Syllabus for Uchcha Madhyamic Paper II STET 2023

Unit I Subject Chemistry **100 Marks**

Physical Chemistry

Unit-1 Gaseous State

- Van der Waals equation of state
- Relationship between critical constants and Van der Waals constants
- Root mean square
- Average and most probable velocities

Unit-2 Solid State

- Derivation of Bragg equation
- Determination of crystal structure of NaCl, KCl and CsCl

Unit-3 Chemical Kinetics and Catalysis

- Concentration dependence of rates
- Mathematical characteristics of zero order, first order, second order, pseudo order, half life and mean life.
- Effect of temperature on rate of reaction, Arrhenius equation
- Expression for the rate constant based on equilibrium constant and thermodynamics aspects.
- Classification of catalysis

Unit-4 Colligative properties of dilute solutions

- The thermodynamics derivations of Rault's law relative lowering vapour pressure, osmotic pressure, elevation in boiling point, depression in freezing point.

Unit-5 Thermodynamics

- Calculation of w, q, dU & dH for the expansion of ideal gases under isothermal and adiabetic conditions for reversible process.
- Hess's Law of heat summation, Heat of reaction at constant pressure and at constant volume.
- Enthalpy of neutralization, Bond dissociation energy
- Gibbs function(G) and Helmholtz function (A) as thermodynamic quantities
- Variation of G and A with P, V and T.

Unit-6 Chemical Equilibrium

- Equilibrium constant
- Le Chatelier's principle

Unit-7 Phase Equilibrium

- Degree of freedom

- Derivation of Gibbs phase rule, phase equlibria of one component system – Water

Unit-8 Electrochemistry

- Specific conductance and equivalent conductance
- Measurement of equivalent conductance, variation of equivalent and specific conductance with dilution.
- Arrhenius theory of electrolyte dissociation
- Ostwald's dilution law
- Nernst equation, derivation of cell E.M.F and single electrode potential
- Calculation of thermodynamic quantities and cell reactions(ΔG, ΔH and K)

Inorganic Chemistry

Unit-1 Atomic Structure

- Quantum numbers, shapes of s, p, d orbitals
- Aufbau and Pauli exclusion principles, Hund's multiplicity rule
- Electronic configuration of elements
- Schrondinger wave equation, significance of wave function

Unit-2 Periodic properties

- Atomic and ionic radii
- Ionization energy
- Electron affinity and electronegativity

Unit-3 Chemical Bonding

- Various types of hybridization and shapes of simple inorganic molecules and ions.
- Valence shell electron pair repulsion (VSEPR) theory of NH_3 , H_3O^+ ,SF_4 , ClF_3
- Homonuclear and heteronuclear (CO and NO) diatomic molecules
- Radius ratio effect and coordination number
- Lattice defects
- Semiconductors
- Fajan's rule
- Hydrogen bonding , Van der Waals forces

Unit-4 S, P Block Elements and noble gases

- Comparative study , Salient features of hydrides of s block elements
- Hydrides, oxides , oxyacids and halides of groups 13-16, hydrides of boron- diborane , borazine, fullerenes, fluorocarbons, Interhalogens.

- Structure and bonding of xenon compounds.

Unit-5 Chemistry of Elements of Transition series

- Coordination numbers and geometry of first transition series
- Magnetic behaviour , spectral properties of second and third transition series.

Unit-6 Coordination compound

- Isomerism coordination compound
- Valence bond theory of transition metal complexes.
- Chelates
- Crystal field splitting in octahedral, tetrahedral and square planar complexes.
- Types of magnetic behaviour of transition metal complexes.
- Electronic spectrum of $[Ti(H_2O)_6]^{3+}$ complex ion.

Unit-7 Acid and Bases

- Arrhenius, Bronsted-Lowry , Lewis concepts of acids and bases.

Unit-8 Environmental at bio inorganic chemistry

- Ozone Depletion, Green house effect, Acid rain, smog
- Haemoglobin, myoglobin and nitrogen fixation.

Organic Chemistry

Unit-1 Structure and Bonding

- Hybridisation , bond lengths and bond angles, bond energy , localized and delocalized chemical bond, Van der Waals interactions.
- Resonance, hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding.

Unit-2 Mechanism of Organic Reactions

- Types of organic reactions, Reagents- electophiles and necleophiles
- Reactive intermediates- Carbocations, carbanions, free radicals, carbenes, arynes and nitrenes.

Unit-3 Stereochemistry

- Molecular chirality, optical activity, enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, meso compounds.
- D & L and R & S system of nomenclature
- Geometrical isomerism in alicyclic compounds

Unit-4 Alkane and Cyclic molecules

- IUPAC nomenclature , Isomerism and alkane , Wurtz reaction, Kolbe reaction , free radical halogenation of alkanes

Unit-5 Alkenes, Cycloalkenes and Dienes and Alkynes

- Mechanism of dehydration of alcohols , dehydrohalogenation of alkyl halides, Saytzeff rule
- Electrophilic and free radical additions
- Markownikoff's rule, hydroboration-oxidation, Epoxidation, ozonolysis , hydration, hydroxylation and oxidation with $KMnO_4$.
- Substitution of allylic and vinylic positions of alkenes.
- Polymerisation, Diels-Alder reaction.
- Reaction of alkynes, Hydroboration-oxidation, metal -ammonia reductions, oxidation and polymerization.

Unit-6 Arenes and Aromaticity

- Aromaticity and Huckel rule , Birch reduction

Unit-7 Alkyl and Aryl Halides

- S_N2 and S_N1 reaction, The addition elimination and the elimination addition mechanisms of nucleophilic aromatic substitution reactions.
- Synthesis and uses of DDT and BHC.

Unit-8 Oxygen containing molecules

- Classification and nomenclature of elements .
- Methods of formation of monohydric alcohols and their reaction
- Chemical reaction of vicinal glycols, oxidative cleavage [$Pb(OAc)_4$ and HIO_4] and pinacol-pinacolone rearrangement.
- Comparative acidic strengths of alcohols and phenols.
- Electrophilic aromatic substitution, acylation and carboxylation.
- Fries rearrangement, Claisen rearrangement, Gatterman synthesis, Reimer-Tierman reaction.
- Nomenclature of ethers and their formation.
- Synthesis of aldehydes and ketones
- Mechanism of nucleophilic additions to carbonyl group, benzoin, aldol, perkin and knoevenagel condensations, wittig reaction , mannich reaction.
- Oxidation of aldehydes, Baeyer-villiger oxidation of ketones, Cannizzaro reaction, clemmensen, wolff-kishner, $LialH_4$ and $NaBH_4$, Halogenation of enolizable ketones.
- Preparation and reaction carboxylic acids and their derivatives, mechanism of decarboxylation, reduction of carboxylic acids.
- Mechanism of esterification and hydrolysis

Unit-9 Organic compound and nitrogen

- Structure and nomenclature of amines , separation and mixture of primary , secondary and tertiary amines , basicity of amines.
- Reductive animation of aldehydic and ketonic compounds , Gabriel-phthalimide reaction , Hofmann bromamide reaction.
- Reaction of amines with nitrous acid , aryl diazonium salts and azo coupling.

Unit-10 Organometallic compounds

- Grignard reagents-formation , structure and chemical reactions

Unit-11 Heterocyclic compounds

- Pyrrole , furan thiophene and pyridine- methods of synthesis and chemical reaction , comparision of basicity
- Preparation and reactions of indole, quinolone and isoquinoline – Fisher indole synthesis, Skraup synthesis

Unit-12 Bio molecules

- Monosaccharides, osazone , Erythro and threo diastereomers, maltose, sucrose,lactose and starch
- Acid-base behaviour of amino acids , constituents of nucleic acids, double helical structure of DNA.

Unit-13 Fat, Oils and Detergents

- Glycerides, unsaturated oils , saponification value, iodine value, soap and synthetic detergents.

Unit-14 Synthetic Polymers and Dyes

- Natural and synthetic rubbers , polyeters, polyamides , phenol formaldehyde resins, urea formaldehyde resins and Zeigler-Natta polymerization.
- Chemistry and synthesis of methyl orange and phenolphthalein, Alizarin and indigo.

Syllabus for Art of Teaching and Other Skills STET 2023

Unit II Art of Teaching, Other skills	**Marks 50**
(A) Art of Teaching	**Marks 30**
(B) Other skills	**Marks 20**

A. Art of Teaching

1. Teaching & Learning:- Meaning, Process & Characteristics.
2. Teaching Objectives and Instructional objectives: Meaning & Types, Blooms Taxonomy.
3. Teaching Methods: - Types and its Characteristics, Merit, and demerits of Methods.
4. Lesson Plan: - Types and Format & Various Model.
5. Microteaching & Instructional analysis.
6. Effective ecosystem of Classroom.

7. Textbook and library
8. Qualities of Teacher.
9. Evaluation & Assessment for learning.
10. Curriculum.
11. Factors affecting teaching and learning.
12. Teaching Aids and Hands on learning.

B. Other skills

1. General Knowledge,

2.Environmental Science

3. Mathematical aptitude,

4.logical Reasoning