***FINAL EXAM* QUESTIONS SET FOR «PHYSICAL AND COLLOIDAL CHEMISTRY 1,2»**

1. Introduction to adsorption. *(Keywords: adsorption process, surface phenomena, adsorbent and adsorbate, physisorption vs chemisorption, adsorption isotherms)*
2. Defining colloidal chemistry. *(Keywords: colloidal particles, dispersion mediums, tyndall effect, stability of colloids, interfacial chemistry)*
3. Objectives of physical chemistry. *(Keywords: molecular structure analysis, thermodynamic laws, chemical reactions, energy transformations, kinetic studies)*
4. Objectives of colloidal chemistry. *(Keywords: particle stability, colloid interactions, emulsion formation, micelle behavior, colloidal applications)*
5. Branches of physical chemistry. *(Keywords: chemical thermodynamics, quantum mechanics, electrochemistry, surface chemistry, statistical mechanics)*
6. Thermodynamics in physical chemistry. *(Keywords: energy conservation, thermal equilibrium, entropy dynamics, phase transitions, work-energy relationships)*
7. Applications of physical chemistry. *(Keywords: catalysis in reactions, material synthesis, energy storage systems, environmental chemistry, pharmaceutical applications)*
8. Introduction to thermodynamics. *(Keywords: energy transformations, system and surroundings, heat and work, state functions, equilibrium principles)*
9. First law of thermodynamics. *(Keywords: energy conservation, internal energy, heat transfer, work in systems, closed systems analysis)*
10. Energy and its forms. *(Keywords: kinetic energy, potential energy, thermal energy, chemical energy, energy transformations)*
11. Work and heat. *(Keywords: work-energy principle, heat transfer mechanisms, path-dependent properties, thermal equilibrium, energy conversion)*
12. Internal energy concept. *(Keywords: total energy of a system, state function, thermodynamic equilibrium, energy conservation, microscopic interactions)*
13. Closed and open systems. *(Keywords: energy exchange, matter transfer, isolated systems, boundary conditions, thermodynamic system types)*
14. Thermodynamic processes. *(Keywords: Isothermal process, Adiabatic process, Isobaric process, Isochoric process, Cyclic processes)*
15. Reversible, irreversible processes. *(Keywords: system equilibrium, energy dissipation, path-dependency, thermodynamic efficiency, process reversibility)*
16. Enthalpy and its applications. *(Keywords: heat at constant pressure, reaction enthalpy, enthalpy changes, phase transitions, heat of combustion)*
17. Specific heat capacity. *(Keywords: heat absorption, temperature change, material properties, thermal capacity, energy transfer)*
18. Spontaneous, non-spontaneous processes. *(Keywords: entropy changes, gibbs free energy, thermodynamic favorability, energy gradients, equilibrium conditions)*
19. The second law of thermodynamics. *(Keywords: entropy increase, irreversible processes, thermodynamic direction, heat engines, energy degradation)*
20. Porous materials and adsorption. *(Keywords: surface area analysis, adsorption capacity, microporous materials, mesoporous structures, material characterization)*
21. Applications of chemical thermodynamics. *(Keywords: reaction feasibility, energy resource management, industrial processes, biological systems, sustainability studies)*
22. The second law of thermodynamics. *(Keywords: entropy increase, irreversible processes, thermodynamic direction, heat engines, energy degradation)*
23. The concept of entropy. *(Keywords: disorder measurement, energy dispersal, spontaneity criteria, entropy in systems, thermodynamic equilibrium)*
24. Reversible and irreversible processes. *(Keywords: energy conservation, dissipative forces, path independence, entropy production, equilibrium conditions)*
25. The Carnot cycle and Carnot efficiency. *(Keywords: idealized heat engines, efficiency limits, reversible cycles, thermodynamic work, heat reservoirs)*
26. The thermodynamic temperature scale. *(Keywords: absolute zero, kelvin scale, thermal energy measurement, temperature and entropy, heat transfer correlation)*
27. Introduction to thermodynamics of phase equilibrium. *(Keywords: phase transitions, equilibrium conditions, thermodynamic potentials, clapeyron equation, phase rule applications)*
28. Gibbs phase rule and its application. *(Keywords: phase diagrams, degrees of freedom, component analysis, system constraints, equilibrium phases)*
29. Ideal vs non-ideal solutions. *(Keywords: raoult’s law, activity coefficients, solution behavior, colligative properties, deviation from ideality)*
30. Liquid-liquid equilibria in two-component systems. *(Keywords: mutual solubility, phase separation, thermodynamic modeling, binary systems, equilibrium composition)*
31. Solid-Liquid equilibria in two-component systems. *(Keywords: binary phase diagrams, solubility limits, solid-liquid interface, thermodynamic equilibrium, component interaction)*
32. Freezing point depression and boiling point elevation. *(Keywords: colligative properties, solute-solvent interactions, cryoscopic constant, ebullioscopic constant, solution behavior)*
33. Introduction to two-component solid systems. *(Keywords: binary systems, phase coexistence, solid solutions, phase diagrams, thermal analysis)*
34. Constructing phase diagrams. *(Keywords: phase boundaries, equilibrium states, thermodynamic properties, experimental data, systematic analysis)*
35. Eutectic and peritectic systems. *(Keywords: eutectic point, peritectic reaction, phase transitions, solid-liquid equilibrium, thermodynamic modeling)*
36. Determining phase compositions. *(Keywords: lever rule, component distribution, phase fraction analysis, system equilibrium, experimental methods)*
37. Colligative properties of non-electrolyte solutions. *(Keywords: vapor pressure lowering, boiling point elevation, freezing point depression, osmotic pressure, solvent properties)*
38. Characteristics of non-electrolytes. *(Keywords: molecular solutions, no ionization, electrical conductivity absence, solubility factors, thermodynamic behavior)*
39. Practical applications of boiling point elevation. *(Keywords: food preservation, industrial processes, cryoscopic analysis, solution-based systems, energy optimization)*
40. Freezing point depression. *(Keywords: cryoscopic properties, solution freezing, colligative effects, concentration dependency, thermodynamic implications)*
41. Introduction to electrolyte solutions. *(Keywords: ionization process, electrical conductivity, dissociation in water, strong and weak electrolytes, ionic interactions)*
42. Electrochemical potential and Nernst equation. *(Keywords: ionic activities, electrode potential, redox reactions, thermodynamic equilibrium, electrochemical cells)*
43. Corrosion and electrochemical protection. *(Keywords: metal oxidation, anodic and cathodic reactions, protective coatings, galvanic series, electrochemical mechanisms)*
44. Properties of electrolyte solutions. *(Keywords: conductivity measurements, osmotic pressure, colligative effects, ionic mobility, electrochemical behavior)*
45. Classification of electrodes. *(Keywords: reference electrodes, indicator electrodes, metallic electrodes, gas electrodes, redox electrodes)*
46. Oxidation and reduction reactions. *(Keywords: electron transfer, redox pairs, electrochemical series, oxidation states, reaction mechanisms)*
47. Electrode potential and chemical activity. *(Keywords: ion concentration, standard potentials, activity coefficients, equilibrium conditions, electrochemical calculations)*
48. Standard electrode potential. *(Keywords: half-cell reactions, reference electrodes, nernst equation, redox potentials, electrochemical measurements)*
49. Introduction to reaction kinetics. *(Keywords: reaction rates, rate laws, activation energy, reaction mechanisms, kinetic modeling)*
50. Temperature and reaction rate. *(Keywords: Arrhenius equation, activation energy, temperature dependency, reaction speed, thermal effects)*
51. Pressure and reaction rate. *(Keywords: gas-phase reactions, pressure dependency, collision frequency, reaction mechanism, equilibrium shifts)*
52. Increasing reaction rates. *(Keywords: catalysis, temperature effects, concentration changes, pressure adjustments, reaction pathway optimization)*
53. Introduction to colloid chemistry. *(Keywords: colloid formation, particle size effects, stabilization mechanisms, surface interactions, interfacial phenomena)*
54. Importance of colloid chemistry. *(Keywords: industrial applications, environmental systems, biomedical uses, food technology, nanotechnology relevance)*
55. Dispersed systems and their significance. *(Keywords: particle dispersion, homogeneous vs heterogeneous, system stability, phase distribution, application fields)*
56. Homogeneous and heterogeneous Dispersions. *(Keywords: single-phase systems, multi-phase systems, particle size distribution, system properties, stabilization techniques)*
57. Suspensions and emulsions. *(Keywords: particle suspension, emulsion stability, phase separation, surfactant roles, application areas)*
58. Defining surface tension. *(Keywords: intermolecular forces, surface energy, liquid interfaces, capillary action, surface phenomena)*
59. Introduction to adsorption. *(Keywords: adsorption mechanisms, surface activity, adsorption isotherms, physisorption and chemisorption, adsorption applications)*
60. Types of adsorption. *(Keywords: physisorption, chemisorption, monolayer adsorption, multilayer adsorption, dynamic adsorption)*