Content Weightages for
National University of Medical Sciences

Sr. No	Subject	Criteria and Subject Division
1.	Biology	80
2.	Chemistry	60
3.	Physics	40
4.	English	20
Total		200

Sr. No	Table of Contents	Subject
Biology		
1.	The Cell	Light and Electron Microscope (Magnification and Resolution).
		Structure of Typical Animal and Plant Cell.
		Fluid Mosaic Model of Cell Membrane.
		Transport of Material across the Cell Membrane: Active transport, Passive transport, Endocytosis and Exocytosis.
		Eukaryotic Cell Structures: Endoplasmic reticulum (RER & SER), Ribosomes, Golgi apparatus, Lysosomes, Vacuoles, Centrioles & Microtubules, Mitochondria, Chloroplast and Nucleus (nuclear membrane, nucleolus and chromosomes).
2.	Biological Molecules	Carbohydrates: Monosaccharides, Disaccharides and Polysaccharides (Starch, Glycogen & Cellulose).
		Lipids: Triglycerides, Phospholipids and their functions.
		Proteins: Amino Acids & Peptide bond formation, Structures of Proteins (primary, secondary, tertiary and quaternary structures) and Globular & Fibrous Proteins.
		Nucleic acids: DNA, RNA and Types of RNA.
		Water: Heat of vaporization, Specific Heat Capacity and Solvent Action.
		Enzyme: Definition, Characteristics of, Mechanism of Enzyme Action Enzymes (Lock & key model and Induced fit model), Factors affecting the rate of Enzyme Action, Inhibitors
3.	Chromosomes and DNA	Chromosome: Nucleosome, DNA, Histone Proteins, Chromatids, Centromere and Telomeres.
		Gene as a Basic Unit of Genetic Information.
		DNA Replication: Hypothesis of DNA Replication, Meselson & Stahl's experiment and
		Replication.
		Transcription.
		Genetic Code.

		Translation
4.	**Cell Division**	Cell Cycle: Interphase (G1, S and G2 phases), Mitotic phase and Cytokinesis.
		Mitosis: Process of Mitosis, Significance of Mitosis.
		Meiosis: Process of Meiosis and Significance of Meiosis.
5.	**Variety of Life**	Kingdoms: Protoctista, Fungi, Plantae and Animalia.
		Viruses: Structure of Viruses.
		AIDS: Causative Agent, Modes of Transmission and Prevention & Control.
6.	**Bioenergetics**	Photosynthetic Pigments (Chlorophylls and Carotenoids).
		Absorption and Action Spectra.
		Light-Dependent Reactions (cyclic and non-cyclic phosphorylation) and Light-Independent Reactions (Calvin cycle).
		Cellular Respiration: Glycolysis, Link reaction / Pyruvic Oxidation, Kreb's Cycle (with reference to production of NADH, FADH and ATP) and ETC.
		Anaerobic Respiration and its Types (Alcoholic and Lactic Acid Fermentation).
7.	**Gas Exchange**	Anatomy of Human Respiratory System.
		Transport of Respiratory Gases: O_2 & CO_2 and Role of Haemoglobin as Respiratory Pigment.
		Respiratory Disorders: Tuberculosis, Emphysema and Lung Cancer.
8.	**Transport in Plants**	Transport of Water and Minerals: Apoplast & Symplast Pathway and Cohesion, Transpiration Pull / Tension & Adhesion.
		Transpiration, Factors affecting it and opening and closing of Stomata.
		Translocation according to Pressure Flow Theory.
		Xerophytes.
9.	**Transport in Human**	Heart: Structure of heart, Cardiac Cycle, Control of Heart Beat, ECG and Blood Pressure.
		Blood Vessels: Arteries, Veins and Capillaries.
		Blood: Plasma and Blood Cells (RBCs, WBCs and platelets).
		Lymphatic System.
10.	**Immunity**	Immune System and its Components.
		Types of Immunity.
		Vaccination.
11.	**Homeostasis**	Homeostasis.
		Thermoregulation in Mammals.
		Human Urinary System.
12.	**Muscles and Movement**	Structure and Function of Skeletal Muscle.
		Mechanism of Skeletal Muscle Contraction; Sarcomere,

		Ultrastructure of Myofilaments, Sliding Filament, Control of Actin-Myosin Interaction and Use of Energy for Muscle Contraction.
13.	**Communication**	Nervous Coordination in Mammals.
		Neurons: Sensory, Intermediate / relay and motor neurons.
		Reflex arc / Reflex action.
		Nerve impulse.
		Synapse.
		Hormones: Definition & Types of Hormones, Hormones of Islets of Langerhans (Insulin & Glucagon) and Role of ADH in Osmoregulation.
		Plants Hormones: Auxins, Gibberellins and Abscisic Acid.
14.	**Reproduction**	Gametogenesis: Spermatogenesis and Oogenesis.
		Hormonal control of Human Menstrual Cycle (FSH, LH, estrogen and progesterone).
15.	**Genetics**	Basics of Genetics: Gene, Locus, Allele, Gene Pool, Phenotype, Genotype, Homozygous, Heterozygous, Dominant Allele, Recessive Allele, Complete Dominance, Codominance, Linkage, F_1 & F_2 Generations, Mutation and Multiple Allele.
		Gene Linkage: Crossing over and Recombination Frequency / Cross Over Value.
		Continuous and Discontinuous Variations.
		Punnet square, Test cross and Monohybrid & Dihybrid Crosses.
		Gene Linkage and Sex Linkage in Human (Haemophilia and Colour Blindness).
16.	**Biotechnology**	Recombinant DNA Technology / Genetic Engineering: Principles of Recombinant DNA Technology and its Application, PCR & Gel Electrophoresis and DNA Analysis / Finger Printing.
		Gene Therapy.
		Transgenic Organisms (Bacteria, Plants and Animals).
17.	**Evolution**	Theory of natural selection.
		Hardy-Weinberg theorem and factors affecting gene / allele frequency.
Chemistry		
1.	**Fundamental Concepts**	Relative masses.
		Isotopes.
		Mole.
		Avogadro's number.
		Empirical and Molecular formulae.
		Stoichiometric Calculations.

		Concentration units of solutions. • Percentage composition • Molarity • Mole fraction
2.	**States of Matter**	Gaseous state.
		General Gas Equation (PV=n RT).
		Liquid state: • Evaporation • Vapor pressure • Boiling • Structure of ice
		Lattice structure of a crystalline solid
3.	**Atomic Structure**	Proton, Neutron and Electron.
		Distribution of Mass and charges.
		Deduce the number of protons, neutrons and electrons from given proton number and nucleon number.
		Shape of s, p and d- Orbitals.
		Electronic configuration.
		Ionization energy.
		Electron affinity.
4.	**Chemical Bonding**	Ionic (Electrovalent) bond
		Use the "dot and cross" model for: • Covalent bonding • Co-ordinate (dative covalent) bonding
		Shapes and Bond Angles of molecules.
		Covalent Bonding.
		Bond Energy, Bond length and bond Polarity (Electronegativity difference).
		Intermolecular Forces (especially Hydrogen Bonding).
		Interpret and predict the effect of different types of bonding on physical properties of substances.
5.	**Chemical Energetics**	Concept of Energy changes during Chemical reactions.
		Use the terms: • Enthalpy change of reaction • Bond energy
		Numerical Magnitude of Lattice Energy.
		Hess's law to construct simple energy cycles.
6.	**Electrochemistry**	Redox processes.
		Oxidation numbers of Elements.
		Balancing chemical equations by redox method.
		Standard electrode (redox) Potential.
		Standard Hydrogen Electrode.
		Methods used to measure the standard Electrode potentials of metals.
		Standard Cell Potential.

		Electrode Potential.
		Construct Redox equations.
		Advantages of Developing the H_2/O_2 fuel cell.
7.	**Chemical Equilibrium**	Rates of forward and reverse Reactions and Dynamic Equilibrium.
		Le- Chatelier's Principle.
		Deduce expression for Equilibrium constant.
		Calculate the values of Equilibrium constants.
		Calculate the equilibrium quantities.
		Conditions used in Haber process.
		Qualitatively the differences in behavior of strong/weak acids and bases.
		Terms: pH, K_a, pK_a, K_b, pK_b, K_w and K_{sp}.
		$[H^+_{(aq)}]$, $[OH^-_{(aq)}]$, pH and pOH values for strong and weak acids and bases.
8.	**Reaction Kinetics/ Chemical Kinetics**	Rate of Reaction, Activation Energy, Catalysis, Rate Equation, Order of Reaction, Rate Constant.
		Collisions.
		Enzymes as Biological Catalysts.
		Construct and use rate equations with special emphasis on: • Zero order reaction • 1st order reaction • 2nd order reaction
		Half-life of a first order Reaction.
		Calculate the order of reaction.
		Calculate the rate constant.
		Name a Suitable method for studying the rate of a Reaction.
Inorganic Chemistry		
1.	**Periods**	Variation in the Physical properties of Elements Belonging to period 2 and period 3: **a.** Atomic Radius **b.** Ionic Radius **c.** Melting Point **d.** Boiling Point **e.** Ionization Energy **f.** Electronegativity **g.** Electron Affinity **h.** Electrical Conductivity **i.** Oxidation States **j.** Hydration Energy Periodic Relationship in Binary compounds: **k.** Halides (especially chlorides)

		l. Oxides
2.	**Groups**	The variation in the properties of group II and VII Elements: **a.** Reactions of group II elements. **b.** Thermal decomposition and solubility of compounds of group II elements **c.** Properties of Halogens and their compounds **d.** Reaction of Chlorine **e.** Comparison of Oxidizing power of halogens **f.** Uses of Halogens and compounds of Halogens
3.	**Transition Elements**	Chemistry of Transition Elements of 3d series: **a.** Electronic Configuration **b.** Variable Oxidation states **c.** Uses as a Catalyst **d.** Formation of Complexes **e.** Colour of Transition Metal Complexes **f.** Geometry and isomerism of complex ions with coordination number 4 and 6.
4.	**Compounds of Nitrogen and Sulphur**	Nitrogenous fertilizers.
		Presence of Sulphur Dioxide in atmosphere.
		Manufacturing of Sulphuric Acid.
		Sulphuric acid as dehydrating agent and oxidizing agent.
Organic Chemistry		
1.	**Fundamental Principles**	The Organic compounds.
		Alkanes and Alkenes of lower masses.
		Nucleophiles, electrophiles and free radicals.
		Isomerism.
		Functional group and Nomenclature of organic compounds.
2.	**Hydrocarbon**	Chemistry of Alkanes with emphasis on: • Combustion. • The Mechanism of free radical Substitution reaction.
		Chemistry of Alkenes with emphasis on: • Preparation of Alkenes • Reaction of Alkenes
		Chemistry of Benzene • Benzene. • Electrophilic substitution reactions and the mechanism. • Hydrogenation of Benzene ring. • Side chain Oxidation of Methyl Benzene (Toluene) and Ethyl Benzene. • Benzene ring by 2,4 Directing and 3,5 directing groups.
3.	**Alkyl Halides**	Importance of Halogenoalkanes.

	(Halogenoalkanes)	Reaction of Alkyl Halides: Nucleophilic substitution reactions and mechanisms
4.	**Alcohols and Phenols**	Alcohols with reference to: Alcohols: Primary, Secondary and Tertiary. Preparation of Ethanol. Reactions of Alcohols.
		Phenols Reactions of Phenol Acidity of Water, ethanol and phenol
5.	**Aldehydes and Ketones**	Structure of Aldehydes and Ketones.
		Preparation of Aldehydes and Ketones.
		Reactions of Aldehydes and Ketones: Nucleophilic addition reaction mechanism
6.	**Carboxylic Acid**	Physical properties of carboxylic acids.
		Reactions of carboxylic acids.
		Relative Acidic strength.
7.	**Amino Acids**	General Structure of -Amino Acids found in Proteins.
		Amino Acids on the basis of Nature of R-group.
		Zwitter Ion.
		Acid base properties of Amino Acids.
		Peptide bond formation.
8.	**Macromolecules**	Addition polymerization.
		Conensation polymerization.
		Structure of Proteins.
		Structure and function of Nucleic acid (DNA).
9.	**Environmental Chemistry**	Air Pollutants.
		Chemistry and causes of Acid Rain.
		Ozone and Chlorofluorocarbons (CFCs).
Physics		
1.	**Measurement**	Physical quantities, numerical magnitude and a proper unit.
		International System of Units, SI base units of physical quantities, and their derived units.
		Prefixes and symbols to indicate decimal, submultiples or multiples of both base and derived units: • Errors and uncertainties • Systematic error and random error. • Fractional uncertainty and percentage uncertainty.
		Assessment of total uncertainty in the final results (Understanding of total assessment about addition and subtraction, multiplication and division & power factor).
2.	**Motion And Force**	Displacement, Distance, Speed, Velocity and Acceleration.
		Velocity–Time Graph.
		Equations of motion.

		Newton's Laws of Motion.
		Momentum and law of conservation of momentum.
		Force and rate of change of momentum.
		Impulse and $I = F \times t = mv_f - mv_i$
		Elastic and in-elastic collisions
		Projectile Motion and its applications.
		Moment of force or torque and use of torque.
		Equilibrium.
3.	**Work, Energy and Power**	Work in terms of the product of a force and displacement in the direction of the force.
		Kinetic energy K.E = $\frac{1}{2} mv^2$
		Potential energy P.E = mgh.
		Inter-conversion of kinetic energy and potential energy in gravitational field.
		Power in terms of work done per unit time and use power as product of force and velocity $P = \frac{W}{t}$ and P = Fv.
4.	**Circular Motion**	Angular motion, angular displacement & angular velocity.
		Centripetal Force and centripetal acceleration. $F = mr^2\omega, F = \frac{mv^2}{r} and\ a_c = r\omega^2 and\ a_c = \frac{v^2}{r}$
		Geostationary orbits.
		Radian.
5.	**Oscillations**	Simple harmonic motion
		Amplitude, Frequency, Angular Frequency, Phase Difference. Express the time period in terms of both frequency and angular frequency.
		Equations $x = x_0 sin\omega t, v = v_0 cos\omega t, v = \pm\omega\sqrt{x_0^2 - x^2}, a = -\omega^2 x$ and its use.
		Motion of simple pendulum and relation.
		Kinetic energy and potential energy during Simple harmonic motion.
		Free, Forced and Damped Oscillations.
		Resonance.
6.	**Waves**	Progressive waves
		Transverse and longitudinal waves.
		Principle of superposition.
		Stationary waves and wavelength of sound waves in air columns and stretched strings.
		Doppler's Effect
		Electromagnetic Spectrum.
7.	**Light**	Interference of light waves, constructive and destructive interference.
		Young's Double Slit experiment, fringe spacing, dark and bright fringes.

		Diffraction (basic principle).
		Diffraction grating.
8.	**Heat & Thermodynamics**	Basic postulates of kinetic theory of gases
		Pressure exerted by a gas and derive the relation $PV = \frac{Nm}{3} < v^2 >$
		Equation of state for an ideal gas as PV = nRT
		$PV = \frac{Nm}{3} < v^2 >$ and PV = NkT and prove that K.E $\propto$ T for a single molecule.
		Internal Energy.
		Specific Heat capacity.
9.	**Electrostatics**	Coulomb's Law.
		Electric field strength.
		$E = \frac{\Delta V}{\Delta d}$ to calculate the field strength.
		Electric field lines.
		$E = \frac{Q}{4\pi\varepsilon_0 r^2}$
		Gravitational force and electric force.
		Electric potential
		Capacitance of a capacitor
		Energy stored in capacitor
10.	**Current Electricity**	Current.
		Ohm's Law.
		Series and parallel Combination of resistors.
		Resistance and resistivity.
		Potential difference and e.m.f.
		Power dissipation in resistors.
		Kirchhoff's First Law as conservation of charge.
		Kirchhoff's Second Law as conservation of energy.
		Potentiometer.
11.	**ELECTROMAGNETISM**	Magnetic field.
		Force on current carrying conductor in uniform magnetic field.
		Force on a moving charge in magnetic field.
		Motion of charge particle in uniform electric and magnetic field.
		e/m for an electron.
12.	**Electromagnetic Induction**	Magnetic flux.
		Faraday's Law and Lenz's Law.
		Induced e.m.f and factors.
		Alternating current and use $V = V_0 sin\omega t$
		Transformer and uses of $\frac{N_s}{N_p} = \frac{V_s}{V_p} = \frac{I_p}{I_s}$ and practical transformer.
		Period, frequency, peak value and root mean square value of an alternating current or voltage.

13.	**Deformation of Solids**	Stress, strain and Young's Modulus.
		Tensile stress and strain.
		Hook's Law.
		Elastic and plastic deformation of a material.
		Strain energy.
		Band Theory, valence band, conduction band and forbidden band.
14.	**Electronics**	Half and Full wave rectification.
		Single diode for half wave rectification of an alternating current.
		Four diodes for full wave rectification of an alternating current.
		Operational amplifier and its characteristics.
15.	**Modern Physics**	Energy of photon E = hf.
		Photoelectric Effect, Threshold Frequency and Work Function Energy.
		Maximum photoelectric energy is independent of intensity whereas photoelectric current is proportional to intensity.
		Einstein's Photoelectric equation $hf = \emptyset + \frac{1}{2}mv_{max}^2$.
		de Broglie wavelength and use $\lambda = \frac{h}{p}$
		Discrete energy levels of hydrogen atom and spectral lines.
		Relation $hf = (E_2 - E_1)$
		Production of X-rays and features of X-rays tube.
16.	**Nuclear Physics**	Nucleus, nucleon number and charge number.
		Radioactivity and emission of radiation.
		Activity, Decay constant and relation Activity = Nλ
		Half-life of radioactive substance and relation $\lambda = \frac{0.693}{t_{1/2}}$
		Nuclear transmutation and conservation of mass, energy, momentum and charge during nuclear changes.
		Mass-defect, binding energy and relation $E = mc^2$
		Nuclear fission and fusion.
		Hadrons, Leptons and Quarks.
English		
1.	**Comprehensive key Vocabulary**	Contextual clues and illustrations
		Background or prior knowledge
		Morphology, syntax, phonics, knowledge of word relationships
		Knowledge of synonyms, antonyms, homophones
2.	**Demonstrate control of tenses and sentence**	Use correct tenses and sentence structure in writing.
		Identify mistakes in the use of tenses and sentence structure in written texts.

	structure	
3.	**Demonstrate correct use of subject-verb agreement**	Use correct subject-verb agreement in written texts
		Identify mistakes in the use of subject verb agreement in written texts
4.	**Demonstrate correct use of articles and prepositions**	Use appropriate articles and prepositions in different written contexts
		Identify mistakes in the use of articles and prepositions in sentences or short texts
		Select the appropriate article or preposition for a particular context
5.	**Demonstrate correct use of writing conventions of spelling, capitalization and punctuation to clarify meaning**	Use capitalization and punctuation such as semi colons, commas in a series, apostrophes in possessives, proper nouns, and abbreviations
		Avoid and identify the following punctuation