

**MJD Govt. College Taranagar (Churu)**  
**Department of Chemistry**  
**B.Sc.-I (Syllabus)**  
**PHYSICAL CHEMISTRY**  
**PAPER-III**

**Unit-I**

**Mathematical Concepts & Computers :**

**(a) Mathematical Concepts**

Logarithmic relations, curve, sketching linear graphs and calculations of slopes, differentiation of functions like  $Kx$ ,  $ex$ ,  $X^n$ ,  $\sin x$ ,  $\log x$ ; maxima and minima, partial differentiation and reciprocity relations. Integrations of some useful/relevant functions; permutations and combinations, Factorials. Probability

**(b) Computers**

General introduction to computers, different components of a computer, hardware and software, input and output devices; binary numbers and arithmetic, introduction to computer languages, Programming operating systems.

**Unit-II**

**(a) Gaseous States :** Postulates of kinetic theory of gases, deviation from ideal behaviour, Vander-waals equation of state.

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**Critical Phenomena :** PV isotherms of real gases, continuity of states, the isotherms of Vander-waals equation, relationship between critical constants and Vander-waals constants, the law of corresponding states, reduced equation of state.

**(b) Molecular Velocities :** Root mean square velocity, average and most probable velocities. Qualitative discussions of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liquification of gases (based on joule - thomson effect).

**Unit-III**

**(a) Liquid State:**

Intermolecular forces, structure of liquids (a qualitative description). Structural differences between solids, liquids and gases, Liquid Crystals : Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholestric phases.

Thermography and seven- segment cell.

**(b) Colloidal State:**

Definition of colloids, classification of colloids.

**Solids in liquids (sols) properties** - Kinetic, optical and electrical stability of colloids, protective action, Hardy - Schultze law, gold number.

**Liquids in liquids (emulsions)** : Type of emulsions, preparation and properties of Emulsions.

**Liquids in solids (gels)** : Classification, preparation and properties, inhibition, general applications of colloids.

### **Unit-IV**

**Solid State** : Definition of space lattice, unit cell.

Laws of crystallography- (i) Law of constancy of interfacial angles, (ii) Law of rationality of

indices, (iii) Law of symmetry. Symmetry elements in crystals.

X-ray diffraction by crystals. Derivation of Bragg equation. Determination of Crystal structure of NaCl, KCl and CsCl (Laue's method and powder method).

### **Unit-V**

**Chemical kinetics and catalysis**

Chemical kinetics and its scope, rate of reaction, factors influencing the rate of reaction concentration, temperature, pressure, solvent, light, catalyst, concentration dependence of rates, mathematical characteristics of simple chemical reactions: zero order, first order, second order, pseudo order, half life and mean life. Determination of the order of reaction differential method, method of integration, method of half life period and isolation method. Radioactive decay as a first order phenomenon.

**Experimental methods of chemical kinetics** : Conductometric, potentiometric, optical methods, polarimetric and spectrophotometric.

**Theories of chemical kinetics:** Effect of temperature on rate of reaction, Arrhenius concept of activation energy.

Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis). Expression for the rate constant based on equilibrium constant and thermodynamic aspects.

Catalysis, characteristics of catalyzed reactions, classification of catalysis, miscellaneous examples.

