

Reg. No

Name

26U507-S

B. Sc. DEGREE END SEMESTER (SAY) EXAMINATION - MAY 2026

SEMESTER 5 : CHEMISTRY

COURSE : 19U5CRCHE07 - PHYSICAL CHEMISTRY – I

(For Supplementary (SAY) 2023 Admission)

Time : Three Hours

Max. Marks: 60

PART A

Answer All (1 mark each)

1. Write down the combined expression for first and second law of thermodynamics.
2. What will be the internal energy change of a system maintained at constant volume, if it absorbs 300 J of heat from the surroundings?
3. $\Delta G = 0$ represents which chemical state?
4. Mention the conditions at which the efficiency of a heat engine can be 1.
5. What is the relationship between K_c and K_p ?
6. Give the relationship between half life and initial concentration of a second order reaction involving only one reactant.
7. What are spontaneous process?
8. The value of F for an invariant system is -----

(1 x 8 = 8)

PART B

Answer any 6 (2 marks each)

9. Derive an expression for equilibrium constant of a reversible reaction.
10. Calculate the work done in Joules, when a gas is allowed to expand from a volume of 2 L to 5 L against a constant external pressure of 1 atm.
11. Calculate the value of γ of an ideal gas, if its heat capacity at constant volume is given as $C_v = 2.5R$
12. The enthalpy change for the transition of liquid water to steam is 40.8 kJmol^{-1} at 373K. Calculate the entropy change for the process.
13. What do you mean by triple point? What is the temperature and pressure of water system at triple point?
14. State first law of thermodynamics and give its mathematical expression
15. What is the effect of pressure on :
(a) the transition temperature of rhombic sulphur, and
(b) the melting point of monoclinic sulphur.
16. Differentiate between intensive and extensive properties.

(2 x 6 = 12)

PART C

Answer any 4 (5 marks each)

17. Prove that the entropy criteria of the universe for reversible and irreversible processes is $\Delta S_{\text{universe}} \geq 0$.
18. Derive the entropy criteria of the system for equilibrium and spontaneity.

19. Discuss in details the factors which influence the rate of reactions. Explain the role of catalyst in detail for determining the rate of reaction.
20. Discuss the Joule-Thomson effect of real gases, based on the thermodynamic expression relating Joule-Thomson coefficient and enthalpy change.
21. Explain the characteristics of chemical equilibrium.
22. One mole of an ideal gas ($C_v = 12.55 \text{ JK}^{-1}\text{mol}^{-1}$) at 350 K is compressed adiabatically and reversibly to one fifth of the original volume. Calculate the final temperature of the gas.

(5 x 4 = 20)

PART D

Answer any 2 (10 marks each)

23. State and explain phase rule. Draw and explain the phase diagram for lead-silver system. Discuss the practical application of this phase diagram.
24. a) Derive expressions for entropy changes of an ideal gas with change in P, V and T.
b) Obtain expressions for isothermal, isobaric and isochoric processes.
25. What are zero order and first order reactions? Give examples ? Derive the integrated rate law expressions for zero and first order reactions?
26. Derive Gibbs-Duhem equation and explain its significance.

(10 x 2 = 20)