Reg. No……..... Name…… **26U4173**

B A, BSC, BCOM DEGREE END SEMESTER EXAMINATION – MARCH 2026

UGP (HONS.) SEMESTER – 4: – DISCIPLINE SPECIFIC COURSE

COURSE: 24UCHEDSC206: PHYSICAL CHEMISTRY-II

(For Regular 2024 Admission)

Time: 2 Hours Max. Marks: 70

SECTION A

Answer all questions. Each question carries 1 mark

1. What is meant by an extensive property in thermodynamics? (U CO1)
2. State second law of thermodynamics. (A CO2)
3. Write Gibbs –Duhem equation and mention its significance. (A CO2)
4. Why does the entropy of universe increasing? (A CO2)
5. Give the Gibb's energy criterion for a) equilibrium state, b) spontaneity. (A CO2)
6. Define critical solution temperature. (A CO3)
7. What is meant by activation energy of a reaction? (U CO4)
8. Which is the rate-determining step of a complex reaction? (U CO4)
9. Using an example, explain the concept of autocatalysis. (U CO4)
10. Express rate equation of a reaction aA + bB → Products. (U CO4)

(1 x 10 = 10)

SECTION B

Answer any Five questions. Each question carries 3 marks

11. Differentiate between reversible and irreversible process. (U CO1)
12. The enthalpies of formation of CO(g) and CO_2(g) are respectively -110.5 and -393.5 kJ/mol. Calculate enthalpy of combustion of CO. (U CO1)
13. Calculate K_c for the reaction N_2O_4 (g) ↔ $2NO_2$ (g) for which K_p = 0.157 atm at 300K. (A CO2)
14. Discuss the physical significance of Helmholtz energy and Gibbs energy. (A CO2)
15. Draw the phase diagram of water system and apply phase rule on areas and curves. (A CO3)
16. Distinguish between the terms 'triple point' and 'eutectic point' as applied to phase studies. (A CO3)

17. Explain steady state approximation in kinetics. (U CO4)

18. Derive integrated rate equation for a zero order reaction. (A CO4)

(3 x 5 = 15)

SECTION C

Answer any Five questions. Each question carries 6 marks

19. One mole of an ideal gas (C_v =12.55$JK^{-1}mol^{-1}$) at 350 K is compressed adiabatically and reversibly to one fifth of the original volume. Calculate a) final temperature of the gas, b) ΔU. (U CO1)

20. Obtain an expression for the entropy change in the isothermal reversible expansion of an ideal gas. (A CO2)

21. Derive Clausius - Clapeyron equation. (A CO2)

22. a) The equilibrium constant of a reaction doubles on raising the temperature from 25^oC to 35 ^oC. Calculate ΔH^o of reaction? b) The Gibbs energy change for a process at 300K and 323K are -150kJ/mol and-127kJ/mol respectively. Calculate the change in enthalpy for the reaction at 300K. (A CO2)

23. Explain the phase diagram of naphthalene-biphenyl system (A CO3)

24. Discuss the significance of Arrhenius parameters and account for the influence of temperature on reaction rate on the basis of Arrhenius equation. (U CO4)

25. Describe the Lindemann theory of unimolecular reactions. (U CO4)

26. The half-life of a first order reaction A → B is 20 minutes. What percentage of A remains after 2 hours? (U CO4)

(6 x 5 = 30)

SECTION D

Answer any One question. Each question carries 15 marks

27. a) Derive Kirchhoff's equation and arrive at its integrated form, b) Describe the liquefaction of gases based on the Joule–Thomson effect. (U CO1)

28. Sketch phase diagram of ferric chloride-water system. Apply phase rule and give the detail of phases coexists in equilibrium at various curves and points in phase diagram. (A CO3)

(15 x 1 = 15)