23105136

QP CODE: 23105136

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / REAPPEARANCE EXAMINATIONS, MARCH 2023

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

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Time: 3 Hours Max. Marks : 60

Part A

*Answer any **ten** questions.*

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

1. Derive the mathematical formulation first law of thermodynamics.
2. Give the relationships for (i) ΔU *and* ΔH for the adiabatic expansion of an ideal gas.
3. Define enthalpies of formation.
4. State the Second Law of thermodynamics in terms of entropy.
5. Explain the state of chemical reactions when: (i) $\Delta G = 0$ and (ii) $\Delta G < 0$
6. Find the pH of 0.4833% aqueous solution of HCl.
7. An aqueous solution of NH_4Cl is acidic. Why?
8. What will be the number of components and number of phases present for the CaCO3 system in equilibrium with CaO and CO2?
9. Give an example of a binary condensed system involving formation of a compound having an incongruent melting point.
10. A first order reaction has a specific reaction rate of 10-3 s-1. How long will it take for 10g of the reactant to reduce to 1.5g? Also calculate the half-life of the reaction.

11. Explain the principle of the determination of the order of a reaction by the half-life method.

12. 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.

(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. Explain any two methods for the liquifaction of gases.

15. Show that Cp-Cv = R for one mole of an ideal gas.

16. State and explain Carnot's theorem. Explain its application.

17. Discuss the entropy criterion for the spontaneity of a process.

18. Kp for a reaction at 327 K and 347 K are 1×10^{-12} and 5×10^{-12} respectively. Assuming ΔH to be constant in the above temperature range, calculate ΔH.

19. How does the solvent influence the strength of an acid? Illustrate with an example.

20. Derive the Henderson's equation for the pH of an acidic buffer.

21. Briefly discuss the intermediate compound formation theory of homogeneous catalysis.

(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. Derive an expression to calculate of the entropy change of an ideal gas when the temperature change from T_1 to T_2 and the pressure changes from P_1 to P_2.

24. Discuss the phase diagram of a simple eutectic sytstem with reference to lead-silver system. Explain its relevance with the pattinson's process.

25. Explain the significance of Eyring equation in the activated complex theory in relating the thermodynamic parameters of activation.

(2×10=20)