

कार्यालय प्रमुख अभियंता
लोक स्वास्थ्य यांत्रिकी विभाग
छत्तीसगढ़ रायपुर

**Syllabus for Chemist- Public Health Engineering
Part -I**

100 Marks

Chemistry Syllabus:-

- 1. Inorganic Chemistry:-** Atomic number, Electronic configuration of elements, Aufbau principle, Hund's Multiplicity Rule, Pauli's Exclusion principle, Long form of periodic table, classification of elements, Atomic and ionic radii, ionization potential, electron affinity and electronegativity. Natural and artificial radioactivity, Nuclear fission and fusion, Electronic theory of valency Elementary ideas about sigma and pi bonds, hybridization and directional nature of covalent bonds, Oxidation states and oxidation number, Common oxidising and reducing agents, Ionic equations, Bronsted and Lewis theories of acids and bases. Chemistry of the common elements and their compounds treated especially from the point of view of periodic classification, principles of extraction, isolation of common elements. Werner's theory of coordination compounds, Electronic configurations of complexes involved in the common metallurgical and analytical operation, Structures of hydrogen peroxide, persulfuric acids, diborane, aluminium chloride and the important oxyacids of nitrogen, phosphorus, chlorine and sulphur, Inert gases; Isolation and chemistry, Principles of inorganic chemical analysis, sulphuric acid, cement, glass and artificial fertilizers.
- 2. Organic Chemistry:-** Modern concepts of covalent bonding. Electron displacements, inductive, mesomeric and hyperconjugative effects. Effect of structure on dissociation constants of acids and bases, Resonance and its applications to organic chemistry, principles of organic reaction mechanisms, addition, nucleophilic and electrophilic substitution. Alkanes, alkenes and alkynes, petroleum as a source of organic compounds. Simple derivatives of aliphatic compounds; Alcohols, Aldehydes, Ketones, acids, halides, esters; ethers, amines, acid anhydride, chlorides and amides monobasic hydroxy and amino acids. Malonic and acetoacetic esters, unsaturated and dibasic acids. Lactic, tartaric, citric, maleic and fumaric acids. Carbohydrates; classification and general reactions, Glucose, fructose and sucrose. Organometallic compounds, Grignard reagents. Stereo-chemistry; optical and geometrical isomerism. Concept of conformation Benzene and its simple derivatives; Toluene, Xylenes, phenols, halides, nitro and amino compounds. Benzoic, salicylic, cinnamic, mandelic and sulphonic acids. Aromatic aldehydes and ketones, Diazo, azo, hydrazo compounds: Aromatic substitution. Naphthalene, pyridine and quinoline; synthesis, structure and simple reactions. Simple chemistry of economically important materials e.g. coal tar, starch, oils, Fats and protein.
- 3. Physical Chemistry:-** Kinetic theory of gases and gas laws, Maxwell's law of distribution of velocities, van der Waals' equation, law of corresponding states. Liquefaction of gases, specific heats of gases, Ratio of c_p/c_v . Thermodynamics, the first law of thermodynamics; Isothermal and adiabatic expansions, Enthalpy, Heat capacities, Thermochemistry, Heats of reaction, formation, solution and combustion, calculation of bond energies, Kirchhoff's equation, Criteria for

spontaneous change, Second law of thermodynamics, Entropy, Free energy, Criteria of chemical Equilibrium.

Solutions, Osmotic pressure, lowering of vapour pressures, depression of freezing point, elevation of boiling point, Determination of molecular weight in solution Association and dissociation of solutes.

Chemical equilibria, law of mass action and its application to homogeneous and heterogeneous equilibria, Le Chatelier principle and its application of chemical equilibrium, chemical kinetics : Molecularity and order of a reaction, First order and second order reactions, Determination of order of a reaction, temperature coefficient and energy of activation.

Electrochemistry: Faraday's laws of electrolysis, conductivity of an electrolyte, equivalent conductivity and its variation with dilution; solubility of sparingly soluble salts electrolytic dissociation, Ostwald's dilution law; anomaly of strong electrolytes; solubility product strength of acids and bases; hydrolysis of salts; hydrogen ion concentration, buffer action, theory of indicators.

Reversible cells, standard hydrogen and calomel electrodes, Electrodes and redox-potentials, concentration cells, Determination of pH, Transport number, ionic product of water potentiometric titrations.

Phase rules: Explanation of the terms involved. Application to one and two components system, Distribution law,

Colloids; General nature of colloidal solutions and their classification, general methods of preparation and properties of colloids, coagulation, protective action and gold number, Absorption

Catalysis: Homogeneous and heterogeneous catalysis promoters, poisoning.

Photochemistry: laws of photochemistry, simple numerical problems, simple numerical and conceptual problems based on the full syllabus.

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Part -II

50 Marks

General Studies Syllabus

The paper on general studies will include questions covering the following field of knowledge.

- General science- Questions on general science should be such which could be conveniently answered by a graduate who has not made study of scientific disciplines.
- Current events of national and international importance- General understanding of current national and international political events is expected from the candidates,
- History of India - It will cover questions from Indus valley civilization to the attainment of independence on social, economic and political aspects.
- Geography of India (special reference to chhattisgarh)- It will comprise physical features, climate, drainage, forest, mineral, industry, agriculture, people and their occupation
- Indian polity and socio-economic system- It will test knowledge of Indian constitution, party system and pressure groups, panchayati raj, Indian social system and social inequality and economic planning and economic system
- Sports- Questions on sports will cover national and international sport activities.
- General mental ability- On general mental ability reasoning and analytical abilities will be tested
- Fundamentals of Statistics- Questions relating to fundamental of statistics will be based on the elementary knowledge of Mean, Median and Mode.

