

**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 Kirchoff'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)  $\text{NH}_3$   
(iii)  $\text{H}_2\text{SO}_4$  (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<sub>2</sub> 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 :—

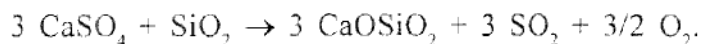
(i) Stoichiometric equation

(ii) Stoichiometric coefficient. 4

(r) In the manufacturing of SO<sub>3</sub>, feed to reactor consists of 50 Kmol of SO<sub>2</sub> 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 :



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

