AT – 270

First Semester B. Sc. (Part – I) Examination

INDUSTRIAL CHEMISTRY (R/V)

P. Pages : 8

Time : Three Hours] [Max. Marks : 80

Note : (1) Question No. **One** is compulsory.

(2) Attempt **One** question from each unit.

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

(4) Use of basic (non scientific) calculator is allowed.

1. (a) Fill in the blanks :—

(i) _____ is the highest rank coal containing 92 – 98 % carbon.

(ii) Coal gas is a mixture of _____.

(iii) Newton's law of heat transfer is associated with _____ mode of heat transfer.

(iv) To make the solution thick or concentrated, _____ operation is used. 2

(b) Choose the correct alternative :—

(i) Proximate analysis gives an idea about percentage of _____ in a coal.

(a) Ash content

(b) Nitrogen

(c) Sulphur

(d) None of these

(ii) Separation of two miscible liquid components by using suitable solvent is called as _____.

(a) Distillation

(b) Filtration

(c) Evaporation

(d) Liquid–liquid extraction

(iii) In cross flow heat exchanger, the direction of fluid flows are _____ to each other.

(a) Parallel

(b) Opposite

(c) Right angle

(d) None of these

(iv) One mole of compound is equivalent to its _____.

(a) Molecular weight

(b) Equivalent weight

(c) Normality

(d) Molality 2

(c) Answer in **One** sentence :—

(i) Define derived units.

(ii) State Planck's law.

(iii) What is latent heat of sublimation ?

(iv) Define heat of reaction. 4

UNIT I

2. (a) Give the SI units of

(i) Power (ii) Density (iii) Energy (iv) Force 4

(b) Calculate equivalent weights of

(i) H_2SO_4 (ii) H_3PO_4 (iii) HCl (iv) NaOH 4

(c) Define —

(i) Normality.

(ii) Molarity.

(iii) Equivalent weight.

(iv) Molecular weight. 4

OR

3. (p) Give the dimensions of —

(i) Heat (ii) Pressure (iii) Specific volume (iv) Work 4

(q) Calculate the molecular weight of —

(i) NH_3 (ii) Na_2CO_3 (iii) HNO_3 (iv) $NaCl$ 4

(r) An aqueous solution of $NaCl$ is prepared by dissolving 25 kg $NaCl$ in 100 kg water. Calculate weight percent of $NaCl$ and H_2O. 4

UNIT II

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

(b) Discuss :—

(i) Limiting reactant.

(ii) Excess reactant. 4

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

OR

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

(q) Give an account on yield and selectivity. 4

(r) In the manufacturing of SO_3, feed to reactor consist of 50 kmol of SO_2 and 150 kmol air, calculate percent excess of air over theoretical requirement. 4

UNIT III

6. (a) Explain the process of water heating by using solar energy. 4

(b) Discuss :—

(i) Heat of formation.

(ii) Heat of combustion. 4

(c) Give an account on biomass energy. 4

OR

7. (p) Explain Hess's law of constant heat Summation. 4

(q) Discuss :—

(i) Tidal power.

(ii) Wind energy. 4

(r) Prove that $C_P - C_V = R$. 4

UNIT IV

8. (a) Discuss the ultimate analysis of Coal. 4

(b) Describe the process of fractional distillation of crude oil. 4

(c) Explain the process of formation of Coal. 4

OR

9. (p) Describe destructive distillation of Coal tar. 4

(q) What is water gas ? Explain its manufacturing process with diagram. 4

(r) Give an account on mining of petroleum. 4

UNIT V

10. (a) Explain filmwise and dropwise condensation. 4

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

(c) Discuss the nature of thermal radiation. 4

OR

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

(q) Explain the phenomenon of Pool boiling. 4

(r) Give an account of Kettle reboiler. 4

UNIT VI

12. (a) What is fluid ? Give the classification of fluid. 4

(b) Describe an equation of continuity. 4

(c) Explain the construction and working of Orfice meter. 4

OR

13. (p) Explain construction and working of U–tube manometer. 4

(q) Explain Bernoulli's equation. 4

(r) Explain the construction and working of reciprocating pump. 4