AS–1350

B.Sc. (Part—I) Semester—I Examination

INDUSTRIAL CHEMISTRY (R/V)

Time : Three Hours] [Maximum Marks : 80

N.B. :— (1) Question No. **1** is compulsory and carries **8** marks.

(2) Remaining all **SIX** questions carry **12** marks each.

(3) Give chemical equations and draw diagram wherever necessary.

(4) Use of calculator is allowed.

1. (A) Fill in the blanks :— 2

(i) Derived units are obtained by dividing and multiplying _____.

(ii) Miscible liquid components are separated from each other by _____ operation by providing thermal energy.

(iii) Coke, Kerosene oil, Petrol are the examples of _____ fuel.

(iv) In Pitot tube fluid become stagnant due to conversion of _____ energy into pressure energy.

(B) Choose correct alternative :— 2

(i) Ultimate analysis of coal gives the idea about percentage of _____ in coal.

(a) Volatile matter (b) Ash content

(c) Nitrogen (d) Moisture content

(ii) _____ is the source of non-conventional energy.

(a) Coal (b) Wood

(c) Oil (d) Sun

(iii) In extraction operation, phase which is rich in solute is called as _____ phase.

(a) Raffinate (b) Extract

(c) Mobile (d) Stationary

(iv) Which of the following is a heat exchange equipment ?

(a) Cooler (b) Condenser

(c) Heater (d) All of above

(C) Answer in **ONE** sentence :— 4

(i) Define stoichiometric equation.

(ii) Define heat of reaction.

(iii) What is mole ?

(iv) State Kirchhoff's law for radiation.

UNIT—I

2. (a) Define :

(i) Base units (ii) Derived units

(iii) Gram atom (iv) Equivalent weight. 4

(b) Calculate equivalent weight of :

(i) HCl (ii) NH_3

(iii) H_2SO_4 (iv) NaOH 4

(c) Show that sum of all the mole fraction in the solution is unity. 4

OR

3. (p) Give the SI units of :

(i) Pressure (ii) Density

(iii) Enthalpy (iv) Power 4

(q) Carbon monoxide reacts with hydrogen to give methyl alcohol. Calculate the weight of CO and H_2 required to produce 500 kg methyl alcohol. 4

(r) Define :

(i) Normality (ii) Molarity

(iii) Molecular weight (iv) Mole fraction 4

UNIT—II

4. (a) Discuss extraction operation with block diagram and give material balance equations. 4

(b) An evaporator is fed with 5000 kg/hr solution containing 10% solute by weight is to be concentrated to a solution containing 40% by weight of solute. Calculate, Kg/hr of water evaporated and Kg/hr of thick product obtained. 4

(c) Explain the following terms with examples :

(i) Excess Reactant

(ii) Conversion. 4

OR

5. (p) Discuss distillation operation with block diagram and give the material balance equations. 4

(q) Explain the following terms with examples :—

(i) Stoichiometric equation

(ii) Stoichiometric coefficient. 4

(r) In the manufacturing of SO_3, feed to reactor consists of 50 Kmol of SO_2 and 150 Kmol air. Calculate percent excess of air over theoretically required. 4

UNIT—III

6. (a) What is heat capacity ? Explain heat capacity at constant pressure. 4

(b) In a production of H_2SO_4 from anhydrite, the gypsum is roasted with clay to obtain sulphur dioxide and cement. The reaction proceeds as follows :

$$3\ CaSO_4 + SiO_2 \rightarrow 3\ CaOSiO_2 + 3\ SO_2 + 3/2\ O_2.$$

Calculate the heat of reaction at 25°C.

Given —Enthalpy of $CaSO_4$ = –1432.7 kJ/mole

Enthalpy of SiO_2 = – 903.5 kJ/mole

Enthalpy of 3 $CaOSiO_2$ = – 2879.0 kJ/mole

Enthalpy of O_2 = 0.0 kJ/mole

Calculate the heat of reaction. 4

(c) Explain production of electricity by solar energy. 4

OR

7. (p) Discuss the terms with example :

(i) Heat of formation

(ii) Heat of combustion. 4

(q) Describe Hess's law of constant heat summation. 4

(r) Discuss the uses of solar energy. 4

UNIT—IV

8. (a) Discuss the classification of coal. 6

(b) Explain the process of fractional distillation of crude oil. 6

OR

9. (p) Discuss proximate and ultimate analysis of coal. 6

(q) Give an account of coal-gas. 6

UNIT—V

10. (a) Explain the phenomenon of pool boiling. 4

(b) State and explain Fourier's law. 4

(c) Explain the terms :—

(i) Thermal conductivity

(ii) Thermal diffusivity. 4

OR

11. (p) Discuss parallel flow heat exchanger. 4

(q) Derive general heat conduction equation. 4

(r) Explain free and forced convection. 4

UNIT—VI

12. (a) Describe the construction and working of orificemeter. 6

(b) Explain :

(i) U-tube manometer

(ii) Pitot tube. 6

OR

13. (p) Explain Bernoulli's equation. 6

(q) Describe construction and working of centrifugal pump. 6

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