

परिशिष्ट-1

SYLLABUS FOR THE POST OF INTERMEDIATE LEVEL EXAM (PASHUDHAN PRASÁAR ADHIKARI, NIREEKSHAK, ADHIDARSHAK PRADARSHAK, SAHAYAK PRASHIKSHAN ADHIKARI (CHEMISRTY) etc.

UNIT-1

DIVERSITY OF LIVING WORLD:- Diversity of living organisms. Classification of the living organisms (Five kingdom classification, major groups and principles of classification within each kingdom). Systematics and binomial system of nomenclature, Salient features of animal (Non-chordates up to phylum level and chordates up to class level) and plant (major groups; Angiosperm up to class) classification, viruses, viroids, lichens, Botanical garden, herbaria, zoological parks and museums.

Current general knowledge and current scientific advancement with above topic.

VacancySarkari.com

UNIT-2

STRUCTURAL ORGANISATION IN ANIMALS AND PLANTS: Tissues in animals and plants. Morphology, anatomy and functions of different parts of flowering plants: root, stem, leaf, inflorescence, flower, fruit and seed. Morphology, anatomy and functions of different organ systems of an annelid (earthworm), an insect (cockroach) and an amphibian (frog).

Current general knowledge and current scientific advancement with above topic.

UNIT-3

CELL: STRUCTURE AND FUNCTION: Cell theory, prokaryotic and eukaryotic cell, cell wall, cell membrane and cell organelles (plastids, mitochondria, endoplasmic reticulum, Golgi bodies/dictyosome, ribosomes, lysosomes, vacuoles, centrioles) and nuclear organization. Cell cycle, mitosis, meiosis. Basic chemical constituents of living bodies. Structure and function of carbohydrates, proteins, lipids and nucleic acids. Enzymes: types, properties and functions.

Current general knowledge and current scientific advancement with above topic.

UNIT-4

PLANT PHYSIOLOGY: Movement of water, food, nutrients and gases, plants and water relations, mineral nutrition, respiration, photosynthesis, plant growth and development.

HUMAN PHYSIOLOGY: Digestion and absorption, breathing and respiration, body fluids and circulation, excretory products and elimination, neural control and coordination, chemical coordination and regulation.

Current general knowledge and current scientific advancement with above topic.

UNIT-5

REPRODUCTION:

Reproduction in organisms: Asexual and sexual reproduction. Sexual reproduction in flowering plants: Structure of flower, pollination, fertilization, development of seeds and fruits, apomixis and polyembryony. Human Reproduction: Reproductive system in male and female, menstrual cycle, production of gametes, fertilization, implantation, embryo development, pregnancy, parturition and lactation. Reproductive Health: Population and birth control, contraception and MTP, sexually transmitted diseases (STD), infertility.

Current general knowledge and current scientific advancement with above topic.

VacancySarkari.com



VacancySarkari.com

UNIT-6

GENETICS AND EVOLUTION

Mendelian inheritance. Chromosome theory of inheritance, deviation from Mendelian ratio (Gene interaction incomplete dominance, co-dominance, multiple alleles). Sex determination in human beings and Honey bee. Linkage and crossing over. Inheritance pattern: Mendelian disorders and chromosomal disorders in human. DNA and RNA, search for genetic material, genetic code, replication, transcription and translation. Gene expression and regulation. Genome and Human Genome Project, DNA finger printing. Evolution: Origin of life, Theories and evidences, Adaptive radiation, Mechanism of evolution, Origin and evolution of man.

Current general knowledge and current scientific advancement with above topic.

UNIT-7

BIOLOGY AND HUMAN WELFARE

Basic concept of immunology, vaccines. Pathogens, parasites, Cancer and AIDS, Adolescence and drug/alcohol abuse. Plant breeding, tissue culture, single cell protein, food production, animal husbandry. Microbes in household food processing, industrial production, sewage treatment, energy generation, biocontrol agents and biofertilizers.

Current general knowledge and current scientific advancement with above topic.

UNIT-8

BIOTECHNOLOGY AND ITS APPLICATION

Principle and process; Recombinant DNA Technology; Application of biotechnology in Health, Agriculture and Environment. Genetically Modified (GM) organisms. Biosafety issues.

Current general knowledge and current scientific advancement with above topic.

UNIT-9

ECOLOGY AND ENVIRONMENT

Ecosystems: components, types, energy flow, nutrients cycle and ecosystem services. Organism and population: Organism and its environment, population and ecological adaptations.

Biodiversity and Conservation: Biodiversity concept, patterns and importance, Loss of biodiversity, Conservation and management, Hot spots, endangered organisms. Protected Areas (Biosphere Reserves, National Parks and Sanctuaries), Wetlands. Environmental issues.

Pollution, Forest fires, floods and landslides in Uttarakhand- causes and remedies.

Current general knowledge and current scientific advancement with above topic.

UNIT-10

SOME BASIC CONCEPTS OF CHEMISTRY

General Introduction: Importance and scope of chemistry. Historical approach to particulate nature of matter, Laws of chemical combination: law of conservation of mass, law of constant proportion, law of multiple

VacancySarkari.com



proportion. Gay Lussac's gaseous law, Calculations based on these laws. Dalton's atomic theory: concepts of elements, atoms and molecules. Atomic and molecular masses, Equivalent weight (acid, base and salts). Mole concept and molar mass: percentage composition, empirical and molecular formula, chemical reactions and stoichiometric calculations. Avogadro's law. Calculations based on normality, molality, molarity, mole fraction and ppm.

Current general knowledge and current scientific advancement with above topic.

UNIT-11

STRUCTURE OF ATOM

Discovery of electron, proton and neutron; Atomic number, Isotopes, Isobars and Iso-electronic species. Atomic models (Thomson's, Rutherford's and Bohr's) and their limitations. Schrodinger's wave equation. Shells and subshells, Concept of orbitals, Shape of s, p and d orbitals, Quantum numbers, Aufbau's principle. Hund's rule, Pauli's exclusion principle. Dual nature of matter and light, de-Broglie's relationship, Heisenberg uncertainty principle. Electronic configuration of atoms and ions, Stability of half-filled and completely filled orbitals, Types of spectra (emission and absorption), Hydrogen spectrum and line spectra.

Current general knowledge and current scientific advancement with above topic.

UNIT-12

CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES; s AND p-BLOCK ELEMENTS

Development of periodic table, Modern periodic law and present form of periodic table. Trends of variation in properties of elements: atomic radii, ionic radii, ionization energy, electron gain enthalpy, electro negativity and oxidation state in groups and periods.

s and p-block elements: Introduction, diagonal relationship, Trends in chemical reactivity with oxygen, water, hydrogen and halogens. Some important compounds: Silicones, silicates and zeolites.

Current general knowledge and current scientific advancement with above topic.

UNIT-13

CHEMICAL BONDING AND MOLECULAR STRUCTURE

Types of Bonds (ionic, covalent and coordinate bonds), Bond parameters. Lewis's structure. Polar nature of covalent bond, Covalent character of ionic bond. Hybridization involving s, p, and d orbitals. Shapes and geometry of molecules and ions. Valence bond theory, Hydrogen bond, VSEPR theory, Molecular orbital theory (theory of homo nuclear diatomic molecules), Hydrogen bond

Current general knowledge and current scientific advancement with above topic.

UNIT-14

THERMODYNAMICS

Concepts of system and surrounding. Work, Heat, Energy, Extensive and Intensive properties, State functions. Thermodynamic process based on variables. First law of thermodynamics: internal energy, enthalpy, heat capacity and specific heat, calculation of ΔU and ΔH . Hess's law of constant heat summation and its applications.

VacancySarkari.com



Enthalpy of: bond formation, bond dissociation, combustion, atomization, sublimation, fusion. Concept of entropy. Criteria of spontaneity. Free energy change for spontaneous and non-spontaneous processes. Current general knowledge and current scientific advancement with above topic.

UNIT-15

EQUILIBRIUM

Equilibrium in physical and chemical processes, Dynamic nature of equilibrium. Law of mass action, Equilibrium constant, Factors affecting equilibrium, Le Chatelier's principle. Ionic equilibrium: ionization of acids and bases, degree of ionization, Ostwald law of dilution, Concept of pH (acid and base), Buffer solutions, Solubility product, Common ion effect (with illustrative examples)

Current general knowledge and current scientific advancement with above topic.

UNIT-16

Redox Reactions and Electrochemistry

Redox reactions: Concept of oxidation and reduction, Redox reactions, Oxidation number, Application of redox reactions.

Electrochemistry: Conductance in electrolytic solutions, Specific, molal and molar conductivity, Variations of conductivity with concentration, Kohlrausch's Law, Electrolysis and laws of electrolysis.

Electrochemical cell, Electrochemical series and its application, EMF of a cell, Standard electrode potential, Standard hydrogen electrode, Nernst's equation and its application, Fuel cell and corrosion. Dry cell: Electrolytic cells and Galvanic cells.

Current general knowledge and current scientific advancement with above topic.

UNIT-17

d AND f-BLOCK ELEMENTS AND COORDINATION COMPOUNDS

d and f-block elements: General Introduction, Electronic configuration, Characteristics of transition metals, General trend in properties of the first row transition metals: metallic character, ionization enthalpy, oxidation states, ionic radii, colour, catalytic property, magnetic properties, Interstitial compounds, Alloy formation. Preparation and properties of $K_2Cr_2O_7$ and $KMnO_4$.

Lanthanoids: Electronic configuration, Oxidation states, Chemical reactivity and Lanthanide contraction.

Actinoids: Electronic configuration and oxidation states.

Coordination compounds: Introduction, ligands, coordination number, colour, magnetic properties, (inner and outer orbital complexes), Shapes and geometry, IUPAC nomenclature of mononuclear coordination compounds, isomerism, Application of coordination compounds.

Current general knowledge and current scientific advancement with above topic.

UNIT-18

CHEMICAL KINETICS

Rate of a reaction, (average and instantaneous), Factors affecting the rate of reaction (concentration, temperature, surface area and catalyst), Order and molecularity of a reaction, Rate law and specific rate

constant, Integrated rate equation and half life period (Zero and first order reaction), Concept of collision theory.

Current general knowledge and current scientific advancement with above topic.

UNIT-19

GENERAL ORGANIC CHEMISTRY

General introduction, Methods of qualitative and quantitative analysis. Classification and IUPAC nomenclature of organic compounds. Fission of a covalent bond. Reagents: electrophiles and nucleophiles. Catenation. Electronic displacement in a covalent bond (inductive effect, electromeric effect, resonance, and hyperconjugation) and their applications. Reaction intermediates (free radicals, carbocations, and carbanions). Types of organic reactions (Substitution, addition, elimination and rearrangement). Isomerism and its types.

Alkanes: Nomenclature, isomerism, conformation (ethane only), Methods of preparation, Physical and chemical reactions including free radical mechanism of halogenation, Combustion and pyrolysis.

Alkenes: Nomenclature, Structure, Bonding and geometrical isomerism, Preparation and properties, Markownikov's rule and anti Markownikov's rule, Ozonolysis, Oxidation and Mechanism of electrophilic addition reaction.

Alkynes: Nomenclature, structure and bonding, Methods of preparation, Physical and chemical properties, Acidic character of alkynes.

Current general knowledge and current scientific advancement with above topic.

UNIT-20

AROMATIC HYDROCARBONS

Introduction, IUPAC nomenclature, Aromaticity and Huckel's rule. Benzene: Methods of preparation, Physical and chemical properties, Mechanism of electrophilic substitution reaction. (nitration, sulphonation, Friedel craft's alkylation and acylation, ortho, para and meta directing groups in monosubstituted benzene.

Current general knowledge and current scientific advancement with above topic.

UNIT-21

HALOALKENES AND HALOARENES

Classification, IUPAC nomenclature, nature of C-X bond, Methods of preparation, Physical and chemical properties, Substitution reactions (SN^1 and SN^2), Polyhalogen compounds.

Current general knowledge and current scientific advancement with above topic.

VacancySarkari.com

Unit-22

OXYGEN AND NITROGEN CONTAINING ORGANIC COMPOUNDS

Alcohols: Classification, IUPAC nomenclature, Distinguish between primary, secondary and tertiary alcohols, Methods of preparation, Physical and chemical properties along with name reactions.

Ether: Classification, IUPAC nomenclature, Methods of preparation, Physical and chemical properties along with name reactions.

Phenol: IUPAC nomenclature, Methods of preparation, Physical and chemical properties along with name reactions. Acidic character of phenol

Aldehydes and Ketones :IUPAC nomenclature, Methods of preparation, Physical and chemical properties along with name reactions.

Ester: IUPAC nomenclature, Methods of preparation, Physical and chemical properties along with name reactions.

Amines: Classification, IUPAC nomenclature, Methods of preparation, Physical and chemical properties along with name reactions. Distinguish between primary, secondary and tertiary amines.

Current general knowledge and current scientific advancement with above topic.

VacancySarkari.com

UNIT-23

APPLIED CHEMISTRY

Chemistry of carbohydrates, Chemistry of proteins, Lipids and Polymers.

Pollution, Air, water and soil pollution. Chemical reactions in atmosphere, Smog. Major atmospheric pollutants, Acid rain, Ozone layer depletion and its effect, Greenhouse effect and global warming, Pollution due to industrial wastes, Green chemistry as an alternative tool for reducing pollution, Strategy for control of environmental pollution.

Soil and its constituents, pH of soil, Fertilizers, Pesticides, Insecticides and Herbicides.

Tranquilizers, Analgesics, Antibiotics, Food preservatives, Colouring agents, Soap and detergents, Artificial sweeteners.

Current general knowledge and current scientific advancement with above topic.

