B. Sc. DEGREE (C.B.C.S.) EXAMINATION, MARCH 2023
(2020 Admission Regular, 2019, 2018 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. Identify the laws which a) gives the concept of entropy b) helps us to calculate the absolute value of entropy.

2. Record the value of ΔU for an ideal gas undergoing isothermal change.

3. Compute the entropy change for the conversion of one mole of ice to water at 273 K and 1 atm pressure.

4. Define heat capacity.

5. Define equilibrium constant in terms of partial pressure.

6. Represent the Henderson's equation for a basic buffer.

7. Define Usanovich base.

8. Give an example for simple eutectic system in phase studies.

9. Determine the number of phases, number of components and variance of the system in equilibrium: $NH_4Cl_{(s)}$ $\Leftrightarrow$ $NH_{3(g)}$ + $HCl_{(g)}$

10. Define the term component.

11. The reaction A + 3B → 2C obeys the rate equation: rate = $k(A)^{1/2}$ (B) $^{3/2}$. What is the order of reaction?

12. Give an example for parallel reactions.

Part B

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

13. Discuss the significance of Gibbs Helmholtz equation.

14. Enumerate the limitations of first law of thermodynamics which necessitates the second law of thermodynamics.

15. Differentiate between a natural and unnatural process.

16. Enumerate the applications of Gibbs Helmholtz equation.

17. Calculate K_p/K_c for the following reactions at 27°C: a) $N_{2(g)}$ + $O_{2(g)}$ $\Leftrightarrow$ $2NO_{(g)}$ b) $N_{2(g)}$ + $3H_{2(g)}$ $\Leftrightarrow$ $2\ NH_{3(g)}$ c) $NH_4Cl_{(s)}$ $\Leftrightarrow$ $NH_{3(g)}$ + $HCl_{(g)}$.

18. Discuss the general phase diagram for condensed systems involving the formation of components with congruent melting points.

19. Apply phase rule and discuss the phase diagram of the ferric chloride-water system.

20. Discuss briefly with example a) Parallel reaction and b) Opposing reaction.

21. Illustrate Zero order reaction by deriving the integrated rate equation.

Part C

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

22. Explain the application of Hess's law in a) Calculation of enthalpy of reaction b) Calculation of enthalpies of formation.

23. Describe the entropy changes of an ideal gas in (a) an isothermal process; (b) an isobaric process, and (c) an isochoric process by deriving equations.

24. Derive van't Hoff equation showing the temperature dependence of equilibrium constant and extend it to its integrated form.

25. Explain the integrated rate equation for second order reactions when there are two reactants and both have the same initial concentration with graphical representation.