



C20-CHST-304

7233

BOARD DIPLOMA EXAMINATION, (C-20)

OCTOBER/NOVEMBER—2023

DCHST- THIRD SEMESTER EXAMINATION

MASS AND ENERGY BALANCES

Time : 3 Hours]

[Total Marks : 80

PART—A

3×10=30

- Instructions :** (1) Answer **all** questions.
(2) Each question carries **three** marks.
(3) Answers should be brief and straight to the point and shall not exceed five simple sentences.

1. State system of units.
2. Define molecular weight and gram equivalent weight.
3. State Dalton's law of partial pressures.
4. Differentiate between dry bulb and wet bulb temperature.
5. Define Bypass in a continuous chemical process.
6. Define key component and inert substance.
7. Define stoichiometric coefficient.
8. Distinguish between sensible heat and latent heat.
9. Define calorific value of a fuel.
10. Define endothermic and exothermic reactions.

PART—B

8×5=40

- Instructions :** (1) Answer *any five* questions.
(2) Each question carries **eight** marks.
(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. Explain different dimensionless groups.

(OR)

Convert (a) 20 gal/hr to m³/sec, (b) 500 atm to kPa and (c) 7200m³/hr to l/sec.

12. Derive ideal gas equation and write the value of ideal gas constant in different system of units

(OR)

4 gm of NaOH(M.Wt-40) ore dissolved in water to obtain 100 ml solution. Find the normality and molarity of the solution.

13. With a neat block diagram, write the material balance overran absorption unit.

(OR)

A feed to a continuous fractionating column analyses 28% benzene and 72% toluene by weight. The analysis of the distillate shows 52 wt% benzene and 5 wt% benzene was found in the bottom product. Calculate the amount of distillate and bottom product per 1000 kg of feed per hour.

14. In the production of sulphur trioxide, 100 kmol of SO₂ and 100 kmol of O₂ are fed to a reactor. If the % conversion of SO₂ is 80, the calculate composition of the product on mole basis.

(OR)

Explain the degree of completion and % conversion of a chemical reaction.

15. Define and explain heat of formation, heat of reaction and heat of combustion with suitable examples.

(OR)

Heat capacity data for SO₂ gas is given by the following equation :

$$C_p^0 = 43.458 + 10.634 \times 10^{-3}T - 5.945 \times 10^{-5} / T^2$$

Calculate the heat needed to arise the temperature of 1 kmol pure SO₂ from 300K to 1000K.

PART—C

10×1=10

- Instructions :** (1) Answer the following question.
(2) The question carries **ten** marks.
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

- 16.** (a) Explain the proximate and ultimate analysis of coal. 6
- (b) Explain the necessity of recycle operation in chemical process industries. 4

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