TB256277I

Reg. No :.....

Name :.....

BACHELOR'S DEGREE (C.B.C.S) EXAMINATION, MARCH 2025

2018, 2019, 2020, 2021 ADMISSIONS SUPPLEMENTARY

SEMESTER VI - CORE COURSE (CHEMISTRY)

CH6B11B18 - Physical Chemistry – III

Time : 3 Hours **Maximum Marks : 60**

Part A

I. Answer any Ten questions. Each question carries 1 mark **(10x1=10)**

1. Heat capacity is a state function. State true or false.
2. Identify the correct relation for the reaction $CaCO_{3(s)} \rightarrow CaO_{(s)} + CO_{2(g)}$
   a) $\Delta H > \Delta U$ b) $\Delta U > \Delta H$ c) $\Delta U = \Delta H$.
3. Identify the laws which a) gives the concept of entropy b) helps us to calculate the absolute value of entropy.
4. Recall the system that can exchange neither matter nor energy with surroundings.
5. State Ostwald's dilution law.
6. Represent the Henderson's equation for an acidic buffer.
7. Define chemical equilibrium.
8. Define incongruent melting point in phase studies.
9. Explain the phases in equilibrium at the metastable triple point of the sulphur system.
10. Determine the number of phases, number of components and variance of the system in equilibrium: $CaCO_{3(s)} \Leftrightarrow CaO_{(s)} + CO_{2(g)}$.
11. Define instantaneous rate of reaction.
12. Represent the schematic diagram of the mechanism of enzyme action.

Part B

II. Answer any Six questions. Each question carries 5 marks **(6x5=30)**

13. Joule Thomson expansion is an isoenthalpic process. Illustrate.
14. Illustrate that $\left(\frac{\partial G}{\partial T}\right)_P = -S$.
15. Five moles of a gas are heated at constant volume from 10 °C to 20 °C. Compute the change in internal energy of the gas Given C_p=7.03 Cal $K^{-1}mol^{-1}$ and R= 8.31 $JK^{-1}mol^{-1}$.
16. Enumerate any five statements of second law of thermodynamics.
17. Discuss the expression for the pH of the hydrolysed salt solution of a strong acid and weak base in aqueous solutions.
18. a) Distinguish between the term triple point and eutectic point. b) Determine the number of components for the following systems:
    i) $S_{(rhombic)} \leftrightarrow S_{(monoclinic)} \leftrightarrow S_{(liquid)}$
    ii) $NH_4Cl \leftrightarrow NH_{3(g)} + HCl_{(g)}$
    iii) ice $\leftrightarrow$ water $\leftrightarrow$ water vapour
19. Explain the phase diagram of the sodium sulphate -water system.
20. Explain the mechanism of enzyme action and mention four characteristics of enzyme action.
21. Summarize the main postulates of collision theory of bimolecular gaseous reactions.

Part C

III. Answer any Two questions. Each question carries 10 marks **(2x10=20)**

22. Differentiate between the following terms a) exact and inexact differentials b) reversible and irreversible process.
23. The work done in isothermal expansion is greater than the work done in adiabatic expansion for an ideal gas. Illustrate graphically.
24. Discuss the expressions for the hydrolysis constant of a salt of a strong acid and weak base in aqueous solutions and its degree of hydrolysis.
25. Discuss the rate equation for the hydrogen-bromine reaction using steady state approximation.