AU–17

B.Sc. Part—I (Semester—I) Examination

1S : INDUSTRIAL CHEMISTRY

(Regular/Vocational)

Time : Three Hours] [Maximum Marks : 80

Note :— (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 diagrams wherever necessary.

(4) Use of calculator is allowed.

1. (A) Fill in the blanks :

(i) Molecular weight of NaOH is _____.

(ii) Equivalent weight of H_2SO_4 is _____.

(iii) A body which absorbs all the incident radiation on it is called as ____ body.

(iv) For _____ mode of heat transfer, no material medium is required. 2

(B) Choose correct alternative :

(i) Which of the following is a fossil fuel ?

(a) Coal

(b) Uranium

(c) Wood

(d) None of these

(ii) Which of the following devices is used for measuring the flow rate ?

(a) Thermometer

(b) Tintometer

(c) Venturimeter

(d) Pyrometer

(iii) Crystallization gives almost _____.

(a) Liquid

(b) Vapor

(c) Pure product

(d) Impure product

(iv) Normal composition of water gas is _____.

(a) $CO_2 + N_2$

(b) $CO + H_2O$

(c) $CO + O_2$

(d) CO and H_2 2

(C) Answer in one sentence :

(i) What is a Laminar Fluid Flow ?

(ii) What is stoichiometric equation ?

(iii) Why water gas is called as blue gas ?

(iv) What is filtration ? 4

UNIT—I

2. (a) Find the molecular weight of :

(i) Na_2CO_3

(ii) H_2SO_4

(iii) NaOH

(iv) HCl

Atomic weight : Na = 23, Cl = 35.5; H = 1, S = 32, C = 12, O = 16. 4

(b) Define :

(i) Normality

(ii) Molarity

(iii) Molality

(iv) G-mole. 4

(c) 196 grams of sulfuric acid (H_2SO_4) are dissolved in water to prepare one litre of solution. Find normality and molarity of solution. (Atomic weight of H, S and O are 1, 32, and 16 respectively). 4

OR

3. (p) Write the SI units for the following :

(i) Length

(ii) Mass

(iii) Time

(iv) Temperature. 4

(q) Calculate the equivalent weights of the following :

(i) H_2SO_4

(ii) $KMnO_4$

(iii) NaOH

(iv) HCl

Atomic weights H = 1, S = 32, O = 16, K = 39, Mn = 55 Na = 23. 4

(r) An aqueous solution of sodium hydroxide is prepared by dissolving 30 kg of sodium hydroxide in 100 kg of water. Find :

(i) Weight percent

(ii) Mole percent

composition of solution (Molecular weight : NaOH = 40, H_2O = 18). 4

UNIT—II

4. (a) Define distillation. Draw the block diagram and write overall and individual material balance. 4

(b) Explain the material balance of evaporation with block diagram. 4

(c) An evaporator is fed with 15,000 kg/h of a solution containing 10% NaCl, 15% NaOH and rest water. In operation water is evaporated and NaCl is precipitated as crystals. The thick liquor leaving the evaporator contains 45% NaOH, 2% NaCl and rest water.

Calculate :

(i) Material Balance of NaOH

(ii) Material Balance of NaCl. 4

OR

5. (p) What is limiting and excess reactant ? Explain with an example. 4

(q) What is evaporation ? Give overall and individual material balance with the help of block diagram. 4

(r) In production of sulphur trioxide, 100 kmol of SO_2 and 200 kmol of O_2 are fed to reactor. The product stream is found to contain 80 kmol SO_3. Find percent conversion of SO_2. 4

UNIT—III

6. (a) Give an account of water heating by solar energy. 4

(b) Explain with example :

(i) Heat of Formation

(ii) Heat of Combustion. 4

(c) Derive the relationship $Cp - Cv = R$. 4

OR

7. (p) Describe tidal power. 4
   (q) Discuss the role of solar energy in space heating. 4
   (r) Explain the terms :
      (i) Molal heat capacity
      (ii) Heat of reaction. 4

UNIT—IV

8. (a) Define fuel. Write the classification of fuel with suitable example. 4
   (b) Explain the organic and inorganic theory of origin of petroleum. 4
   (c) Describe the destructive distillation of coal. 4

OR

9. (p) Explain different types of coal. 4
   (q) Draw the manufacture coal gas and explain the process. 4
   (r) Discuss the proximate analysis of coal. 4

UNIT—V

10. (a) Derive and explain general heat conduction equation. 6
   (b) What are heat exchangers ? Explain any one type. 4
   (c) Define :
      (1) Absorptivity
      (2) Black Body. 2

OR

11. (p) Give an account of phenomenon of pool boiling. 6
   (q) State and explain Fourier's law. 4
   (r) Define :
      (1) Convection
      (2) Radiation. 2

UNIT—VI

12. (a) State and explain the continuity equation. 4
   (b) Explain construction and working of U-tube manometer. 2
   (c) Discus the construction and working of the following flowmeters :
      (i) Venturimeter
      (ii) Orifice meter. 6

OR

13. (p) Explain Bernoulli equation. 6
   (q) Discuss construction and working of reciprocating pump. 6