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SARDAR PATEL UNIVERSITY
B. Sc. (III Semester) Examination
Friday, 28th December 2012
2:30 p. m. – 5:30 p. m.
US03CICH02 : Industrial Chemistry Principles (Chemical Process Principles)

Total Marks: 70

Q. 1 Select and write the right option from among the given options in the following questions. (10)

(1) For expressing the trace impurities in the mixture & solutions _____ unit is preferable.
(a) Parts per million (b) Percentage (c) Molality

(2) One atmospheric pressure is equivalent to _____.
(a) 1 kg/cm^2 (b) 760 mm Hg (c) 101.3 kPa (d) all the above

(3) Boiling point of immiscible liquid system is always _____ the boiling point of individual components.
(a) more than (b) less than (c) equal to

(4) Any vapor-gas mixture at its dew point temperature is known as _____ mixture.
(a) saturated (b) unsaturated (c) none

(5) Which of the following is unit process?
(a) Nitration (b) Crystallization (c) Distillation

(6) Recycle ratio is expressed as_____.
(a) $\frac{F}{R}$ (b) $\frac{R}{F}$ (c) F · R

(7) The energy associated with mass of the system include
(a) Potential energy (b) Kinetic energy
(c) Internal energy (d) All the above

(8) Combustion is _____ process.
(a) oxidation (b) reduction (c) gasification

(9) Which of the following is adsorbent?
(a) silica gel (b) activated carbon
(c) molecular sieve (d) all the above

(10) _____ adsorption involves monolayer formation during adsorption of gases on solids.
(a) Physical (b) Chemical (c) None

Q. 2 Answer **any six** of the following: (12)

(1) List the units to express the composition of mixtures and solutions.
(2) Define average molecular weight of gaseous mixture.
(3) Define critical properties.
(4) List few unit operations and unit processes.
(5) Explain batch and continuous processes giving examples.
(6) Give classification of fuels.
(7) List the forms of energy to be taken into account in energy balance calculation. State units of energy.
(8) Explain adsorption operation giving examples.

Q. 3 (a) Discuss various units to express the composition of mixtures and solutions. (04)

(b) Atmospheric air contains 21% oxygen and 79% nitrogen on molal basis. Calculate (i) composition by wt%, (ii) average molecular weight & density of air at 300 K and 101.3 kPa. (04)

OR

Q. 3 (a) Prove that for gaseous mixture mole percentage composition is always equal to volume percentage composition. (04)

(b) A gas mixture contains 0.274 kmole of HCl, 0.337 kmole. N_2 and 0.089 kmole of O_2. Calculate average molecular weight of gas and volume occupied by the mixture at 405.3 kPa and 303 K. (04)

Q. 4 Discuss phenomenon of vaporization and vapor pressure. (08)

OR

Q. 4 Discuss various units to express the composition of vapor bearing gas mixtures. (08)

Q. 5 Write short note on - (08)

(1) Recycle operation

(2) Unit operations and Unit processes

OR

Q. 5 (a) Explain giving examples: (04)

(1) Limiting and excess reactants

(2) Yield and selectivity

(b) 2000 kg of wet solids containing 70% solids by weight are fed to a dryer where it is dried by hot air. The product finally is found to contain 1% moisture by weight. Calculate kg of water removed from wet solids and kg of product obtained. (04)

Q. 6 (a) State law of conservation of energy and its mathematical expression. (03)

(b) Derive the equation $\Delta H = Q - Ws$ assuming usual notations. (05)

OR

Q. 6 (a) Explain : Heat of reaction, Heat of solution, Adiabatic process (03)

(b) Write short note on Heat capacity. (05)

Q. 7 (a) Define combustion. Explain combustion reaction and air requirement for burning of fuels. (04)

(b) Write short note on Calorific value. (04)

OR

Q. 7 (a) List relative merits and demerits of fuels. (04)

(b) A sample of petrol is found to contain 15.2% H_2 & 84.8% C by weight. Calculate weight of air needed for the combustion of 1 kg of petrol and mole % composition of the products of combustion. (04)

Q. 8 Explain two types of adsorption and make comparison between them. (08)

OR

Q. 8 Discuss Langmuir adsorption isotherm stating its special cases. (08)

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