Seat No. _____

HX-12

B. Sc. (Sem. II) (CBCS) Examination

May - 2023

### BS-IC-201 : Industrial Chemistry

Time : $2\frac{1}{2}$ Hours / Total Marks : **70**

Instructions : (1) Quesiton paper carries total 5 questions.

(2) All the questions are compulsory & carry 14 marks each.

(3) Draw labeled diagrams wherever necessary.

(4) Assume suitable data.

1 (a) Answer the following questions :   **4**

(1) "Microsoft office is operating system of computer" is this statement true or false ?

(2) What is full form of WWW ?

(3) Give examples of input devices in computer.

(4) Bomb calorimeter is used to measure _____.

(b) Answer in brief : (any one out of **two**)   **2**

(1) Explain boiling method for water softening in brief.

(2) Define : Fuel with example.

(c) Answer in detail : (any one out of **two**)   **3**

(1) Draw only diagram of Bomb calorimeter.

(2) Draw only diagram of Ion exchange resin method for water softening.

(d) Write a note on : (any one out of **two**)   **5**

(1) Draw diagram of computer system with input and output devices.

(2) Explain classification of boiler in detail.

2 (a) Answer the following questions :   **4**

        (1) _____ is a surface-based process while ____ involves the whole volume of the material.

        (2) _____ is biocatalysts.

        (3) If the force of attraction existing between adsorbate and adsorbent are van der Waal's forces, the adsorption is called _____.

        (4) "Chemisorption is multilayer adsorption" is this statement true or false?

    (b) Answer in brief : (any one out of **two**)   **2**

        (1) Enlist factors affecting adsorption. Explain any two in brief.

        (2) Elaborate the word : (1) Dispersion medium

                                      (2) Dispersed phase.

    (c) Answer in detail : (Any one out of **two**)   **3**

        (1) Describe in details : Electric demineralization of water.

        (2) Explain Brownian motion and Tyndall effect observed in colloidal solution.

    (d) Write a note on : (any one out of **two**)   **5**

        (1) Derive equation for Langmuir adsorption isotherm.

        (2) Explain electrodialysis and electrophoresis in detail.

3 (a) Answer the following questions :   **4**

        (1) Define : Selectivity in brief.

        (2) Define : Stoichiometry coefficient.

        (3) A process in which no heat can leave or enter a system is called as _____.

        (4) In a reaction, $SO_2 + \frac{1}{2} O_2 \rightarrow SO_3$ 100 mol SO_2/h and 75 mol O_2/h are fed to a reactor. Find the % excess of oxygen.

(b) Answer in brief : (any one out of **two**) 2

   (1) Discuss % yield with example.

   (2) State the law of conservation of energy.

(c) Answer in detail : (any one out of **two**) 3

   (1) Derive relationship between C_p and C_v for an ideal gas.

   (2) Write a note on standard heat of reaction from heat of formation.

(d) Write a note on : (any one out of **two**) 5

   (1) In the manufacture of acetic acid by oxidation of acetaldehyde, 100 kmol of acetaldehyde is fed to a reactor per hour. The product leaving the reactor contains 14.81% acetaldehyde, 59.26% acetic acid and the rest oxygen (on mole basis). Find the percentage conversion of acetaldehyde.

     Reaction : $CH_3CHO + \frac{1}{2}O_2 \rightarrow CH_3COOH$
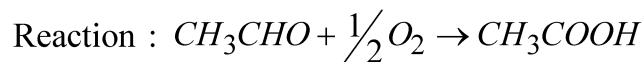
   (2) A stream of carbon dioxide flowing at a rate of 100 kmol/min is heated from 298 K (25°C) to 383 K (110 °C). Calculate the heat that must be transferred using Cp° data given below.

     Ata: $Cp^o = a + bT + cT^2 + dT^3$, kJ (kmol-K)

     Where $a = 21.3655$, $b = 64.2841 \times 10^{-3}$, $C = -41.0506 \times 10^{-6}$,

     $d = 9.799 \times 10^{-9}$

4 (a) Answer the following questions : 4

   (1) In which process particles are formed from homogeneous phase?

   (2) Mother liquor is also known as _____.

   (3) Circulating liquid evaporator crystallizer is also known as _____.

   (4) Nutsche filter is used for small scale plant. True/False.

(b) Answer in brief : (any one out of **two**)   2

    (1) Draw only diagram of sand filter.

    (2) Define : (1) Free moisture content (2) Humidity.

(c) Answer in detail : (any one out of **two**)   3

    (1) Discuss leaf filter with diagram.

    (2) Write advantages and disadvantages of bed filter.

(d) Write a note on : (any one out of two)   5

    (1) Explain circulating magma vacuum crystallizer in detail.

    (2) Discuss Sparklar horizontal plate filter in detail.

5 (a) Answer the following questions :   4

    (1) Priming is removed from pump by providing _____

    (2) _____ is used in mixing for reducing vortex.

    (3) Baffles are used in mixer to avoid ___ formation during mixing.

    (4) Define : Tube pitch

(b) Answer in brief : (any one out of **two**)   2

    (1) Give comparison between Reciprocating and Centrifugal compressor.

    (2) Enlist classification of pumps.

(c) Answer in detail : (any one out of **two**)   3

    (1) Draw only diagram of shell and tube heat exchanger.

    (2) Write a short note on jet ejector.

(d) Write a note on : (any one out of **two**)   5

    (1) Explain finned tube heat exchanger with neat figure.

    (2) Describe tumbling mixers with neat diagrams.