrogen contains 15.8% acetone by volume. Calculate the relative and percent saturation of the mixture at a temperature of 293K (20^oC) and a pressure of 101.325kPa. CO3- App (8)

Data: Vapor pressure of acetone at 293K = 24.638 kPa.

14. Toluene is to be heated from 290 K (17^oC) to 350 K (77^oC) at the rate of 250 g/s. Evaluate the heat to be supplied to toluene using the heat capacity data given below. CO4- U (8)

Data:

$Cp^o = a + bT + cT^2 + dT^3$, KJ/kmol.K

Gas	a	b X 10^3	c X 10^6	d X 10^9
Toluene	1.8083	812.223	-1512.67	1630.01

15. Crude oil is analyzed to contain 87% carbon, 12.5% hydrogen and 0.5% sulphur (by weight). Calculate the net calorific value of the crude oil at 298K (25^oC) CO5- U (8)

Data:

Gross Calorific value of crude oil at 2989K is 45071KJ/Kg oil.

Latent heat of water vapor at 298K (25^oC) = 2442.5 KJ/Kg.