Program	Institute
B.Sc. Biotechnology	Manipal School of Life Sciences (MSLS) Manipal

MET 2026 Test Details

- Test Duration: **120** minutes
- Total Questions: **60**
    - **Multiple Choice Questions (MCQs):** Biology (15), Physics (10), Chemistry (10), and English (10)
    - **Numerical Answer Type (NAT):** Biology (5), Physics (5) and Chemistry (5)
- Max Marks: **240**
- Marking Scheme
    - MCQ: **+4** for every correct answer, **-1** for every wrong answer, **0** for every unanswered question
    - NAT: **+4** for every correct answer, **0** for every wrong, **0** for every unanswered question
- By default, MET 2026 Test fee (Rs.1,200) is collected along with the application fee at the time of Online Application submission.
- Schedule & Mode: Refer www.manipal.edu/met for updates

MET 2026 Attempt Details

No. of Attempts: **2**

At the time of Online application submission (https://apply.manipal.edu) all candidates are requested to select any 3 Tentative Test center cities in the order of Preference / Priority. Most preferred City to be selected under "Tentative Test Center City (Preference 1)". All efforts will be made to allot the Preference no.1 city. However, due to administrative / logistic reasons, the University may allot a Preference no.2 city / Preference no. 3 city.

In case of unavailability of the Test Center at a particular city, the University reserves the right to allot a city other than the candidate's Preferred Test Center cities. The decision of the University regarding the allotment of the Test Center City shall be final. No further correspondence or request shall be entertained in such a case.

Hence, while filling up the Online Application Form, candidates MUST select the most Convenient City as per Preference / Priority from the list of Exam Center cities made available. MAHE will not be responsible for any inconvenience due to the incorrect selection of city by the candidates.

All applicants can book their entrance test slots (**Date & Batch**) in the Online Test Booking System (OTBS) based on the availability of seats. There is **NO** provision for selecting the City at the time of Online Test Booking.

Guidelines for 1st Attempt Booking

- The bookings (Date & Batch) are done on a first come first serve basis and are subject to the availability of seats.
- A slot once booked cannot be changed. Requests for the change of test center city / date / slot will not be entertained under any circumstances. **Hence, you are requested to book your slot, avoiding all other Central / State Entrance tests.**

It is the responsibility of the candidates to book their test schedule. MAHE will not be held accountable for the non-bookings.

Guidelines for 2nd Attempt Booking

Application Status	Booking Status	Phase 1 Test Status	Slot Booking for Phase 2
Applied **on or before** the last date applicable for 1st attempt	Phase 1 Slot Booked	Present	Eligible to book 2nd attempt during Phase 2 with an additional payment of Rs. 1200, to be made during Phase 2 booking
	Phase 1 Slot Booked	Absent	
	Phase 1 Slot Not Booked	Not Applicable	
Applied **after** the last date applicable for 1st attempt	Slot booking for Phase 2 only and NO second attempt		

- Candidate will be allowed to take second attempt if s/he is not satisfied with his/her performance in the first test, subject to availability of seats. The second slot may be booked after the first attempt as per the schedule mentioned above.
- Candidates applying **on or before** the last date applicable for 1st attempt will be eligible for a second attempt with an additional fee payment of Rs.1200, in Phase 2
- Candidates giving the first attempt in Phase 2 are NOT eligible for a second attempt in Phase 2
- Based on the above-mentioned eligibility, the candidate can go for the second attempt by making an online payment of Rs.1200/- in https://apply.manipal.edu, subject to the availability of seats. There is no need of applying afresh under https://apply.manipal.edu
- **Test Center City for the second attempt is as same as the City for the first attempt**. In case of unavailability of the Test Center at the same City, the University will identify the Test Center at the nearby City.
- The bookings are done on first come first serve basis and are subject to availability of seats.

A slot once booked for cannot be changed. Requests for the change of test center / date / slot will not be entertained under any circumstances. **Hence, you are requested to book your slot, avoiding all other Central / State Entrance tests.**

BIOLOGY

DIVERSITY IN LIVING WORLD

- What is living? Biodiversity; Need for classification; Taxonomy & Systematics; Concept of species and taxonomical hierarchy; Binomial nomenclature.
- Five kingdom classification: salient features and classification of Monera; Protista and Fungi into major groups: Lichens, Viruses and Viroids.
- salient features and classification of plants into major groups-Algae, Bryophytes, Pteridophytes, Gymnosperms (three to five salient and distinguishing features and at least two examples of each category);
- Salient features and classification of animals-nonchordate up to phyla level and chordate up to classes level (three to five salient features and at least two examples)

STRUCTURAL ORGANISATION IN ANIMALS AND PLANTS

- Morphology and modifications; Tissues; Anatomy and functions of different parts of flowering plants: Root, stem, leaf, inflorescence- cymose and recemose, flower fruit and seed (To be dealt along with the relevant practical of the Practical Syllabus) Family (Malvaceae, Cruciferae, Leguminoceae, Compositae, Gaminae)
- Animal tissues; Morphology, anatomy and functions of different systems (digestive, circulatory, respiratory, nervous and reproductive) of an insect and frog) (Brief account only)

CELL STRUCTURE AND FUNCTION

- Cell theory and cell as the basic unit of life; Structure of prokaryotic and eukaryotic cell; Plant cell and animal cell; Cell envelope, cell membrane, cell wall; Cell organelle structure and function; Endomembrane system-endoplasmic

reticulum, Golgi bodies, lysosomes, vacuoles; mitochondria, ribosomes, plastids, micro bodies; Cytoskeleton, cilia fagella centrioles (ultra-structure and function); Nucleus-nuclear membrane, chromatin, nucleolus.

- Chemical constituents of living cells: Biomolecules-structure and function of proteins, carbohydrates. lipids, nucleic acids; Enzymes-types, properties, enzyme action, classification and nomenclature of enzymes
- B Cell division: Cell cycle, mitosis, meiosis and their significance.

PLANT PHYSIOLOGY

- Photosynthesis: Photosynthesis as a means of Autotrophic nutrition; Site of photosynthesis take place; pigments involved in Photosynthesis (Elementary- idea); Photochemical and biosynthetic phases of photosynthesis; Cyclic and non-cyclic and photophosphorylation; chemiosmotic hypothesis; photorespiration C3 and C4 pathways; Factors affecting photosynthesis.
- Respiration: Exchange gases; cellular respiration-glycolysis. fermentation (anaerobic), TCA cycle and electron transport system (aerobic); Energy relations- Number of ATP molecules generated; Amphibolic pathways; Respiratory quotient.
- Plant growth and development: Seed germination; phases of plant growth and plant growth rate; Conditions of growth; Differentiation, dedifferentiation and redifferentiation; Sequence of developmental process in a plant cell; Growth regulators- auxin, gibberellin, cytokinin, ethylene, ABA.

HUMAN PHYSIOLOGY

- Breathing and Respiration: Respiratory organs in animals (recall only); Respiratory system in humans; Mechanism of breathing and its regulation in humans-Exchange of gases, transport of gases and regulation of respiration Respiratory volumes; Disorders related to respiration-Asthma, Emphysema, Occupational respiratory disorders.
- Body fluids and circulation: composition of blood, blood groups, coagulation of blood; composition of lymph and its function; Human circulatory system-structure of human heart and blood vessels; cardiac cycle, cardiac output. ECG, Double 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; Human excretory system-structure and function; Urine formation, osmoregulation; Regulation of kidney function-Renin-angiotensin, Atrial Natriuretic Factor, ADH and Diabetes insipidus; Role of other organs in excretion; Disorders; Uraemia, Renal failure, Renal calculi, Nephritis; Dialysis and artificial kidney.
- Locomotion and Movement: Types of movement- ciliary, flagellar, muscular; Skeletal muscle- contractile proteins and muscle contraction; Skeletal system and its functions (To be dealt with the relevant practical of practical syllabus); Joints; Disorders of muscular and skeletal system-Myasthenia gravis, Tetany, Muscular dystrophy, Arthritis, Osteoporosis, Gout.
- Neural control and coordination: Neuron and nerves; Nervous system in humans' central nervous system, peripheral nervous system and visceral nervous system; Generation and conduction of nerve impulse;
- Chemical coordination and regulation: Endocrine glands and hormones; Human endocrine system-Hypothalamus, pituitary, pineal, Thyroid, parathyroid, Adrenal, Pancreas, Gonads; Mechanism of hormone action (Elementary idea); Role of hormones as messengers and regulators, Hypo-and hyperactivity and related disorders (common disorders e.g. Dwarfism, Acromegaly, Cretinism, Goiter, Exophthalmic goiter, Diabetes, Addison's disease).

(Imp: Diseases and disorders mentioned above to be dealt in brief.)

REPRODUCTION

- Sexual reproduction in flowering plants: Flower structure; Development of male and female gametophytes; Pollination-types, agencies and examples; Outbreeding devices; Pollen-Pistil interaction; Double fertilization; Post fertilization events- Development of endosperm and embryo, Development of seed and formation of fruit; Special mode apomixis, parthenocarpy, polyembryony; Significance of seed and fruit formation.

- Human Reproduction: Male and female reproductive systems; Microscopic anatomy of testis and ovary; Gametogenesis-spermatogenesis & oogenesis; Menstrual cycle; Fertilisation, embryo development upto blastocyst formation, implantation: Pregnancy and placenta formation (Elementary idea); Parturition (Elementary idea); 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, ZIFT, GIFT (Elementary idea for general awareness).

GENETICS AND EVOLUTION

- Heredity and variation: Mendelian inheritance; Deviations from Mendelism - Incomplete dominance, Co-dominance, Multiple alleles and Inheritance of blood groups, Pleiotropy; Elementary idea of polygenic inheritance; Chromosome theory of inheritance; Chromosomes and genes; Sex determination in humans, birds and honey bee; Linkage and crossing over; Sex linked inheritance-Haemophilia, Colour blindness; Mendelian disorders in humans-Thalassemia; Chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndromes.
- Molecular basis of Inheritance: Search for genetic material and DNA as genetic material; Structure of DNA and RNA; DNA packaging; DNA replication; Central dogma; Transcription, genetic code, translation; Gene expression and regulation- Lac Operon; Genome and human genome project; DNA finger printing, protein biosynthesis.
- Evolution: Origin of life; Biological evolution and evidences for biological evolution from palaeontology, comparative anatomy, embryology and molecular evidence); Darwin’s contribution, Modem Synthetic theory of Evolution; Mechanism of evolution- Variation (Mutation and Recombination) and Natural Selection with examples, types of natural selection; Gene flow and genetic drift; Hardy-Weinberg’s principle; Adaptive Radiation; Human evolution.

BIOLOGY AND HUMAN WELFARE

- Health and Disease; Pathogens; parasites causing human diseases (Malaria, Filariasis, Ascariasis. Typhoid, Pneumonia, Common cold, Amoebiasis, Ring worm, Dengue, Chikungunya); Basic concepts of immunology-vaccines; Cancer, HIV and AIDS; Adolescence, drug and alcohol abuse. Tobacco abuse
- Microbes in human welfare: In household food processing, industrial production, sewage treatment, energy generation and as biocontrol agents and biofertilizers.

BIOTECHNOLOGY AND ITS APPLICATIONS

- Principles and process of Biotechnology: Genetic engineering (Recombinant DNA technology).
- Application of Biotechnology in health and agriculture: Human insulin and vaccine production, gene therapy Genetically modified organisms - Bt crops: Transgenic Animals, Biosafety issues – Biopiracy and patents.

ECOLOGY AND ENVIRONMENT

- Organisms and environment population interactions -mutualism competition, predation, parasitism Population attributes-growth. birth rate ad death rate, age distribution.
- Ecosystem: Patterns, components; productivity and decomposition: Energy flow: Pyramids of number, biomass. Energy
- Biodiversity and its conservation: Concept of Biodiversity; patterns of Biodiversity: Importance of Biodiversity; Loss of Biodiversity, Biodiversity conservation; Hotspots, endangered organisms. extinction; Red Data Book. biosphere reserves, National parks and sanctuaries, Sacred Groves.

PHYSICS

UNITS AND MEASUREMENTS

Units of measurements, System of units, SI Units, fundamental and derived units, least count, significant figures, Errors in measurements. Dimensions of Physics quantities, dimensional analysis and its applications.

KINEMATICS

The frame of reference, motion in a straight line, speed and velocity, uniform and non-uniform motion, average speed and instantaneous velocity, uniformly accelerated motion, velocity-time, position-time graph, relations for uniformly accelerated motion, relative velocity. Motion in a plane, projectile motion, uniform circular motion.

LAWS OF MOTION

Force and inertia, Newton's first law of motion, momentum, Newton's second Law of motion, impulse, Newton's third Law of motion. Law of conservation of linear momentum and its applications, equilibrium of concurrent forces. Static and Kinetic friction, laws of friction, rolling friction. Dynamics of uniform circular motion, centripetal force and its applications: vehicle on a level circular road, vehicle on a banked road.

WORK, ENERGY AND POWER

Work done by a constant force and a variable force, kinetic and potential energies, work-energy theorem, power. The potential energy of a spring, conservation of mechanical energy, conservative and non- conservative forces, motion in a vertical circle. Elastic and inelastic collisions in one and two dimensions.

ROTATIONAL MOTION

Centre of mass of a two-particle system, centre of mass of a rigid body. Basic concepts of rotational motion, moment of a force, torque, angular momentum, conservation of angular momentum and its applications. The moment of inertia, the radius of gyration, values of moments of inertia for simple geometrical objects, parallel and perpendicular axes theorems and their applications. Equilibrium of rigid bodies, rigid body rotation and equations of rotational motion, comparison of linear and rotational motions.

GRAVITATION

The universal law of gravitation. Acceleration due to gravity and its variation with altitude and depth. Kepler's law of planetary motion. Gravitational potential energy, gravitational potential. Escape velocity, motion of a satellite, orbital velocity, time period and energy of satellite.

PROPERTIES OF SOLIDS AND LIQUIDS

Elastic behaviour, stress-strain relationship, Hooke's Law, Young's modulus, bulk modulus and modulus of rigidity. Pressure due to a fluid column, Pascal's law and its applications, effect of gravity on fluid pressure, viscosity, Stoke's law, terminal velocity, streamline and
turbulent flow, critical velocity, Bernoulli's principle and its applications. Surface energy and surface tension, angle of contact, excess of pressure across a curved surface, application of surface tension: drops, bubbles and capillary rise. Heat, temperature, thermal expansion, specific heat capacity, calorimetry, change of state, latent heat. Heat transfer: conduction, convection and radiation.

THERMODYNAMICS

Thermal equilibrium and the concept of temperature, zeroth law of thermodynamics, heat, work and internal energy. The first law of thermodynamics, isothermal and adiabatic processes. The second law of thermodynamics: reversible and irreversible processes.

KINETIC THEORY OF GASES

Equation of state of a perfect gas, work done on compressing a gas, kinetic theory of gases: assumptions, the concept of pressure, kinetic interpretation of temperature, RMS speed of gas molecules, degrees of freedom, law of equipartition of energy and applications to specific heat capacities of gases, mean free path, Avogadro's number.

OSCILLATIONS AND WAVES

Oscillations and periodic motion: time period, frequency, displacement as a function of time, periodic functions. Simple harmonic motion (S.H.M.) and its equation, phase, oscillations of a spring: restoring force and force constant, energy in S.H.M.: kinetic and potential energies, simple pendulum: derivation of expression for its time period. Wave motion, longitudinal and transverse waves, speed of the travelling wave, displacement relation for a progressive wave, principle of superposition of waves, reflection of waves, standing waves in strings and organ pipes, fundamental mode and harmonics, beats.

ELECTROSTATICS

Electric charges: conservation of charge, Coulomb's law forces between two-point charges, forces between multiple charges, superposition principle and continuous charge distribution.

Electric field: electric field due to a point charge, electric field lines, electric dipole, electric field due to a dipole, torque on a dipole in a uniform electric field. Electric flux, Gauss's law and its applications to find field due to infinitely long uniformly charged straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell. Electric potential and its calculation for a point charge, electric dipole and system of charges, potential difference, equipotential surfaces, electrical potential energy of a system of two-point charges and of electric dipole in an electrostatic field. Conductors and insulators, dielectrics and electric polarization, capacitors and capacitance, the combination of capacitors in series and parallel and capacitance of a parallel plate capacitor with and without dielectric medium between the plates, energy stored in a capacitor.

CURRENT ELECTRICITY

Electric current: drift velocity, mobility and their relation with electric current, Ohm's law, electrical resistance, I-V characteristics of Ohmic and non-ohmic conductors, electrical energy and power, electrical resistivity and conductivity, series and parallel combinations of resistors, temperature dependence of resistance. Internal resistance, potential difference and emf of a cell, a combination of cells in series and parallel. Kirchhoff’s laws and their applications, Wheatstone bridge, Metre Bridge.

MAGNETIC EFFECTS OF CURRENT AND MAGNETISM

Biot - Savart law and its application to the current carrying circular loop, Ampere's law and its applications to infinitely long current carrying straight wire and solenoid. Force on a moving charge in uniform magnetic and electric fields, force on a current-carrying conductor in a uniform magnetic field, the force between two parallel currents carrying conductors, Definition of ampere, torque experienced by a current loop in a uniform magnetic field: Moving coil galvanometer, its sensitivity and conversion to ammeter and voltmeter. Current loop as a magnetic dipole and its magnetic dipole moment, bar magnet as an equivalent solenoid, magnetic field lines, magnetic field due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis, torque on a magnetic dipole in a uniform magnetic field, para-, dia- and ferromagnetic substances with examples, the effect of temperature on magnetic properties.

ELECTROMAGNETIC INDUCTION AND ALTERNATING CURRENTS

Electromagnetic induction: Faraday's law, induced emf and current, Lenz’s law, eddy currents, self and mutual inductance. Alternating currents, peak and RMS value of alternating current/voltage, reactance and impedance, LCR series circuit, resonance, power in AC circuits, watt-less current, AC generator and transformer.

ELECTROMAGNETIC WAVES

Displacement current, electromagnetic waves and their characteristics, transverse nature of electromagnetic waves, electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, X-rays, Gamma rays), applications of electromagnetic waves**.**

OPTICS

Reflection of light, spherical mirrors, mirror formula. Refraction of light at plane and spherical surfaces, thin lens formula and lens maker formula, total internal reflection and its applications, magnification, power of a lens, combination of thin lenses in contact, refraction of light through a prism, microscope and astronomical telescope (reflecting and refracting) and their magnifying powers.

Wave optics: wave front and Huygens 'Principle, laws of reflection and refraction using Huygens principle. Interference: Young's double-slit experiment and expression for fringe width, coherent sources and sustained interference of light. Diffraction due to a single slit, width of central maximum. Polarization: plane-polarized light, Brewster's law, uses of plane-polarized light and Polaroid.

DUAL NATURE OF MATTER AND RADIATION

Dual nature of radiation, Photoelectric effect, Hertz and Lenard's observations, Einstein's photoelectric equation, particle nature of light. Matter waves: wave nature of particle, de- Broglie relation.

ATOMS AND NUCLEI

Alpha-particle scattering experiment, Rutherford's model of atom, Bohr model, energy levels, hydrogen spectrum. Composition and size of nucleus, atomic masses, mass-energy relation, mass defect, binding energy per nucleon and its variation with mass number, nuclear fission and fusion.

ELECTRONIC DEVICES

Semiconductors, semiconductor diode: I-V characteristics in forward and reverse bias, diode as a rectifier; I-V characteristics of LED, the photodiode, solar cell, Zener diode, Zener diode as a voltage regulator. Logic gates (OR. AND. NOT. NAND and NOR).

EXPERIMENTAL SKILLS

Familiarity with the basic approach and observations of the experiments and activities:

1. Vernier callipers -its use to measure the internal and external diameter and depth of a vessel.
2. Screw gauge-its use to determine the thickness/ diameter of thin sheet/wire.
3. Simple pendulum-dissipation of energy by plotting a graph between the square of amplitude and time.
4. Metre scale - the mass of a given object by the principle of moments.
5. Young's modulus of elasticity of the material of a metallic wire.
6. Surface tension of water by capillary rise and effect of detergents,
7. Co-efficient of viscosity of a given viscous liquid by measuring the terminal velocity of a given spherical body.
8. Speed of sound in air at room temperature using a resonance tube,
9. Specific heat capacity of a given (i) solid and (ii) liquid by method of mixtures.
10. The resistivity of the material of a given wire using a metre bridge.
11. The resistance of a given wire using Ohm's law.
12. Resistance and figure of merit of a galvanometer by half deflection method.
13. The focal length of (i) Convex mirror (ii) Concave mirror and (iii)Convex lens, using the parallax method.
14. The plot of the angle of deviation vs angle of incidence for a triangular prism.
15. The refractive index of a glass slab using a travelling microscope.
16. Characteristic curves of a p-n junction diode in forward and reverse bias.
17. Characteristic curves of a Zener diode and finding reverse breakdown voltage.
18. Identification of diode, LED, resistor, a capacitor from a mixed collection of such items

CHEMISTRY

PHYSICAL CHEMISTRY

SOME BASIC CONCEPTS IN CHEMISTRY

Matter and its nature, Dalton's atomic theory, Concept of atom, molecule, element and compound, Laws of chemical combination, Atomic and molecular masses, mole concept, molar mass, percentage composition, empirical and molecular formulae, Chemical equations and stoichiometry.

ATOMIC STRUCTURE

Nature of electromagnetic radiation, photoelectric effect, spectrum of the hydrogen atom, Bohr model of a hydrogen atom - its postulates, derivation of the relations for the energy of the electron and radii of the different orbits, limitations of Bohr's model, dual nature of matter, de Broglie's relationship, Heisenberg uncertainty principle, elementary ideas of quantum mechanics, the quantum mechanical model of the atom and its important features, concept of atomic orbitals as one-electron wave functions, variation of Ψ and Ψ2 with r for 1s and 2s orbitals, various quantum numbers (principal, angular momentum and magnetic quantum numbers) and their significance, shapes of s, p and d - orbitals, electron spin and spin quantum number, rules for filling electrons in orbitals – Aufbau principle, Pauli's exclusion principle and Hund's rule, electronic configuration of elements and extra stability of half-filled and completely filled orbitals.

CHEMICAL BONDING AND MOLECULAR STRUCTURE

Kossel-Lewis approach to chemical bond formation, the concept of ionic and covalent bonds.

Ionic Bonding: Formation of ionic bonds, factors affecting the formation of ionic bonds; calculation of lattice enthalpy.

Covalent Bonding: Concept of electronegativity, Fajan's rule, dipole moment, Valence Shell Electron Pair Repulsion (VSEPR) theory and shapes of simple molecules. Quantum mechanical approach to covalent bonding: Valence bond theory - its important features, the

concept of hybridization involving s, p and d orbitals, resonance. Molecular Orbital Theory - Its important features, LCAOs, types of molecular orbitals (bonding, antibonding), sigma and pi-bonds, molecular orbital electronic configurations of homonuclear diatomic molecules, the concept of bond order, bond length and bond energy.

Elementary idea of metallic bonding, hydrogen bonding and its applications.

CHEMICAL THERMODYNAMICS

Fundamentals of thermodynamics: System and surroundings, extensive and intensive properties, state functions, entropy, types of processes.

The first law of thermodynamics - Concept of work, heat, internal energy and enthalpy, heat capacity, molar heat capacity, Hess's law of constant heat summation, Enthalpies of bond dissociation, combustion, formation, atomization, sublimation, phase transition, hydration, ionization and solution.

The second law of thermodynamics - Spontaneity of processes, Δ S of the universe and Δ G of the system as criteria for spontaneity. ΔG° (Standard Gibbs energy change) and equilibrium constant.

SOLUTIONS

Different methods for expressing the concentration of solution - molality, molarity, mole fraction, percentage (by volume and mass both), the vapour pressure of solutions and Raoult's Law - Ideal and nonideal solutions, vapour pressure - composition, plots for ideal and non- ideal solutions, Colligative properties of dilute solutions - a relative lowering of vapour pressure, depression of freezing point, the elevation of boiling point and osmotic pressure, determination of molecular mass using colligative properties, abnormal value of molar mass, van't Hoff factor and its significance.

EQUILIBRIUM

Meaning of equilibrium is the concept of dynamic equilibrium.

Equilibria involving physical processes: Solid-liquid, liquid-gas, gas-gas and solid-gas equilibria, Henry's law. General characteristics of equilibrium involving physical processes.

Equilibrium involving chemical processes: Law of chemical equilibrium, equilibrium constants (Kp and Kc) and their significance, the significance of Δ G and Δ G ° in chemical equilibrium, factors affecting equilibrium concentration, pressure, temperature, the effect of catalyst, Le Chatelier's principle.

Ionic equilibrium: Weak and strong electrolytes, ionization of electrolytes, various concepts of acids and bases (Arrhenius, Bronsted - Lowry and Lewis) and their ionization, acid-base equilibria (including multistage ionization) and ionization constants, ionization of water, pH scale, common ion effect, hydrolysis of salts and pH of their solutions, the solubility of sparingly soluble salts, solubility products and buffer solutions.

REDOX REACTIONS AND ELECTROCHEMISTRY

Electronic concepts of oxidation and reduction, redox reactions, oxidation number, rules for assigning oxidation number and balancing of redox reactions. Electrolytic and metallic conduction, conductance in electrolytic solutions, molar conductivities and their variation with concentration, Kohlrausch's law and its applications. Electrochemical cells - Electrolytic and Galvanic cells, different types of electrodes, electrode potentials including standard electrode potential, half-cell and cell reactions, emf of a Galvanic cell and its measurement, Nernst equation and its applications, relationship between cell potential and Gibbs' energy change, dry cell and lead accumulator, fuel cells.

CHEMICAL KINETICS

Rate of a chemical reaction, factors affecting the rate of reactions: concentration, temperature, pressure and catalyst, elementary and complex reactions, order and molecularity of reactions, rate law, rate constant and its units, differential and integral forms of zero and first-order reactions, their characteristics and half-lives, the effect of temperature on the rate of reactions, Arrhenius theory, activation energy and its calculation, collision theory of bi-molecular gaseous reactions (no derivation).

INORGANIC CHEMISTRY

CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES

Modern periodic law and present form of the periodic table, s, p. d and f block elements, periodic trends in properties of elements atomic and ionic radii, ionization enthalpy, electron gain enthalpy, valence, oxidation states and chemical reactivity.

p- BLOCK ELEMENTS

Group -13 to Group 18 Elements

General Introduction: Electronic configuration and general trends in physical and chemical properties of elements across the periods and down the groups, unique behaviour of the first element in each group.

d - and f - BLOCK ELEMENTS

Transition Elements - General introduction, electronic configuration, occurrence and characteristics, general trends in properties of the first-row transition elements - physical properties, ionization enthalpy, oxidation states, atomic radii, colour, catalytic behaviour, magnetic properties, complex formation, interstitial compounds, alloy formation, preparation, properties and uses of $K_2Cr_2O_7$ and $KMnO_4$.

Inner Transition Elements

Lanthanoids - Electronic configuration, oxidation states and Lanthanoid contraction.

Actinoids - Electronic configuration and oxidation states.

COORDINATION COMPOUNDS

Introduction to coordination compounds. Werner's theory, ligands, coordination number, denticity, chelation, IUPAC nomenclature of mononuclear co-ordination compounds, isomerism, Bonding: Valence bond approach and basic ideas of Crystal field theory, colour and magnetic properties, importance of coordination compounds (in qualitative analysis, extraction of metals and in biological systems).

ORGANIC CHEMISTRY

PURIFICATION AND CHARACTERISATION OF ORGANIC COMPOUNDS

Purification - Crystallization, sublimation, distillation, differential extraction and chromatography - principles and their applications.

Qualitative analysis - Detection of nitrogen, sulphur, phosphorus and halogens.

Quantitative analysis (basic principles only) - Estimation of carbon, hydrogen, nitrogen, halogens, sulphur and phosphorus.

Calculations of empirical formulae and molecular formulae, numerical problems in organic quantitative analysis

SOME BASIC PRINCIPLES OF ORGANIC CHEMISTRY

Tetravalency of carbon, shapes of simple molecules - hybridization (s and p): classification of organic compounds based on functional groups and those containing halogens, oxygen, nitrogen and sulphur, homologous series: Isomerism - structural and stereoisomerism.

Nomenclature (Trivial and IUPAC)

Covalent bond fission - Homolytic and heterolytic, free radicals, carbocations and carbanions, stability of carbocations and free radicals, electrophiles and nucleophiles.

Electronic displacement in a covalent bond - Inductive effect, electromeric effect, resonance and hyperconjugation.

Common types of organic reactions- Substitution, addition, elimination and rearrangement.

HYDROCARBONS

Classification, isomerism, IUPAC nomenclature, general methods of preparation, properties and reactions.

Alkanes - Conformations: Sawhorse and Newman projections (of ethane), mechanism of halogenation of alkanes.

Alkenes - Geometrical isomerism, mechanism of electrophilic addition, addition of hydrogen, halogens, water, hydrogen halides (Markownikoffs and peroxide effect), Ozonolysis and polymerization.

Alkynes - Acidic character, addition of hydrogen, halogens, water and hydrogen halides, polymerization.

Aromatic hydrocarbons - Nomenclature, benzene - structure and aromaticity, mechanism of electrophilic substitution, halogenation, nitration.

Friedel-Craft's alkylation and acylation, directive influence of the functional group in mono- substituted benzene.

ORGANIC COMPOUNDS CONTAINING HALOGENS

General methods of preparation, properties and reactions, nature of C-X bond, mechanisms of substitution reactions. Uses, environmental effects of chloroform, iodoform, freons and DDT.

ORGANIC COMPOUNDS CONTAINING OXYGEN

General methods of preparation, properties, reactions and uses.

ALCOHOLS, PHENOLS AND ETHERS

Alcohols: Identification of primary, secondary and tertiary alcohols, mechanism of dehydration.

Phenols: Acidic nature, electrophilic substitution reactions, halogenation, nitration and sulphonation, Reimer - Tiemann reaction.

Ethers: Structure.

Aldehyde and Ketones: Nature of carbonyl group, nucleophilic addition to >C=O group, relative reactivities of aldehydes and ketones, important reactions such as - Nucleophilic addition reactions (addition of HCN, NH3 and its derivatives), Grignard reagent, oxidation, reduction (Wolf Kishner and Clemmensen), the acidity of α-hydrogen. Aldol condensation, Cannizzaro reaction, Haloform reaction, chemical tests to distinguish between aldehydes and ketones.

Carboxylic Acids: Acidic strength and factors affecting it.

ORGANIC COMPOUNDS CONTAINING NITROGEN

General methods of preparation, properties, reactions and uses.

Amines: Nomenclature, classification, structure, basic character and identification of primary, secondary and tertiary amines and their basic character**.**

Diazonium Salts: Importance in synthetic organic chemistry.

BIOMOLECULES

General introduction and importance of biomolecules.

CARBOHYDRATES – Classification, aldoses and ketoses, monosaccharides (glucose and fructose) and constituent monosaccharides of oligosaccharides (sucrose, lactose and maltose).

PROTEINS - Elementary idea of α-amino acids, peptide bond, polypeptides, proteins: primary, secondary, tertiary and quaternary structure (qualitative idea only), denaturation of proteins, enzymes.

VITAMINS – Classification and functions.

NUCLEIC ACIDS – Chemical constitution of DNA and RNA, biological functions of nucleic acids. Hormones (General introduction)

PRINCIPLES RELATED TO PRACTICAL CHEMISTRY

Detection of extra elements (Nitrogen, sulphur, halogens) in organic compounds, detection of the following functional groups, hydroxyl (alcoholic and phenolic), carbonyl (aldehyde and ketones) carboxyl and amino groups in organic compounds.

- The chemistry involved in the preparation of the following:
- Inorganic compounds, Mohr's salt, potash alum.
- Organic compounds: Acetanilide, p-nitro acetanilide, aniline yellow, iodoform.
- The chemistry involved in the titrimetric exercises – acids, bases and the use of indicators, oxalic-acid vs KMnO4, Mohr's salt vs KMnO4
- Chemical principles involved in the qualitative salt analysis:

Cations – Pb2+, Cu2+, Al3+, Fe3+, Zn2+, Ni2+, Ca2+, Ba2+, Mg2+, NH4+

Anions- CO32−, S2-, SO42−, NO3-, NO2-, Cl-, Br-, I- (Insoluble salts excluded).

Chemical principles involved in the following experiments:

1. Enthalpy of solution of CuSO4
2. Enthalpy of neutralization of strong acid and strong base.
3. Preparation of lyophilic and lyophobic sols.
4. Kinetic study of the reaction of iodide ions with hydrogen peroxide at room

ENGLISH

GRAMMAR AND LANGUAGE USE

Grammatical accuracy and sentence construction skills. Core Grammar Concepts: Tenses and verb forms; Subject-verb agreement; Articles and determiners; Prepositions and conjunctions. Advanced Grammar skills: Clauses; Conditional sentences; Types of sentences; Error Detection and Sentence Correction.

VOCABULARY

Understanding the right use of vocabulary through contextual vocabulary, synonyms, antonyms, and idiomatic usage. Vocabulary: Synonyms and Antonyms; One-word Substitutions; Commonly confused pairs of words; Collocations and Phrasal Verbs; Idioms.

PUNCTUATION, AND USAGES

Proper use of punctuation, and appropriate usages that enhance clarity in writing. Punctuation marks: commas, semicolons, colons, dashes, and capitalisation; Identification of incorrect usage and improvement of sentences; redundancy and ambiguity in sentences; Avoidance of run-on sentences and fragments.

READING COMPREHENSION

Understanding and interpreting diverse texts to assess comprehension and analytical abilities. Short comprehension passages on Narrative, Descriptive, Expository, Argumentative topics. Skills tested: Identifying the main idea and supporting details; Drawing inferences and conclusions; Vocabulary in context; Critical reasoning and evaluating arguments.

♣ Best of Luck ♣

Updated: 2.00PM, January 16, 2026