The syllabus is in tune with the syllabus introduced by the Board of Intermediate Education, TS, for Intermediate course with effect from the academic year 2017-2018(1st year) and 2018-2019 (2nd year) and is designed at the level of Intermediate Course and equivalent to (10+2) scheme of Examination conducted by Board of Intermediate Education, TS. The syllabus is designed to indicate the scope of subjects included for TS EAMCET 2019. The topics mentioned therein are not to be regarded as exhaustive. Questions may be asked in TS EAMCET-2019 to test the student's knowledge and intelligent understanding of the subject. The syllabus is applicable to students of both the current and previous batches of Intermediate Course, who desire to appear for TS EAMCET 2019.

BOTANY

1) DIVERSITY IN THE LIVING WORLD:

The living world: What is living? Diversity in the living world; Taxonomic categories and taxonomical aids.

Biological Classification: Five kingdom classification - Monera, Protista, Fungi, Plantae and Animalia, Three domains of life (six kingdom classification), Viruses, Viroids, Prions & Lichens.

Science of plants – Botany: Origin, Development, Scope of Botany and Branches of Botany.

Plant Kingdom: Salient features, classification and alternation of generations of the plants of the following groups - Algae, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms.

2) STRUCTURAL ORGANISATION IN PLANTS- MORPHOLOGY:

Morphology of flowering Plants

Vegetative: Parts of a typical Angiospermic plant; Vegetative morphology and modifications- Root, Stem and Leaf- types; Venation, Phyllotaxy.

Reproductive: Inflorescence - Racemose, Cymose and special types.

Flower: Parts of a flower and their detailed description; Aestivation, Placentation.

Fruits: Types- True, False and parthenocarpic fruits.

3) REPRODUCTION IN PLANTS:

Modes of Reproduction: Asexual reproduction, binary fission, Sporulation, budding, fragmentation, vegetative propagation in plants, Sexual reproduction, Overview of angiosperm life cycle.

Sexual Reproduction in Flowering Plants: Stamen, microsporangium, pollen grain. Pistil, megasporangium (ovule) and embryo sac; Development of male and female gametophytes. Pollination - Types, agents , Out breeding devices and Pollen - Pistil interaction. Double Fertilization; Post fertilisation events: Development of endosperm and embryo; development of seed, Structure of Dicotyledonous and Monocotyledonous seeds, Significance of fruit and seed. Special modes - Apomixis, parthenocarpy, polyembryony.

4) PLANT SYSTEMATICS:

Taxonomy of angiosperms: Introduction. Types of Systems of classification. Semi- Technical description of a typical flowering plant. Description of Families: Fabaceae, Solanaceae and Liliaceae.

5) CELL STRUCTURE AND FUNCTION:

Cell - The Unit of Life: Cell- Cell theory and cell as the basic unit of life- overview of the cell. Prokaryotic and Eukaryotic cells , Ultra Structure of Plant cell (structure in detail and functions in brief), Cell membrane, Cell wall, Cell organelles: Endoplasmic reticulum, Mitochondria, Plastids, Ribosomes, Golgi bodies, Vacuoles, Lysosomes, Microbodies, Centrosome and Centriole, Cilia, Flagella, Cytoskeleton and Nucleus. Chromosomes: Number, structural organization; Nucleosome.

Biomolecules: Structure and function of Proteins, Carbohydrates, Lipids and Nucleic acids.

Cell cycle and Cell Division: Cell cycle, Mitosis, Meiosis - significance.

6) INTERNAL ORGANISATION OF PLANTS:

Histology and Anatomy of Flowering Plants: Tissues - Types, structure and functions: Meristematic; Permanent tissues - Simple and Complex tissues. Tissue systems - Types, structure and function: Epidermal, Ground and Vascular tissue systems. Anatomy of Dicotyledonous and Monocotyledonous plants - Root, Stem and Leaf. Secondary growth in Dicot stem and Dicot root.

7) PLANT ECOLOGY:

Ecological Adaptations, Succession and Ecological Services: Introduction. Plant communities and Ecological adaptations: Hydrophytes, Mesophytes and Xerophytes. Plant succession. Ecological services - Carbon fixation, Oxygen release and pollination (in brief).

8) PLANT PHYSIOLOGY:

Transport in Plants: Means of Transport- Diffusion, Facilitated Diffusion, Passive symports and antiports, Active Transport, Comparison of Different Transport Processes, Plant-Water Relations- Water Potential, Osmosis, Plasmolysis, Imbibition, Long Distance Transport of Water- Water Movement up a Plant, Root Pressure, Transpiration pull, Transpiration-Opening and Closing of Stomata, Transpiration and Photosynthesis - a compromise, Uptake and Transport of Mineral Nutrients- Uptake of Mineral Ions, Translocation of Mineral Ions, Phloem transport: Flow from Source to Sink-The Pressure Flow or Mass Flow Hypothesis.

Mineral Nutrition: Methods to Study the Mineral Requirements of Plants, Essential Mineral Elements-Criteria for Essentiality, Macronutrients, Micronutrients, Role of Macro- and Micronutrients, Deficiency Symptoms of Essential Elements, Toxicity of Micronutrients, Mechanism of Absorption of Elements, Translocation of Solutes, Soil as Reservoir of Essential Elements, Metabolism of Nitrogen-Nitrogen Cycle, Biological Nitrogen Fixation, Symbiotic nitrogen fixation, Nodule Formation.

Enzymes: Chemical Reactions, Enzymatic Conversions, Nature of Enzyme Action, Factors Affecting Enzyme Activity, Temperature and pH, Concentration of Substrate, Classification and Nomenclature of Enzymes, Co-factors.

Photosynthesis in Higher Plants: Early Experiments, Site of Photosynthesis, Pigments involved in Photosynthesis, Light Reaction, The Electron Transport-Splitting of Water, Cyclic and Noncyclic Photo-phosphorylation, Chemiosmotic Hypothesis, Biosynthetic phase-The Primary Acceptor of CO_2, The Calvin Cycle, The C4 Pathway, Photorespiration, Factors affecting Photosynthesis.

Respiration of Plants: Cellular respiration, Glycolysis, Fermentation, Aerobic Respiration - Tricarboxylic Acid Cycle, Electron Transport System (ETS) and Oxidative Phosphorylation, The Respiratory Balance Sheet, Amphibolic Pathway, Respiratory Quotient.

Plant Growth and Development: Growth- Plant Growth, Phases of Growth, Growth Rates,

Conditions for Growth, Differentiation, Dedifferentiation and Redifferentiation, Development, Plant Growth Regulators- Discovery, Physiological effects of Plant Growth Regulators, Auxins, Gibberellins, Cytokinins, Ethylene, Abscisic acid, Seed Dormancy, Photoperiodism, Vernalisation.

9) MICROBIOLOGY:

Bacteria: Morphology of Bacteria, Bacterial cell structure - Nutrition, Reproduction-Sexual Reproduction, Conjugation, Transformation, Transduction, The importance of Bacteria to Humans.

Viruses: Discovery, Classification of Viruses, structure of Viruses, Multiplication of Bacteriophages – The lytic cycle, The Lysogenic Cycle, Viral diseases in Plants, Viral diseases in Humans.

10) GENETICS:

Principles of Inheritance and Variation: Mendel's Experiments, Inheritance of one gene (Monohybrid Cross)-Back cross and Test cross, Law of Dominance, Law of Segregation or Law of purity of gametes, Deviations from Mendelian concept of dominance - Incomplete Dominance, Co-dominance, Explanation of the concept of dominance, Inheritance of two genes- (Dihybrid Cross) Law of Independent Assortment, Chromosomal Theory of Inheritance, Linkage and Recombination, Mutations, Significance of mutations.

11) MOLECULAR BIOLOGY:

Molecular Basis of inheritance: The DNA- Structure of Polynucleotide Chain, Packaging of DNA Helix, The Search for Genetic Material, Transforming Principle, Biochemical Characterisation of Transforming Principle, The Genetic Material is DNA, Properties of Genetic Material (DNA versus RNA), RNA World, Replication - The Experimental Proof, The Machinery and the Enzymes.

Transcription-Transcription Unit, Transcription Unit and the Gene, Types of RNA and the process of Transcription. Genetic Code-Mutations and Genetic Code, tRNA- the Adapter Molecule, Translation, Regulation of Gene Expression-The Lac operon.

12) Biotechnology:

Principles and processes of Biotechnology: Principles of Biotechnology-Construction of the first artificial recombinant DNA molecule, Tools of Recombinant DNA Technology- Restriction Enzymes, Cloning Vectors, Competent Host (For Transformation with Recombinant DNA), Processes of Recombinant DNA Technology- Isolation of the Genetic Material (DNA), Cutting of DNA at Specific Locations, Separation and isolation of DNA fragments, Insertion of isolated gene into a suitable vector, Amplification of Gene of Interest using PCR, Insertion of Recombinant DNA into the Host, Cell/Organism, Selection of Transformed host cells, Obtaining the Foreign Gene Product, Downstream Processing.

Biotechnology and its applications: Biotechnological Applications in Agriculture-Bt Cotton, Pest Resistant Plants, Other applications of Biotechnology - Insulin, Gene therapy, Molecular Diagnosis, ELISA, DNA fingerprinting, Transgenic plants, Bio-safety and Ethical issues- Biopiracy.

13) PLANTS, MICROBES AND HUMAN WELFARE:

Strategies for enhancement in food production : Plant Breeding- What is Plant Breeding?, Wheat and Rice, Sugarcane, Millets, Plant Breeding for Disease Resistance, Methods of

breeding for disease resistance, Mutation, Plant Breeding for Developing Resistance to Insect Pests, Plant Breeding for Improved Food Quality, Single Cell Protein (SCP), Tissue Culture.

Microbes in Human Welfare: Microbes in Household Products, Microbes in Industrial Products-Fermented Beverages, Antibiotics, Chemicals, Enzymes and other Bioactive Molecules, Microbes in Sewage Treatment, Primary treatment, Secondary treatment or Biological treatment, Microbes in Production of Biogas, Microbes as Biocontrol Agents, Biological control of pests and diseases, Microbes as Biofertilisers, Challenges posed by Microbes.

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ZOOLOGY

1) ZOOLOGY - Diversity of Living World:

What is life?; Nature, Scope & meaning of zoology; Branches of Zoology; Need for classification- Zoos as tools for classification; Basic principles of Classification: Biological system of classification- (Phylogenetic classification only); Levels or Hierarchy of classification; Nomenclature - Bi &Trinominal; Species concept; Kingdom Animalia;

Biodiversity - Meaning and distribution, Genetic diversity, Species diversity, Ecosystem diversity (alpha, beta and gama), other attributes of biodiversity, role of biodiversity, threats to biodiversity, methods of conservation, IUCN Red data books, Conservation of wild life in India -Legislation, Preservation, Organizations, Threatened species.

2) STRUCTURAL ORGANIZATION IN ANIMALS:

Levels of organization, Multicellularity: Diploblastic & Triploblastic conditions; Asymmetry, Symmetry: Radial symmetry, and Bilateral symmetry (Brief account giving one example for each type from the representative phyla); Acoelomates, Pseudocoelomates and Eucoelomates: Schizo & Entero coelomates (Brief account of formation of coelom)

Tissues: Epithelial, Connective, Muscular and Nervous tissues. (make it a little more elaborative)

3) ANIMAL DIVERSITY-I : INVERTEBRATE PHYLA:

General Characters – (Strictly restrict to 8 salient features only Classification up to Classes with two or three examples - Brief account only). Porifera; Cnidaria; Ctenophora; Platyhelminthes; Nematoda

Annelida (Include Earthworm as a type study strictly adhering to NCERT text book); Arthropoda; Mollusca; Echinodermata; Hemichordata.

4) ANIMAL DIVERSITY-II: PHYLUM : CHORDATA

General Characters – (Strictly restrict to 8 points only Classification up to Classes - Brief account only with two or three examples). Phylum : Chordata; Sub phylum: Urochordata; Sub phylum: Cephalochordata; Sub phylum : Vertebrata; Super class: Agnatha, Class Cyclostomata; Super class: Gnathostomata - Super class pisces, Class: Chondricthyes, Class: Osteichthyes; **Tetrapoda**: Class: Amphibia (Include Frog as a type study strictly adhering to NCERT text book), Class: Reptilia, Class: Aves, Class: Mammalia.

5) LOCOMOTION & REPRODUCTION IN PROTOZOA:

Locomotion: Definition, types of locomotor structures pseudopodia (basic idea of pseudopodia without going into different types), flagella & cilia (Brief account giving two examples each); Flagellar & Ciliary movement - Effective & Recovery strokes in Euglena, Synchronal & Metachronal movements in Paramecium

Reproduction: Definition, types. Asexual Reproduction: Transeverse binary fission in Paramecium & Longitudinal binary fission in Euglena. Multiple fission, Sexual Reproduction.

6) BIOLOGY & HUMAN WELFARE:

Parasitism and parasitic adaptation; Health and disease: introduction (follow NCERT); Life cycle, Pathogenecity, Treatment & Prevention (Brief account only) 1. Entamoeba histolytica, 2. Plasmodium vivax, 3. Ascaris lumbricoides, 4. Wuchereria bancrofti; Brief account of pathogenecity, treatment & prevention of Typhoid, Pneumonia, Common cold, & Ring worm Drugs and Alcohol absuse (TDA).

7) TYPE STUDY OF PERIPLANETA AMERICANA:

Habitat and habits; External features; Locomotion, Digestive system; Respiratory system; Circulatory system Excretory system; Nervous system - sense organs, structure of ommatidium; Reproductive system.

8) ECOLOGY & ENVIRONMENT:

Organisms and Environment: Ecology, population, communities, habitat, niche, biome and ecosphere (definitions only); Ecosystem: Elementary aspects only, Abiotic factors- Light, Temperature & Water (Biological effects only)

Ecological adaptations; Population interactions; Ecosystems: Types, Components, Lake ecosystem; Food chains, Food web, Productivity and Energy flow in Ecosystem, Ecological pyramids - Pyramids of numbers, biomass and energy; Nutritient cycling - Carbon, Nitrogen & Phosphorous cycles (Brief account); Population attributes: Growth, Natality and Mortality, Age distribution, Population regulation, Environmental issues.

9) HUMAN ANATOMY AND PHYSIOLOGY-I:

Digestion and absorption: Alimentary canal and digestive glands; Physiology of digestion and gastrointestinal hormones; Peristalsis, digestion, absorption and assimilation of proteins, carbohydrates and fats, egestion, Calorific value of proteins, carbohydrates and fats (for box item- not to be evaluated); Disorders of digestive system, indigestion, constipation, vomiting, jaundice, diarrhea.

Breathing and Respiration: Respiratory organs in animals; Respiratory system in humans; Mechanism of breathing and its regulation in humans - Exchange of gases, transport of gases and regulation of respiration movements, Respiratory volumes; Respiratory disorders: Asthma, Emphysema, Bronchitis, Pneunomia, Occupational respiratory disorders - Asbestosis, Silicosis, Siderosis, Black Lung Disease in coal mine workers.

10) HUMAN ANATOMY AND PHYSIOLOGY-II:

Body Fluids and Circulation: Covered in I year composition of lymph and functions; Clotting of blood; Human circulatory system - structure of human heart and blood vessels; Cardiac cycle, cardiac output, double circulation, circulatory pathways, Portal circulation and coronary circulation; regulation of cardiac activity; Disorders of circulatory system: Hypertension,

coronary artery disease, angina pectoris, heart failure.

Excretory products and their elimination: Modes of excretion - Ammonotelism, Ureotelism, Uricotelism, Excretory organs; Human excretory system - structure of kidney and nephron; Urine formation, osmoregulation; Regulation of kidney function -Renin-Angiotensin - Aldosterone system, Atrial Natriuretic Factor, ADH and diabetes insipidus; Role of other organs in excretion; Disorders: Uraemia, renal failure, renal calculi, glomerular nephritis, dialysis using artificial kidney, and kidney transplantation.

11) HUMAN ANATOMY AND PHYSIOLOGY-III:

Muscular and Skeletal system: Skeletal muscle - ultra structure; Contractile proteins & Mechanism of muscle contraction, muscle fatigue, types of muscle fibres, Skeletal system and its functions; Joints. (to be dealt with relevance to practical syllabus); Disorders of the muscular and skeletal system: myasthenia gravis, tetany, muscular dystrophy, arthritis, osteoporosis, gout.

Neural control and co-ordination: Nervous system in human beings - Central nervous system, Peripheral nervous system and Somatic and autonomic neural system; Generation and conduction of nerve impulse; Reflex action; Sensory perception; Sense organs; Brief description of other receptors; Elementary structure and functioning of eye and ear, disorders of human neural system.

12) HUMAN ANATOMY AND PHYSIOLOGY-IV:

Endocrine system and chemical co-ordination Endocrine glands and hormones; Human endocrine system - Hypothalamus, Pituitary, Pineal, Thyroid, Parathyroid, Thymus gland, Adrenal, Pancreas, Gonads; Mechanism of hormone action (Elementary idea only), hormones of kidney, heart and gastrointestinal tract, Role of hormones as messengers and regulators

Hypo and Hyper activity and related disorders: Common disorders -Dwarfism, acromegaly, cretinism, goiter, exophthalmic goiter, diabetes, Addison's disease, Cushing's syndrome. (Diseases & disorders to be dealt in brief).

Immune system: Basic concepts of Immunology - Types of Immunity - Innate Immunity, Acquired Immunity, Active and Passive Immunity, Cell mediated Immunity and Humoral Immunity, Cells of immune system, organs of immune system, soluble mediators of immunity and immunological disorders.

13) HUMAN REPRODUCTION:

Human Reproductive System: Male and female reproductive systems; Microscopic anatomy of testis & ovary; Gametogenesis, Spermatogenesis & Oogenesis; Menstrual cycle; Fertilization, Embryo development up to blastocyst formation, Implantation; Pregnancy, placenta formation, Parturition, Lactation (elementary idea).

Reproductive Health: Need for reproductive health and prevention of sexually transmitted diseases (STD); Birth control - Need and methods, contraception and medical termination of pregnancy (MTP); Amniocentesis; infertility and assisted reproductive technologies - IVF-ET, ZIFT, GIFT (elementary idea for general awareness).

14) GENETICS:

Heredity and variation: Mendel's laws of inheritance with reference to Drosophila. (Drosophila melanogaster Grey, Black body colour; Long, Vestigial wings), Pleiotropy; Multiple alleles: Inheritance of blood groups and Rh-factor; Codominance (Blood groups as example)

Elementary idea of polygenic inheritance; Skin colour in humans. Sex determination – in humans, birds, Fumea moth, Genic balance theory of sex determination in Drosophila melanogaster and honey bees, Sex linked inheritance – Haemophilia, Colour blindness; Mendelian disorders in humans: Thalassemia, Haemophilia, Sickle celled anaemia, cystiefibrosis PKU, Alkaptonuria; Chromosomal disorders –Down's syndrome, Turner's syndrome and Klinefelter syndrome; Genome, Human Genome Project and DNA Finger Printing.

15) ORGANIC EVOLUTION:

Origin of Life, Biological evolution and Evidences for biological evolution (palaeontological, comparative anatomical, embryological and molecular evidences)

Theories of evolution: Lamarckism (in brief), Darwin's theory of Evolution-Natural Selection with example (Kettlewell's experiments on Bistonbitularia), Mutation Theory of Hugo De Vries; Modern synthetic theory of Evolution

Hardy Weinberg law, Evolutionary forces, Types of Natural Selection; Gene flow and genetic drift; Human evolution; Speciation - Allopatric, sympatric; Reproductive isolation.

16) APPLIED BIOLOGY:

Beekeeping, Animal Husbandry: Fishery management, Poultry management, Dairy management; Animal breeding, Bio-medical Technology: Diagnostic Imaging (X-ray, CTscan, MRI), ECG, EEG, Application of Biotechnology in health: Human insulin and vaccine production; Gene Therapy; Transgenic animals; ELISA; Vaccines, MABs, Cancer biology, stem cells.

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PHYSICS

1) PHYSICAL WORLD: What is physics?, Scope and excitement of Physics, Physics, technology and society, Fundamental forces in nature, Gravitational Force, Electromagnetic Force, Strong Nuclear Force, Weak Nuclear Force, Towards Unification of Forces, Nature of physical laws.

2) UNITS AND MEASUREMENTS: Introduction , The international system of units, Measurement of Length, Measurement of Large Distances, Estimation of Very Small Distances: Size of a Molecule, Range of Lengths, Measurement of Mass, Range of Masses, Measurement of time , Accuracy, precision of instruments and errors in measurement, Systematic errors, random errors, least count error, Absolute Error, Relative Error and Percentage Error, Combination of Errors, Significant figures, Rules for Arithmetic Operations with Significant Figures, Rounding off the Uncertain Digits, Rules for Determining the Uncertainty in the Results of Arithmetic Calculations, Dimensions of Physical Quantities, Dimensional Formulae and dimensional equations, Dimensional Analysis and its Applications, Checking the Dimensional Consistency of Equations, Deducing Relation among the Physical Quantities.

3) MOTION IN A STRAIGHT LINE: Introduction, Position, path length and displacement, Average velocity and average speed, Instantaneous velocity and speed, Acceleration, Kinematic equations for uniformly accelerated motion, Relative velocity.

4) MOTION IN A PLANE: Introduction, Scalars and vectors, Position and Displacement Vectors, Equality of Vectors, Multiplication of vectors by real numbers, Addition and subtraction of vectors - graphical method, Resolution of vectors, Vector addition - analytical method, Motion in a plane, Position Vector and Displacement, Velocity, Acceleration, Motion in a plane with constant acceleration, Relative velocity in two dimensions. Projectile motion, Equation of path of a projectile, Time of Maximum height, Maximum height of a projectile, Horizontal range of projectile, Uniform circular motion.

5) LAWS OF MOTION: Introduction, Aristotle's fallacy, The law of inertia, Newton's first law of motion, Newton's second law of motion, Newton's third law of motion, Impulse, Conservation of momentum, Equilibrium of a particle, Common forces in mechanics, friction, Circular motion, Motion of a car on a level road, Motion of a car on a Banked road, Solving problems in mechanics.

6) WORK, ENERGY AND POWER: Introduction, The Scalar Product, Notions of work and kinetic energy : The work-energy theorem, Work, Kinetic energy, Work done by a variable force, The work-energy theorem for a variable force, The concept of Potential Energy, The conservation of Mechanical Energy, The Potential Energy of a spring, Various forms of energy: the law of conservation of energy, Heat, Chemical Energy, Electrical Energy, The Equivalence of Mass and Energy, Nuclear Energy, The Principle of Conservation of Energy, Power, Collisions, Elastic and Inelastic Collisions, Collisions in one dimension, Coefficient of Restitution and its determination, Collisions in Two Dimensions.

7) SYSTEMS OF PARTICLES AND ROTATIONAL MOTION: Introduction, What kind of motion can a rigid body have?, Centre of mass, Centre of Gravity, Motion of centre of mass, Linear momentum of a system of particles, Vector product of two vectors, Angular velocity and its relation with linear velocity, Angular acceleration, Kinematics of rotational motion about a fixed axis, Torque and angular momentum, Moment of force (Torque), Angular momentum of particle, Torque and angular momentum for a system of a particles, conservation of angular momentum, Equilibrium of a rigid body, Principle of moments, Moment of inertia, Theorems of perpendicular and parallel axes, Theorem of perpendicular axes, Theorem of parallel axes, Dynamics of rotational motion about a fixed axis, Angular momentum in case of rotations about a fixed axis, Conservation of Angular Momentum, Rolling motion, Kinetic Energy of Rolling Motion.

8) OSCILLATIONS: Introduction, Periodic and oscillatory motions, Period and frequency, Displacement, Simple harmonic motion (S.H.M.), Simple harmonic motion and uniform circular motion, Velocity and acceleration in simple harmonic motion, Force law for Simple harmonic Motion, Energy in simple harmonic motion, Some systems executing Simple Harmonic Motion, Oscillations due to a spring, The Simple Pendulum, Damped simple harmonic motion, Forced oscillations and resonance.

9) GRAVITATION: Introduction, Kepler's laws, Universal law of gravitation, The gravitational constant, Acceleration due to gravity of the earth, Acceleration due to gravity below and above the surface of earth, Gravitational potential energy, Escape speed, Earth satellite, Energy of an orbiting satellite, Geostationary and polar satellites, Weightlessness.

10) MECHANICAL PROPERTIES OF SOLIDS: Introduction, Elastic behaviour of solids, Stress and strain, Hooke's law, Stress-strain curve, Elastic moduli, Young's Modulus, Determination of Young's Modulus of the Material of a Wire, Shear Modulus, Bulk Modulus, Poisson's Ratio, Applications of elastic behaviour of materials.

11) MECHANICAL PROPERTIES OF FLUIDS: Introduction, Pressure, Pascal's Law, Variation of Pressure with Depth, Atmosphere Pressure and Gauge Pressure, Hydraulic Machines, Streamline flow, Bernoulli's principle, Speed of Efflux: Torricelli's Law, Venturi-meter, Blood Flow and Heart Attack, Dynamic Lift, Viscosity, Variation of Viscosity of fluids with temperature, Stokes' Law, Reynolds number, Surface tension, Surface Energy, Surface Energy and Surface Tension, Angle of Contact, Drops and Bubbles, Capillary Rise, Detergents and Surface Tension.

12) THERMAL PROPERTIES OF MATTER: Introduction, Temperature and heat, Measurement of temperature, Ideal-gas equation and absolute temperature, Thermal expansion, Specific heat capacity, Calorimetry, Change of state, Regelation, Latent Heat, Heat transfer, Conduction, thermal conductivity, Convection, Radiation, Black body Radiation, Greenhouse Effect, Newton's law of cooling.

13) THERMODYNAMICS: Introduction, Thermal equilibrium, Zeroth law of thermodynamics, Heat, Internal Energy and work, First law of thermodynamics, Specific heat capacity, Thermodynamic state variables and equation of State, Thermodynamic process, Quasi-static process, Isothermal Process, Adiabatic Process, Isochoric Process, Isobaric process, Cyclic process, Heat engines, Refrigerators and heat pumps, Second law of thermodynamics, Reversible and irreversible processes, Carnot engine, Carnot's theorem.

14) KINETIC THEORY: Introduction, Molecular nature of matter, Behaviour of gases, Boyle's Law, Charles' Law, Kinetic theory of an ideal gas, Pressure of an Ideal Gas, Law of equipartition of energy, Specific heat capacity, Monatomic Gases, Diatomic Gases, Polyatomic Gases, Specific Heat Capacity of Solids, Specific Heat Capacity of Water, Mean free path.

15) WAVES: Introduction, Transverse and longitudinal waves, Displacement relation in a progressive wave, The speed of a travelling wave, The principle of superposition of waves, Reflection of waves, Beats, Doppler effect.

16) RAY OPTICS AND OPTICAL INSTRUMENTS: Introduction, Reflection of Light by Spherical Mirrors, Refraction, Total Internal Reflection, Refraction at Spherical Surfaces and by Lenses, Refraction through a Prism, Dispersion by a Prism, Some Natural Phenomena due to Sunlight , Optical Instruments.

17) WAVE OPTICS: Introduction, Huygens Principle, Refraction and reflection of plane waves using Huygens Principle, Coherent and Incoherent Addition of Waves, Interference of Light Waves and Young's Experiment, Diffraction, Polarisation.

18) ELECTRIC CHARGES AND FIELDS: Introduction, Electric Charges, Conductors and Insulators, Charging by Induction, Basic Properties of Electric Charge, Coulomb's Law, Forces between Multiple Charges, Electric Field, Electric Field Lines, Electric Flux, Electric Dipole, Dipole in a Uniform External Field, Continuous Charge Distribution, Gauss's Law, Application of Gauss's Law.

19) ELECTROSTATIC POTENTIAL AND CAPACITANCE: Introduction, Electrostatic Potential, Potential due to a Point Charge, Potential due to an Electric Dipole, Potential due to a System of Charges, Equipotential Surfaces, Potential Energy of a System of Charges, Potential Energy in an External Field, Electrostatics of Conductors, Dielectrics and Polarisation, Capacitors and Capacitance, The Parallel Plate Capacitor, Effect of Dielectric on Capacitance, Combination of Capacitors, Energy Stored in a Capacitor, Van de Graaff Generator.

20) CURRENT ELECTRICITY: Introduction, Electric Current, Electric Currents in Conductors, Ohm's law, Drift of Electrons and the Origin of Resistivity, Limitations of Ohm's Law, Resistivity of various Materials, Temperature Dependence of Resistivity, Electrical Energy, Power, Combination of Resistors — Series and Parallel, Cells, emf, Internal Resistance, Cells in Series and in Parallel, Kirchhoff's Laws, Wheatstone Bridge, Meter Bridge, Potentiometer.

21) MOVING CHARGES AND MAGNETISM: Introduction, Magnetic Force, Motion in a Magnetic Field, Motion in Combined Electric and Magnetic Fields, Magnetic Field due to a Current Element, Biot-Savart Law, Magnetic Field on the Axis of a Circular Current Loop, Ampere's Circuital Law, The Solenoid and the Toroid, Force between Two Parallel Currents, the Ampere, Torque on Current Loop, Magnetic Dipole, The Moving Coil Galvanometer.

22) MAGNETISM AND MATTER: Introduction, The Bar Magnet, Magnetism and Gauss's Law, The Earth's Magnetism, Magnetisation and Magnetic Intensity, Magnetic Properties of Materials, Permanent Magnets and Electromagnets.

23) ELECTROMAGNETIC INDUCTION: Introduction, The Experiments of Faraday and Henry, Magnetic Flux, Faraday's Law of Induction, Lenz's Law and Conservation of Energy, Motional Electromotive Force, Energy Consideration: A Quantitative Study, Eddy Currents, Inductance, AC Generator.

24) ALTERNATING CURRENT: Introduction, AC Voltage Applied to a Resistor, Representation of AC Current and Voltage by Rotating Vectors — Phasors, AC Voltage Applied to an Inductor, AC Voltage Applied to a Capacitor, AC Voltage Applied to a Series LCR Circuit, Power in AC Circuit: The Power Factor, LC Oscillations, Transformers.

25) ELECTROMAGNETIC WAVES: Introduction, Displacement Current, Electromagnetic Waves, Electromagnetic Spectrum.

26) DUAL NATURE OF RADIATION AND MATTER: Introduction, Electron Emission, Photoelectric Effect, Experimental Study of Photoelectric Effect, Photoelectric Effect and Wave Theory of Light, Einstein's Photoelectric Equation: Energy Quantum of Radiation, Particle Nature of Light: The Photon, Wave Nature of Matter, Davisson and Germer Experiment.

27) ATOMS: Introduction, Alpha-particle Scattering and Rutherford's Nuclear Model of Atom, Atomic Spectra, Bohr Model of the Hydrogen Atom, The Line Spectra of the Hydrogen Atom, De Broglie's Explanation of Bohr's Second Postulate of Quantisation.

28) NUCLEI: Introduction, Atomic Masses and Composition of Nucleus, Size of the Nucleus, Mass-Energy and Nuclear Binding Energy, Nuclear Force, Radioactivity, Nuclear Energy.

29) SEMICONDUCTOR ELECTRONICS: MATERIALS, DEVICES AND SIMPLE CIRCUITS: Introduction, Classification of Materials: Metals, Semiconductors and Insulators, Intrinsic Semiconductor, Extrinsic Semiconductor, p-n Junction, Semiconductor diode, Application of Junction Diode as a Rectifier, Special Purpose p-n Junction Diodes, Junction Transistor, Digital Electronics and Logic Gates, Integrated Circuits.

30) COMMUNICATION SYSTEMS: Introduction, Elements of a Communication System, Basic Terminology Used in Electronic Communication Systems, Bandwidth of Signals, Bandwidth of Transmission Medium, Propagation of Electromagnetic Waves, Modulation and its Necessity, Amplitude Modulation, Production of Amplitude Modulated Wave, Detection of Amplitude Modulated Wave.

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CHEMISTRY

1) ATOMIC STRUCTURE: Introduction; Sub- atomic particles; Atomic models – Thomson's Model; Rutherford's Nuclear model of atom, Drawbacks; Developments to the Bohr's model of atom; Nature of electromagnetic radiation; Particle nature of electromagnetic radiation- Planck's quantum theory; Bohr's model for Hydrogen atom; Explanation of line spectrum of hydrogen; Limitations of Bohr's model; Quantum mechanical considerations of sub atomic particles; Dual behaviour of matter; Heisenberg's uncertainty principle; Quantum mechanical model of an atom. Important features of Quantum mechanical model of atom; Orbitals and quantum numbers; Shapes of atomic orbitals; Energies of orbitals; Filling of orbitals in atoms. Aufbau Principle, Pauli's exclusion Principle and Hund's rule of maximum multiplicity; Electronic configurations of atoms; Stability of half filled and completely filled orbitals.

2) CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES: Need to classify elements; Genesis of periodic classification; Modern periodic law and present form of the periodic table; Nomenclature of elements with atomic number greater than 100; Electronic configuration of elements and the periodic table; Electronic configuration and types of elements s,p,d.and f blocks; Trends in physical properties: (a) Atomic radius, (b) Ionic radius (c)Variation of size in inner transition elements, (d) Ionization enthalpy, (e) Electron gain enthalpy,
(f) Electro negativity; Periodic trends in chemical properties: (a) Valence or Oxidation states,
(b) Anomalous properties of second period elements - diagonal relationship; Periodic trends and chemical reactivity.

3) CHEMICAL BONDING AND MOLECULAR STRUCTURE: Kossel - Lewis approach to chemical bonding, Octet rule, Representation of simple molecules, formal charges, limitations of octet rule; Ionic or electrovalent bond - Factors favourable for the formation of ionic compounds-Crystal structure of sodium chloride, Lattice enthalpy; General properties of ionic compounds; Bond Parameters - bond length, bond angle, and bond enthalpy, bond order, resonance-Polarity of bonds dipole moment; Valence Shell Electron Pair Repulsion (VSEPR) theories; Predicting the geometry of simple molecules; Valence bond theory-Orbital overlap concept-Directional properties of bonds-overlapping of atomic orbitals strength of sigma and pi bonds-Factors favouring the formation of covalent bonds; Hybridisation- different types of hybridization involving s, p and d orbitals- shapes of simple covalent molecules; Coordinate bond -definition with examples; Molecular orbital theory - Formation of molecular orbitals, Linear combination of atomic orbitals (LCAO)-conditions for combination of atomic orbitals - Energy level diagrams for molecular orbitals -Bonding in some homo nuclear diatomic molecules- H_2, He_2, Li_2, B_2, C_2, N_2 and O_2; Hydrogen bonding-cause of formation of hydrogen bond - Types of hydrogen bonds-inter and intra molecular-General properties of hydrogen bonds.

4) STATES OF MATTER: GASES AND LIQUIDS: Intermolecular forces; Thermal Energy; Intermolecular forces Vs Thermal interactions; The Gaseous State; The Gas Laws; Ideal gas equation; Graham's law of diffusion - Dalton's Law of partial pressures; Kinetic molecular theory of gases; Kinetic gas equation of an ideal gas (No derivation) deduction of gas laws from Kinetic gas equation; Distribution of molecular speeds - rms, average and most probable speeds-Kinetic energy of gas molecules; Behaviour of real gases - Deviation from Ideal gas behaviour - Compressibility factor *vs* Pressure diagrams of real gases; Liquefaction of gases; Liquid State - Properties of Liquids in terms of Inter molecular interactions - Vapour pressure, Viscosity and Surface tension (Qualitative idea only. No mathematical derivation).

5) STOICHIOMETRY: Some basic concepts - Properties of matter - uncertainty in Measurement-significant figures, dimensional analysis; Laws of Chemical Combinations - Law of Conservation of Mass, Law of Definite Proportions, Law of Multiple Proportions, Gay Lussac's Law of Gaseous Volumes, Dalton's Atomic Theory, Avogadro's Law, Atomic and molecular masses- mole concept and molar mass. Concept of equivalent weight; Percentage composition of compounds and calculations of empirical and molecular formulae of compounds; Stoichiometry and stoichiometric calculations; Methods of expressing concentrations of solutions-mass percent, mole fraction, molarity, molality and normality; Redox reactions-classical idea of redox reactions, oxidation and reduction reactions-redox reactions in terms of electron transfer; Oxidation number concept; Types of Redox reactions-combination, decomposition, displacement and disproportionation reactions; Balancing of redox reactions - oxidation number method, Half reaction (ion-electron) method; Redox reactions in Titrimetry.

6) THERMODYNAMICS: Thermodynamic Terms; The system and the surroundings; Types of systems and surroundings; The state of the system; The Internal Energy as a State Function. (a) Work (b) Heat (c) The general case, the first law of Thermodynamics; Applications; Work; Enthalpy, H- a useful new state function; Extensive and intensive properties; Heat capacity; The relationship between C_p and C_v; Measurement of ΔU and ΔH: Calorimetry; Enthalpy change, $\Delta_r H$ of reactions - reaction Enthalpy (a) Standard enthalpy of reactions, (b) Enthalpy changes during transformations, (c) Standard enthalpy of formation, (d) Thermo chemical equations (e) Hess's law of constant heat summation; Enthalpies for different types of reactions. (a) Standard enthalpy of combustion ($\Delta_c H^\theta$), (b) Enthalpy of atomization ($\Delta_a H^\theta$), phase transition, sublimation and ionization, (c) Bond Enthalpy ($\Delta_{bond} H^\theta$), (d) Enthalpy of solution ($\Delta_{sol} H^\theta$) and dilution; Spontaneity. (a) Is decrease in enthalpy a criterion for spontaneity? (b) Entropy and spontaneity, the second law of thermodynamics, (c) Gibbs Energy and spontaneity; Gibbs Energy change and equilibrium; Absolute entropy and the third law of thermodynamics.

7) CHEMICAL EQUILIBRIUM AND ACIDS-BASES:

CHEMICAL EQUILIBRIUM: Equilibrium in Physical process; Equilibrium in chemical process - Dynamic Equilibrium; Law of chemical Equilibrium - Law of mass action and Equilibrium constant; Homogeneous; Equilibria, Equilibrium constant in gaseous systems. Relationship between K_P and K_c; Heterogeneous Equilibria; Applications of Equilibrium constant; Relationship between Equilibrium constant K, reaction quotient Q and Gibbs energy G; Factors affecting Equilibria.-Le-chatlier principle application to industrial synthesis of Ammonia and Sulphur trioxide; Ionic Equilibrium in solutions

ACIDS,BASES AND SALTS: Acids, bases and salts- Arrhenius, Bronsted-Lowry and Lewis concepts of acids and bases; Ionisation of Acids and Bases -Ionisation constant of water and its ionic product- pH scale-ionisation constants of weak acids-ionisation of weak bases-relation between K_a and K_b-Di and poly basic acids and di and poly acidic Bases-Factors affecting acid strength-Common ion effect in the ionization of acids and bases-Hydrolysis of salts and pH of their solutions; Buffer solutions-designing of buffer solution-Preparation of Acidic buffer; Solubility Equilibria of sparingly soluble salts. Solubility product, Common ion effect on solubility of salts.

8) HYDROGEN AND ITS COMPOUNDS: Position of hydrogen in the periodic table; Dihydrogen-Occurence and Isotopes; Preparation and properties of Dihydrogen; Hydrides: Ionic, covalent and non-stiochiometric hydrides; Water: Physical properties; structure of water, ice. Chemical properties of water; hard and soft water, Temporary and permanent hardness of water; Hydrogen peroxide: Preparation; Physical properties; structure and chemical properties; storage and uses; Heavy Water; Hydrogen as a fuel.

9) THE s - BLOCK ELEMENTS (ALKALI AND ALKALINE EARTH METALS)

Group 1 Elements : Alkali metals; Electronic configurations; Atomic and Ionic radii; Ionization enthalpy; Hydration enthalpy; Physical properties; Chemical properties; Uses; General characteristics of the compounds of the alkali metals: Oxides; Halides; Salts of oxo Acids; Anomalous properties of Lithium: Differences and similarities with other alkali metals, Diagonal relationship; similarities between Lithium and Magnesium; Some important compounds of Sodium: Sodium Carbonate; Sodium Chloride; Sodium Hydroxide; Sodium hydrogen carbonate; Biological importance of Sodium and Potassium.

Group 2 Elements: Alkaline earth elements; Electronic configuration; Ionization enthalpy; Hydration enthalpy; Physical properties, Chemical properties; Uses; General characteristics of compounds of the Alkaline Earth Metals: Oxides, hydroxides, halides, salts of oxoacids (Carbonates; Sulphates and Nitrates); Anomalous behavior of Beryllium; its diagonal relationship with Aluminium; Some important compounds of calcium: Preparation and uses of Calcium Oxide; Calcium Hydroxide; Calcium Carbonate; Plaster of Paris; Cement; Biological importance of Calcium and Magnesium.

10) p- BLOCK ELEMENTS GROUP 13 (BORON FAMILY):

General introduction - Electronic configuration, Atomic radii, Ionization enthalpy, Electro negativity; Physical & Chemical properties; Important trends and anomalous properties of boron; Some important compounds of boron - Borax, Ortho boric acid, diborane; Uses of boron, aluminium and their compounds.

11) p-BLOCK ELEMENTS - GROUP 14 (CARBON FAMILY):

General introduction - Electronic configuration, Atomic radii, Ionization enthalpy, Electro negativity; Physical & Chemical properties; Important trends and anomalous properties of carbon; Allotropes of carbon; Uses of carbon; Some important compounds of carbon and silicon – carbon monoxide, carbon dioxide, Silica, silicones, silicates and zeolites.

12) ENVIRONMENTAL CHEMISTRY:

Definition of terms: Air, Water and Soil Pollutions; Environmental Pollution; Atmospheric pollution; Tropospheric Pollution; Gaseous Air Pollutants (Oxides of Sulphur; Oxides of Nitrogen; Hydrocarbons; Oxides of Carbon (CO, CO_2). Global warming and Green house effect; Acid rain- Particulate Pollutants- Smog; Stratospheric Pollution: Formation and breakdown of Ozone- Ozone hole- effects of depletion of the Ozone Layer; Water Pollution: Causes of Water Pollution; International standards for drinking water; Soil Pollution: Pesticides, Industrial Wastes; Strategies to control environmental pollution- waste Management- collection and disposal; Green Chemistry: Green chemistry in day-to-day life; Dry cleaning of clothes; Bleaching of paper; Synthesis of chemicals

13) ORGANIC CHEMISTRY-SOME BASIC PRINCIPLES, TECHNIQUES AND HYDROCARBONS

SOME BASIC PRINCIPLES AND TECHNIQUES

General introduction; Tetravalency of Carbon: shapes of organic compounds; Structural representations of organic compounds; Classification of organic compounds; Nomenclature of organic compounds; Isomerism; Fundamental concepts in organic reaction mechanisms; Fission of covalent bond; Nucleophiles and electrophiles; Electron movements in organic reactions; Electron displacement effects in covalent bonds: inductive effect, resonance, resonance effect, electromeric effect, hyperconjugation; Types of Organic reactions; Methods of purification of organic compounds; Qualitative elemental analysis of organic compounds; Quantitative elemental analysis of organic compounds.

HYDROCARBONS:

Classification of Hydrocarbons; **Alkanes** - Nomenclature, isomerism (structural and conformations of ethane only); Preparation of alkanes; Properties - Physical properties and chemical Reactivity, Substitution reactions - Halogenation (free radical mechanism), Combustion, Controlled Oxidation, Isomerisation, Aromatization, reaction with steam and Pyrolysis; **Alkenes-** Nomenclature, structure of ethene, Isomerism (structural and geometrical); Methods of preparation; Properties- Physical and chemical reactions: Addition of Hydrogen, halogen, water, sulphuric acid, Hydrogen halides (Mechanism- ionic and peroxide effect, Markovnikov's, anti Markovnikov's or Kharasch effect). Oxidation, Ozonolysis and Polymerization; **Alkynes -** Nomenclature and isomerism, structure of acetylene. Methods of preparation of acetylene; Physical properties, Chemical reactions- acidic character of acetylene, addition reactions- of Hydrogen, Halogen, Hydrogen halides and Water. Polymerization.

AROMATIC HYDROCARBONS: Nomenclature and isomerism, Structure of benzene, Resonance and aromaticity; Preparation of benzene. Physical properties. Chemical properties: Mechanism of electrophilic substitution. Electrophilic substitution reactions- Nitration, Sulphonation, Halogenation, Friedel-Crafts alkylation and acylation; Directive influence of functional groups in mono substituted benzene, Carcinogenicity and toxicity

14) SOLID STATE:

General characteristics of solid state; Amorphous and crystalline solids; Classification of crystalline solids based on different binding forces (molecular, ionic, metallic and covalent solids); Probing the structure of solids: X-ray crystallography; Crystal lattices and unit cells. Bravais lattices primitive and centred unit cells; Number of atoms in a unit cell (primitive, body centred and face centred cubic unit cell); Close packed structures: Close packing in one dimension, in two dimensions and in three dimensions- tetrahedral and octahedral voids- formula of a compound and number of voids filled- locating tetrahedral and octahedral voids; Packing efficiency in simple cubic, bcc and in hcp, ccp lattice; Calculations involving unit cell dimensions-density of the unit cell; Imperfections in solids-types of point defects- stoichiometric and non-stoichiometric defects; Electrical properties-conduction of electricity in metals, semiconductors and insulators- band theory of metals; Magnetic properties.

15) SOLUTIONS:

Types of solutions; Expressing concentration of solutions - mass percentage, volume percentage, mass by volume percentage, parts per million, mole fraction, molarity and molality; Solubility: Solubility of a solid in a liquid, solubility of a gas in a liquid, Henry's law; Vapour pressure of liquid solutions: vapour pressure of liquid- liquid solutions. Raoult's law as a special case of Henry's law -vapour pressure of solutions of solids in liquids; Ideal and non-ideal solutions.

COLLIGATIVE PROPERTIES: Colligative properties and determination of molar mass-relative lowering of vapour pressure-elevation of boiling point-depression of freezing point-osmosis and osmotic pressure-reverse osmosis and water purification; Abnormal molar masses-van't Hoff factor.

16) ELECTROCHEMISTRY AND CHEMICAL KINETICS:

ELECTROCHEMISTRY: Electrochemical cells; Galvanic cells: measurement of electrode potentials; Nernst equation-equilibrium constant from Nernst equation- electrochemical cell and Gibbs energy of the cell reaction; Conductance of electrolytic solutions- measurement of the conductivity of ionic solutions-variation of conductivity and molar conductivity with concentration-strong electrolytes and weak electrolytes-applications of Kohlrausch's law; Electrolytic cells and electrolysis: Faraday's laws of electrolysis-products of electrolysis; Batteries: primary batteries and secondary batteries; Fuel cells; Corrosion of metals-Hydrogen economy.

CHEMICAL KINETICS: Rate of a chemical reaction; Factors influencing rate of a reaction: dependence of rate on concentration- rate expression and rate constant- order of a reaction, molecularity of a reaction; Integrated rate equations-zero order reactions-first order reactions- half life of a reaction; Pseudo first order reaction; Temperature dependence of the rate of a reaction -effect of catalyst; Collision theory of chemical reaction rates.

17) SURFACE CHEMISTRY: Adsorption and absorption: Distinction between adsorption and absorption-mechanism of adsorption-types of adsorption-characteristics of physisorption-characteristics of chemisorptions-adsorption isotherms-adsorption from solution phase-applications of adsorption; Catalysis: Catalysts, promoters and poisons-auto catalysis-homogeneous and heterogeneous catalysis-adsorption theory of heterogeneous catalysis-important features of solid catalysts: (a)activity (b)selectivity-shape-selective catalysis by zeolites-enzyme catalysis-characteristics and mechanism- catalysts in industry; Colloids; Classification of colloids: Classification based on physical state of dispersed phase and dispersion medium- classification based on nature of interaction between dispersed phase and dispersion medium- classification based on type of particles of the dispersed phase- multi molecular, macromolecular and associated colloids- cleansing action of soaps-preparation of colloids-purification of colloidal solutions- properties of colloidal solutions: Tyndal effect, colour, Brownian movement-charge on colloidal particles, electrophoresis; Emulsions; Colloids Around us- application of colloids.

18) GENERAL PRINCIPLES OF METALLURGY: Occurrence of metals; Concentration of ores-levigation, magnetic separation, froth floatation, leaching; Extraction of crude metal from concentrated ore-conversion to oxide, reduction of oxide to the metal; Thermodynamic principles of metallurgy – Ellingham diagram-limitations-applications-extraction of aluminium, iron, copper and zinc from their oxides; Electrochemical principles of metallurgy; Oxidation and reduction; Refining of crude metal-distillation, liquation poling, electrolysis, zone refining and vapour phase refining; Uses of aluminium, copper, zinc and iron.

19) p-BLOCK ELEMENTS:

GROUP-15 ELEMENTS : Occurrence- electronic configuration, atomic and ionic radii, ionisation enthalpy, electronegativity, physical and chemical properties; Dinitrogen-preparation, properties and uses; Compounds of nitrogen-preparation and properties of ammonia; Oxides of nitrogen; Preparation and properties of nitric acid; Phosphorous-allotropic forms; Phosphine-preparation and properties; Phosphorous halides; Oxoacids of phosphorous

GROUP-16 ELEMENTS: Occurrence- electronic configuration, atomic and ionic radii, ionisation enthalpy, electron gain enthalpy, electronegativity, physical and chemical properties; Dioxygen-preparation, properties and uses; Simple oxides; Ozone-preparation, properties, structure and uses; Sulphur-allotropic forms; Sulphur dioxide-preparation, properties and uses; Oxoacids of sulphur; Sulphuric acid-industrial process of manufacture, properties and uses.

GROUP-17 ELEMENTS: Occurrence, electronic configuration, atomic and ionic radii, ionisation enthalpy, electron gain enthalpy, electronegativity, physical and chemical properties; Chlorine- preparation, properties and uses; Hydrogen chloride- preparation, properties and uses; Oxoacids of halogens; Interhalogen compounds.

GROUP-18 ELEMENTS : Occurrence, electronic configuration, ionization enthalpy, atomic radii, electron gain enthalpy, physical and chemical properties(a) Xenon-fluorine compounds- XeF_2,XeF_4 and XeF_6 -preparation, hydrolysis and formation of fluoro anions-structures of XeF_2, XeF_4 and XeF_6 (b) Xenon-oxygen compounds XeO_3 and $XeOF_4$ - their formation and structures

20) d AND f BLOCK ELEMENTS & COORDINATION COMPOUNDS:

d AND f BLOCK ELEMENTS :Position in the periodic table; Electronic configuration of the d-block elements; General properties of the transition elements (d-block) -physical properties, variation in atomic and ionic sizes of transition series, ionisation enthalpies, oxidation states, trends in the M^{2+}/M and M^{3+}/M^{2+} standard electrode potentials, trends in stability of higher oxidation states, chemical reactivity and E^{θ} values, magnetic properties, formation of coloured ions, formation of complex compounds, catalytic properties, formation of interstitial compounds, alloy formation; Some important compounds of transition elements-oxides and oxoanions of metals-preparation and properties of potassium dichromate and potassium permanganate-structures of chromate, dichromate, manganate and permanganate ions; Inner transition elements(f-block)-lanthanoids- electronic configuration-atomic and ionic sizes-oxidation states- general characteristics; Actinoids-electronic configuration atomic and ionic sizes, oxidation states, general characteristics and comparison with lanthanoids; Some applications of d and f block elements.

COORDINATION COMPOUNDS**:** Werner's theory of coordination compounds; Definitions of some terms used in coordination compounds; Nomenclature of coordination compounds-IUPAC nomenclature; Isomerism in coordination compounds- (a)Stereo isomerism-Geometrical and optical isomerism (b)Structural isomerism-linkage, coordination, ionisation and hydrate isomerism; Bonding in coordination compounds. (a)Valence bond theory - magnetic properties of coordination compounds-limitations of valence bond theory (b) Crystal field theory (i) Crystal field splitting in octahedral and tetrahedral coordination entities (ii) Colour in coordination compounds-limitations of crystal field theory; Bonding in metal carbonyls; Stability of coordination compounds; Importance and applications of coordination compounds.

21) POLYMERS: Introduction; Classification of Polymers -Classification based on source, structure, mode of polymerization, molecular forces and growth polymerization; Types of polymerization reactions-addition polymerization or chain growth polymerization-ionic polymerization, free radical mechanism-preparation of addition polymers-polythene, teflon and polyacrylonitrile-condensation polymerization or step growth polymerization-polyamides-preparation of Nylon 6,6 and Nylon 6, -poly esters-terylene, bakelite, melamine-formaldehyde polymers; copolymerization, Rubber-natural rubber-vulcanisation of rubber-Synthetic rubbers-preparation of neoprene and buna-N; Molecular mass of polymers-number average and weight average molecular masses- poly dispersity index(PDI); Biodegradable polymers-PHBV, Nylon 2 Nylon 6; Polymers of commercial importance - polypropene, polystyrene, polyvinylchloride (PVC), urea-formaldehyde resin, Glyptal and Bakelite - their monomers, structures and uses.

22) BIOMOLECULES: Carbohydrates - Classification of carbohydrates-Monosaccharides: preparation of glucose from sucrose and starch- Properties and structure of glucose- D,L and (+), (-) configurations of glucose- Structure of fructose; Disaccharides: Sucrose- preparation, structure; Invert sugar- Structures of maltose and lactose-Polysaccharides: Structures of starch, cellulose and glycogen- Importance of carbohydrates; **Aminoacids:** Natural aminoacids-classification of aminoacids - structures and D and L forms-Zwitter ions;**Proteins:** Structures, classification, fibrous and globular- primary, secondary, tertiary and quarternary structures of proteins- Denaturation of proteins; **Enzymes:** Enzymes, mechanism of enzyme action; **Vitamins:** Explanation, names, classification of vitamins - sources of vitamins-deficiency diseases of different types of vitamins; **Nucleic acids:** chemical composition of nucleic acids, structures of nucleic acids, DNA finger printing, biological functions of nucleic acids; **Hormones:** Definition, different types of hormones, their production, biological activity, diseases due to their abnormal activities.

23) CHEMISTRY IN EVERYDAY LIFE: Drugs and their classification: (a) Classification of drugs on the basis of pharmocological effect (b) Classification of drugs on the basis of drug action (c) Classification of drugs on the basis of chemical structure (d) Classification of drugs on the basis of molecular targets; Drug-Target interaction-Enzymes as drug targets (a) Catalytic action of enzymes (b) Drug-enzyme interaction,receptors as drug targets; Therapeutic action of different classes of drugs: antacids, antihistamines, neurologically active drugs: tranquilizers, analgesics-non-narcotic, narcotic analgesics, antimicrobials-antibiotics, antiseptics and disinfectants- anti fertility drugs; Chemicals in food-artificial sweetening agents, food preservatives, antioxidants in food; Cleansing agents-soaps and synthetic detergents – types and examples.

24) HALOALKANES AND HALOARENES: Classification and nomenclature; Nature of C-X bond; Methods of preparation: Alkyl halides and aryl halides-from alcohols, from hydrocarbons (a) by free radical halogenation (b) by electrophilic substitution (c) by replacement of diazonium group (Sandmeyer reaction) (d) by the addition of hydrogen halides and halogens to alkenes-by halogen exchange(Finkelstein reaction); Physical properties-melting and boiling points, density and solubility; Chemical reactions: Reactions of haloalkanes (i)Nucleophilic substitution reactions (a) SN^2 mechanism (b) SN^1 mechanism (c) stereochemical aspects of nucleophilic substitution reactions-optical activity (ii) Elimination reactions (iii) Reaction with metals-Reactions of haloarenes:
(i) Nucleophilic substitution (ii) Electrophilic substitution and (iii) Reaction with metals; Polyhalogen compounds: Uses and environmental effects of dichloro methane, trichloromethane, triiodomethane, tetrachloro methane, freons and DDT.

25) ORGANIC COMPOUNDS CONTAINING C, H AND O (Alcohols, Phenols, Ethers, Aldehydes, Ketones and Carboxylic acids):

ALCOHOLS, PHENOLS AND ETHERS: Alcohols,phenols and ethers -classification; Nomenclature: (a)Alcohols, (b)phenols and (c) ethers; Structures of hydroxy and ether functional groups; Methods of preparation: **Alcohols** from alkenes and carbonyl compounds (reduction and reaction with Grignard reagents); **Phenols** from haloarenes, benzene sulphonic acid, diazonium salts, cumene; Physical propertics of alcohols and phenols; Chemical reactions of alcohols and phenols (i) Reactions involving cleavage of O-H bond-Acidity of alcohols and phenols, esterification (ii) Reactions involving cleavage of C-O bond- reactions with HX, PX_3, dehydration and oxidation (iii) Reactions of phenols- electrophilic aromatic substitution, Kolbe's reaction, Reimer - Tiemann reaction, reaction with zinc dust, oxidation; Commercially important alcohols (methanol,ethanol); **Ethers-**Methods of preparation: By dehydration of alcohols, Williamson synthesis- Physical properties-Chemical reactions: Cleavage of C-O bond and electrophilic substitution of aromatic ethers.

ALDEHYDES AND KETONES: Nomenclature and structure of carbonyl group; Preparation of aldehydes and ketones-(1) by oxidation of alcohols (2) by dehydrogenation of alcohols (3) from hydrocarbons -Preparation of aldehydes (1) from acyl chlorides (2) from nitriles and esters(3) from hydrocarbons-Preparation of ketones(1) from acyl chlorides (2)from nitriles (3)from benzene or substituted benzenes; Physical properties of aldehydes and ketones; Chemical reactions of aldehydes and ketones-nucleophilic addition, reduction, oxidation, reactions due to alpha hydrogen and other reactions (Cannizzaro reaction, electrophilic substitution reaction); Uses of aldehydes and ketones.

CARBOXYLIC ACIDS: Nomenclature and structure of carboxylgroup; Methods of preparation of carboxylic acids (1)from primary alcohols and aldehydes (2) from alkylbenzenes(3)from nitriles and amides (4)from Grignard reagents (5) from acyl halides and anhydrides (6) from esters; Physical properties; Chemical reactions: (i) Reactions involving cleavage of O-H bond-acidity, reactions with metals and alkalies (ii) Reactions involving cleavage of C-OH bond-formation of anhydride, reactions with PCl_5, PCl_3, $SOCl_2$, esterification and reaction with ammonia (iii) Reactions involving-COOH group-reduction, decarboxylation (iv) Substitution reactions in the hydrocarbon part - halogenation and ring substitution; Uses of carboxylic acids.

26) ORGANIC COMPOUNDS CONTAINING NITROGEN:

AMINES: Structure of amines; Classification; Nomenclature; Preparation of amines: reduction of nitro compounds, ammonolysis of alkyl halides, reduction of nitriles, reduction of amides, Gabriel phthalimide synthesis and Hoffmann bromamide degradation reaction; Physical properties; Chemical reactions: basic character of amines, alkylation, acylation, carbyl amine reaction, reaction with nitrous acid, reaction with aryl sulphonyl chloride, electrophilic substitution of aromatic amines-bromination, nitration and sulphonation.

DIAZONIUM SALTS: Methods of preparation of diazonium salts (by diazotization) Physical properties; Chemical reactions: Reactions involving displacement of Nitrogen; Sandmeyer reaction, Gatterman reaction, replacement by i) iodiode and fluoride ions ii) hydrogen, hydroxyl and Nitro groups; reactions involving retention of diazo group; coupling reactions; Importance of diazonium salts in synthesis of aromatic compounds.

CYANIDES AND ISOCYANIDES: Structure and nomenclature of cyanides and isocyanides; Preparation, physical properties and chemical reactions of cyanides and isocyanides.

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MODEL QUESTIONS – BOTANY

1. **Assertion (A)**: In the leaves of the sugarcane C_3 and C_4 cycles are spatially separated.
Reason (R) : Hatch and Slack pathway occurs in bundle sheath cells and Calvin cycle in mesophyll cells.
1) Both (A) and (R) are true. (R) is the correct explanation of (A)
2) Both (A) and (R) are true, but (R) is not the correct explanation of (A)
3) (A) is true but (R) is false
4) (A) is false but (R) is true

2. Arrange the following in the order of their occurrence in the life cycle of an angiospermic plant:
I. Primary Endosperm Nucleus II. Microsporogenesis
III. Xenogamy IV. Pericarp
The correct sequence is:
1) I, III, II, IV 2) III, I, IV, II
3) II, III, I, IV 4) IV, I, II, III

3. If one strand of DNA molecule has the nucleotide sequence TAC AAT CGG TAA, the new stand synthesized in transcription will have the nucleotide sequence as:
1) ATG TTA GCC ATT 2) TAC AAT CGG TAA
3) AUG UUA GCC AUU 4) TUC UUT CGG TUU

4. Study the following lists:

List I	**List II**
A) Spadix	I. *Allium*
B) Umbel	II. *Tridax*
C) Spike	III. *Cocos*
D) Head	IV. *Achyranthus*
	V. *Hibiscus*

The correct match is:

	(A)	(B)	(C)	(D)
1.	I	IV	V	II
2.	IV	I	III	V
3.	II	III	IV	I
4.	III	I	IV	II

5. Prokaryotic cell possesses the following:
I . Chloroplast II. Cell wall
III. 70 S ribosomes IV. Well defined nucleus

The correct combination is:
1) I and II 2) II and III 3) I and III 4) II and IV

MODEL QUESTIONS – ZOOLOGY

1. In human being acromian process is present on:
   1) Sternum 2) Skull 3) Pectoral girdle 4) Pelvic girdle

2. Identify the sequence of leg parts of cockroach from base to tip of the leg
   A) Tibia B) Coxa C) Tarsus D) Femur E) Trochanter
   Correct sequence is
   1) B-A-D-E-C 2) B-E-D-A-C 3) A-D-C-B-E 4) A-C-B-E-D

3. Multiple selection type
   Choose the correct statements with reference to Cephalopods:
   A) Shell may be external and multichambered
   B) It includes Cuttle fishes
   C) Development includes Veliger larva
   D) Blood circulation is open type
   1) All 2) A & B 3) C & D 4) A & D

4. Matching type

SET-I	**SET-II**
Scientific names	Common Names
A) Pinctada	I) Elephant tusk shell
B) Mytilus	II) Sea hare
C) Dentalium	III) Pearl Oyster
D) Aplysia	IV) Marine mussel
	V) Ship worm

   Identify the correct match between SET-I and SET-II

	A	B	C	D
1)	III	IV	II	I
2)	III	I	II	V
3)	III	IV	I	II
4)	III	V	II	IV

5. Statement and Reason type
   Statement (S) During favourable conditions Euglena undergoes longitudinal binary fission.
   Reason (R) Binary fission in Euglena is described as symmetrogenic division as daughter individuals are like mirror images.
   1) Both S and R correct and R is the correct explanation to 'S'.
   2) Both S and R are correct but R is not correct explanation to 'S'.
   3) S is correct but R is not correct.
   4) S is not correct but R is correct.

MODEL QUESTIONS – PHYSICS

1. A particle starts from origin at t=0 with a velocity of 10 **i** m/s and moves in x-y plane under the action of force which produces a constant acceleration of (2i + 3j) m/s^2. The y – coordinate of the particle at the instant its x-coordinate becomes 24m
(1) 12m (2) 6m (3) 18m (4) 3m

2. When 0.2 kg of ice at 0^0 C mixed with 0.5 kg of water at 60 ^{0} C in a container, the resulting temperature is 10 ^{0}C. The heat of fusion of ice (S_{water} = 4186 J/kg/K)
(1) 1.31 X 10^5 J/kg (2) 2.62 X 10^5 J/kg
(3) 10.46 X 10^5 J/kg (4) 5.23 X 10^5 J/kg

3. Statement (A): When Zener diode is connected in reverse bias it acts as a voltage regulator.
Statement (B): Photodiode is operated in reverse biased condition.
Statement (C): No external bias is applied to the solar cell.
(1) A, B, C are TRUE (2) Only A & C are TRUE
(3) Only A & B are TRUE (4) Only B & C are TRUE

4. A solenoid of length 1.0m has a radius of 1cm and is made up of 1000 turns. It carries a current of 2.5 A. The magnitude of the magnetic field inside the solenoid in Tesla is
(1) π x 10^{-3} (2) π x 10^{-4} (3) π x 10^{-6} (4) π x 10^{-5}

5. Assertion: Artificial satellite does not require any fuel while it revolves around the earth's orbit.
Reason: Earth provides the necessary centripetal force for the satellite to move in its orbit.
(1) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(2) Both Assertion and Reason are true But Reason is not the correct explanation of Assertion.
(3) Assertion is true but Reason is false
(4) Both Assertion and Reason are false

6. Match the following physical quantities with their correct dimensional formula

List-I	**List-II**
(a) Gravitational constant	(i) $M^1 L^2 T^{-1}$
(b) Angular Momentum	(ii) $M^1 L^1 T^{-3} K^{-1}$
(c) Coefficient of thermal conductivity	(iii) $M^{-1} L^3 T^{-2}$
(d) Power of lense	(iv) $M^0 L^1 T^0$

	(a)	(b)	(c)	(d)
(1)	(ii)	(i)	(iii)	(iv)
(2)	(iii)	(ii)	(iv)	(i)
(3)	(ii)	(iii)	(i)	(iv)
(4)	(iii)	(i)	(ii)	(iv)

MODEL QUESTIONS – CHEMISTRY

1. Ionization enthalpies (kJ/mole) of Li, Be, B and C are
   (1) 520, 801, 899, 1086
   (2) 1086, 899, 801, 520
   (3) 520, 899, 801, 1086
   (4) 801, 520, 899, 1086

2. Which of the following statements is not true?
   (1) Bond order of N_2 is 3
   (2) B_2 is paramagnetic
   (3) SO_2 molecule is linear
   (4) Hybridisation of B in BCl3 is sp^2

3. Which of the following is/are more acidic than phenol?
   (a) C_2H_2 (b) C_2H_5OH (c) CH_3COOH (d) CH_3CHO
   (1) a and b
   (2) c and d
   (3) only b
   (4) only c

4. Assertion (A): Carbonyl compounds undergo nucleophilic addition reactions.
   Reason (R): Carbonyl group is non-polar.
   The correct answer is:
   (1) Both (A) and (R) are true and (R) is the correct explanation of (A)
   (2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
   (3) (A) is true but (R) is not true
   (4) (A) is not true but (R) is true

5. Match the following:

LIST I	**LIST II**
(A) Packing efficiency in ccp structure	(i) 2
(B) Number of atoms in bcc unit cell	(ii) 4
(C) Packing efficiency in simple cubic structure	(iii) 52.4%
(D) Number of atoms in fcc unit cell	(iv) 68.0%
	(v) 74.0%

The correct answer is:

	(A)	(B)	(C)	(D)
(1)	v	iv	iii	ii
(2)	iii	ii	i	iv
(3)	v	i	iii	ii
(4)	iv	i	ii	iii

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