1059

B.A./B.Sc.(General)-2nd Semester

Industrial Chemistry

Paper-B: Material and Energy Balance

Time allowed: 3 Hours

Max. Marks: 75

NOTE: *Attempt five questions in all, including Question No. IX (Unit-V) which is compulsory and selecting one question each from Unit I-IV.*

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UNIT – I

I. (a) Calculate equivalent weights and molecular weights of the following: -

   (i) $KMnO_4$ (ii) SO_4^{-2} (iii) H_2SO_4

   (iv) $Ca(OH)_2$ (v) $NaOH$

   (b) Explain the terms open and closed systems with suitable examples.

   (10+5)

II. (a) Find mole fractions of each component in given solutions:-

   (i) 30% NaOH+70% H_2O (wt./wt.)

   (ii) 20g H_2SO_4+80g H_2O

   (iii) A binary solution of two components consists of a component m whose mole fraction is 0.12. Find the mole fraction of second component n.

   (iv) 2 moles of HCl+98 mole of H_2O.

   (v) A solution is made of three components. What is the sum of all mole fractions?

   (b) Taking a suitable example explain the concept of limiting reactant.

   (10+5)

UNIT – II

III. (a) (i) What is the enthalpy of formation of H_2, N_2 and O_2 at NTP?

   (ii) Define the term enthalpy of formation giving one example.

   (iii) Define the term enthalpy of combustion giving one example.

   (b) Explain the concept of batch and continuous distillation.   (9+6)

IV. (a) What is distillation? Give types of distillations with suitable examples.

   (b) What are azeotropes? Explain distillation of azeotropes.   (8+7)

UNIT – III

V. (a) Draw a neat labeled sketch of a falling film evaporator and explain its functioning.

   (b) What is filtration? Write a note on different filter media.   (8+7)

VI. (a) What are different types of evaporators? Give a brief account.

(b) Name different types of dryers used in drying process. Give uses of dryers briefly. (8+7)

UNIT – IV

VII. (a) What are boilers? Explain functioning of any one type of boiler.

(b) Give disadvantages of fuel combustion. (8+7)

VIII. (a) What are different techniques of water purification? Give a brief account.

(b) Draw a well labeled diagramme for plate heat exchangers. (8+7)

UNIT-V

IX. Answer the following in about 20-30 words each: -

(a) Define colorific value.

(b) What are disadvantages of using hard water?

(c) Differentiate between drying and evaporation.

(d) Define molality.

(e) Give an example of a multicomponent system.

(f) Which fuel causes least pollution out of Diesel, petrol, CNG, Solar energy? Which one will cause highest pollution?

(g) Convert one poise into SI units.

(h) How many moles of C are present in 0.25ml of $C_6H_{12}O_6$?

(i) What are non ideal solutions?

(j) Name different types of heat exchanges. $(10 \times 1\frac{1}{2})$

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