QP CODE: 26017150

26017150

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / REAPPEARANCE / MERCY CHANCE EXAMINATIONS, MARCH 2026

Sixth Semester

CORE COURSE - CH6CRT11 - PHYSICAL CHEMISTRY - III

Common for B.Sc Chemistry Model I, B.Sc Chemistry Model II Industrial Chemistry & B.Sc Chemistry Model III Petrochemicals

2017 Admission Onwards

B085EB71

Time: 3 Hours Max. Marks : 60

Part A

*Answer any **ten** questions.*

*Each question carries **1** mark.*

1. Define isobaric process and isochoric process.
2. Give the expressions for heat capacity at constant volume and heat capacity at constant pressure.
3. State the first law of thermodynamics in two different ways.
4. Why thermodynamic scale of temperature is considered more basic than the ideal or perfect gas scale of temperature?
5. How is Gibbs energy related to temperature and entropy ?
6. Find the pH of 0.4833% aqueous solution of HCl.
7. Give the Henderson's equation for an acidic buffer.
8. All four phases of sulphur cannot coexist in equilibrium under any condition. Why?
9. Explain the term 'eutectic point'.
10. Explain the integrated rate law method for the determination of the order of a reaction.
11. The half-life of a second order reaction involving only one reactant is 20 minutes when the initial concentration of the reactant is 0.05 mol dm-3. Calculate the rate constant.
12. Give the Michaelis-Menten equation and explain the terms.

(10×1=10)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. The enthalpies of formation of $C_2H_{6(g)}$, $CO_{2(g)}$ and $H_2O_{(l)}$ are respectively -84.4, -393.5 and -285.5KJ/mol. Calculate the enthalpy of combustion of ethane.

14. Derive an expression for the work done in a reversible isothermal expansion of an ideal gas.

15. Calculate the change in the melting point of ice for a change of pressure of 1 atm. Ice melts at 0^oC at 1 atm. The molar volumes of ice and water are 0.019643 and 0.018012 $dm^3\ mol^{-1}$ respectively. The heat of fusion of ice is 60281 mol^{-1}.

16. Show that the efficiency of a reversible Carnot cycle is $(T_2-T_1)/T_2$ where T_1 and T_2 are temperatures of the source and the sink respectively.

17. A quantity of air (Y=1.4) at 300 K is compressed adiabatically to one third of its volume. Find the change in its temperature.

18. Derive the van't Hoff equation showing the temperature-dependence of equilibrium constant and arrive at its integrated form.

19. Explain Bronsted theory . What are conjugate acids and conjugate bases? Give one example for each.

20. a) What do you mean by ionization constant of a base and the degree of ionization. b) Calculate the ionization constant of NH_4OH if it is 1% ionized in 0.18M solution at 25^0C

21. How is the order of a reaction determined by the graphical method ?

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **10** marks.*

22. Prove thermodynamically that Joule - Thomson coefficient for an ideal gas is zero Also deduce the expression for Joule - Thomson coefficient for real gases in terms of van der Waals constant 'a' and 'b'.

23. Calculate entropy changes in ideal gases in different reversible processes as follows: (a). Change in entropy with P or V at constant T (b). Change in entropy with T and V and (c). Change in entropy with T and P.

24. Discuss the phase diagram of ferric chloride-water system.

25. Discuss the Lindemann theory of unimolecular reactions with special reference to the use of steady state approximation.

(2×10=20)