PMDC 2026

MEDICAL AND DENTAL COLLEGES ADMISSION TEST

(MDCAT)

CURRICULUM

(Biology, Chemistry, Physics, English, Logical Reasoning)

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PREAMBLE

In order to standardize the admission process, the Pakistan Medical & Dental Council (PM&DC) has decided to conduct a uniform admission test for all medical and dental institutions in Pakistan. This will ensure that all candidates are given equal opportunity to perform. This was a difficult task as the candidates appearing in this examination come from diverse backgrounds and different levels of education.

One of the greatest challenges was to devise a common curriculum / syllabus which encompasses not only the content taught in the premedical years but to note the topics missing from various syllabus. The MDCAT curriculum / syllabus will not favor any group or place another to any disadvantage.

The MDCAT is designed to evaluate the problem solving, critical thinking, and knowledge of natural, behavioral, and social sciences concepts and principles of a candidate required to the study of medicine. The MDCAT will be a standardized multiple-choice paper-based examination. It will also test the aspirants' other abilities like intuitive and critical thinking skills.

STRUCTURE, WEIGHTAGE AND DIFFICULTY LEVELS

<table>
<tr><td>STRUCTURE</td><td colspan="3">

Total number of MCQs: 180
Duration of MDCAT: 3hours
Format: Paper-based MCQs
Minimum pass marks for Medical College Admission: 55%
Minimum pass marks for Dental College Admission: 50%
No negative marking

</td></tr>
<tr><td rowspan="8">WEIGHTAGE</td><td rowspan="2">Subject</td><td colspan="2">WEIGHTAGE</td></tr>
<tr><td>Percentage</td><td>No. of MCQs</td></tr>
<tr><td>Biology</td><td>45%</td><td>81</td></tr>
<tr><td>Chemistry</td><td>25%</td><td>45</td></tr>
<tr><td>Physics</td><td>20%</td><td>36</td></tr>
<tr><td>English</td><td>5%</td><td>09</td></tr>
<tr><td>Logical Reasoning</td><td>5%</td><td>09</td></tr>
<tr><td>TOTAL</td><td>100</td><td>180</td></tr>
<tr><td>DIFFICULTY LEVEL</td><td colspan="3">15% MCQs Easy (Knowledge Base)
70% MCQs Moderate (Understanding Base)
15% MCQs Difficult (Application Base)</td></tr>
</table>

KEY TERMS (Introduced by Nearpeer)	RST-------- Relevant Sub Topics RLO-------- Relevant Learning Outcomes

1. BIOLOGY		
Unit	**Topics/Subtopics**	**Learning outcomes**
1- ACELLULAR LIFE	Viruses	Classify viruses on basis of their structure/ number of strands/ diseases/ hosts etc.
	AIDS and HIV Infection	Identify symptoms, mode of transmission and cause of viral disease (AIDS)
2- BIOENERGETICS\ CELLULAR RESPIRATION	Aerobic Respiration (RST)	Describe the process of aerobic respiration and explain how glucose is completely oxidized in the presence of oxygen to release energy.
	Anaerobic Respiration (RST)	Describe anaerobic respiration and its end products.
	Glycolysis	State glycolysis as cytoplasmic breakdown of glucose into pyruvate with ATP formation.
	Link Reaction	Describe the conversion of pyruvate into acetyl-CoA.
	Kreb's Cycle	Outline the Krebs cycle as oxidation of acetyl-CoA to CO_2 with energy release.
	Electron Transport Chain	Explain ATP formation through the electron transport chain using oxygen.
3- BIOLOGICAL MOLECULES	Introduction to Biological molecules	Define and classify biological molecules.
		Discuss the importance of biological molecules
	Biological Importance of Water	Describe biologically important properties of water (polarity, hydrolysis, specific heat, water as solvent and reagent, density, cohesion/ionization)
	Carbohydrates	Discuss carbohydrates: mono saccharaides (glucose), oligosaccharides (cane sugar, sucrose, lactose), polysaccharides (starches, cellulose, glycogen)
	Proteins	Describe proteins: amino acids, structure of proteins
	Lipids	Describe lipids: phospholipids, triglycerides, alcohol and esters (acylglycerol)
	Ribonucleic acid (RNA)	Give an account of structure and function RNA
	Conjugated molecules	Discuss conjugated molecules (glycol lipids, glycol proteins)

	Structure of DNA	Explain the double helical structure of DNA as proposed by Watson and Crick.
		Define gene is a sequence of nucleotides as part of DNA, which codes for the formation of a polypeptide.
4- CELL STRUCTURE & FUNCTION	Cell structure	Compare the structure of typical animal and plant cell
	Prokaryotic and Eukaryotic cell	Compare and contrast the structure of prokaryotic cells with eukaryotic cells
	Cytoplasmic Organelles	Outline the structure and function of the following organelles: nucleus, Endoplasmic reticulum, Golgi apparatus a Mitochondria
	Cell Membrane	Describe the structure and function of the cell membrane and it's components
	Chromosomes	Describe the structure, chemical composition and function of chromosomes.

1. BIOLOGY		
5- COORDINATION & CONTROL/ NERVOUS & CHEMICAL COORDINATION	Receptors	Recognize receptors as transducers sensitive to various stimuli.
		Explain different types of receptors.
	Gonadotropism in Chemical Coordination	Introduce the chemical coordination.
		Describe major pituitary hormones
	Neurons	Explain the structure of a typical neuron (cell body, dendrites, axon and myelin sheath
		Define nerve impulse
		Describe synapse
		Classify reflexes
		Briefly explain the functions of components of a reflex arc
	Brain	Discuss the main parts of the brain (e.g., components of brain stem, mid brain, cerebellum, cerebrum)
		Describe the functions of each part.
6- ENZYMES	Enzymes	Describe the distinguishing characteristics of enzymes
	Mode of Enzyme Action	Explain mechanism of action of enzymes
	Factors that Affect the Rate of Enzyme Reactions	Describe effects of factor on enzyme action (temperature, pH and concentration)
	Inhibitors	Describe enzyme inhibitors
7- EVOLUTION	Concept of Evolution	Explain origin of life according to concept of evolution
	Evidences of Evolution	Describe Biogeography Fossil Record, Comparative embryology, Comparative Anatomy and molecular biology.
	Lamarckism	Describe the theory of inheritance of acquired characters, as proposed by Lamarck.
	Darwinism	Explain the theory of natural selection as proposed by Darwin
	Human Reproductive system	Describe the functions of various parts of the male & female reproductive systems and the hormones that regulate those functions

8- REPRODUCTION	Menstrual cycle	Describe the menstrual cycle (female reproductive cycle) emphasizing the role of hormones
	Sexually transmitted diseases	List the common sexually transmitted diseases along with their causative agents and main symptoms
9- SUPPORT & MOVEMENT	Human skeleton	Describe cartilage, muscle and bone
		Explain the main characteristics of cartilage and bone along with functions.
	Muscles	Compare characteristics of smooth muscles, cardiac muscles and skeletal muscles
	Skeletal muscles	Explain the ultra-structure of skeletal muscles

1. BIOLOGY		
	Muscle contraction	Describe in brief the process of skeletal muscle contraction
	Joints	Classify joints
	Arthritis	Define arthritis
10- INHERITANCE	Mendel's laws of Inheritance	Associate inheritance with the laws of Mendel.
		Explain the law of independent assortment, using a suitable example.
	Gene linkage and crossing over	Describe the terms gene linkage and crossing over
		Explain how gene linkage counters independent assortment and crossing-over modifies the progeny
	X-linked Recessive inheritance	Describe the concept of sex-linkage.
		Briefly describe Inheritance of sex –linked traits
		Analyze the inheritance of hemophilia.
11- CIRCULATION	Human Heart	Discuss general structure of human heart
	Cardiac cycle and phases of Heartbeat	Describe the phases of heartbeat.
	Blood Vessels	List the differences and functions of arteries, veins and capillaries.
	Lymphatic system	Describe lymphatic system (nodes, vessels and organs)
12- IMMUNITY	Specific Defense Mechanism	Define and discuss the functions and importance of specific defense mechanisms.
13- RESPIRATION	Human Respiratory System	Discuss the functions of main part of respiratory system.
		Discuss the process of gas exchange in human lungs.
		Discuss the effect of smoking on respiratory system.
14- DIGESTION	Human digestive system	Describe the parts of human digestive system
		Explain the functions of the main parts of the digestive system including associated structures and glands

15- HOMEOSTASIS		Explain different organs of urinary system. Describe the structure of kidney and relate it with its function.

1. BIOLOGY		
	Homeostasis (kidney specifically)	Explain the processes of glomerular filtration, selective re-absorption and tubular secretion as the events in kidney functioning.
		Justify the functioning of kidneys as both excretion and osmoregulation.
		Compare the function of two major capillary beds in kidney i.e. glomerular capillaries and peritubular capillaries.
		Explain the causes and treatments of kidney stones.
		Outline the causes of kidney failure.
	Thermoregulation	Describe thermoregulation and explain its needs.
	Excretion	List various nitrogenous compounds excreted during the process of excretion.
16- BIOTECHNOLOGY	Biotechnology and Health Care	Describe how biotechnologists can combat health problems by producing vaccines.
		State the role played by biotechnology in disease diagnosis (DNA/RNA probes, monoclonal antibodies).
		Describe what products biotechnologists obtain for use in disease treatment.

2. CHEMISTRY

Units	Topics/subtopics	Learning Objectives
1. INTRODUCTION OF FUNDAMENTALS CONCEPT OF CHEMISTRY	Moles and Avogadro's Numbers	Construct mole ratios from balanced equations for use as conversion factors in stoichiometric problems.
		Perform stoichiometric calculations with balanced equations using moles, representative particles, masses and volumes of the gases (at ST).
	Limiting and Excess Reactants	Explain the limiting reagent in reaction
		Calculate the maximum number of products produced and the amount of any un-reacted excess reagent
	Yield	Given information from which any two the following may be determine, calculate the third: theoretical yield, actual yield, percentage yield.
		Calculate the theoretical yield and the percent yield when given the balanced equation, the amount of reactants and the actual yield.
2. ATOMIC STRUCTURE	Discovery of Proton Planck's Quantum Theory	Describe discovery and properties of proton. (Positive rays)
		Define Photon as a unit of radiation energy
	Quantum Number	Describe the concept of orbitals.
		Distinguish among Principal energy level, energy sub-level and atomic orbitals
	Shapes of orbitals	Describe the general shapes of S, P and orbitals.
	Spectrum of Hydrogen	Describe Hydrogen Atom using the quantum theory.
	Electronic Configuration	Use the Aufbau principle, the Pauli Exclusion Principle and Hund's Rule to write the Electronic Configuration of atoms.
		Write electronic configuration of atom
		List the postulates of Kinetic Molecular Theory.

3. GASES	Kinetic Molecular Theory	
		Describe the motion of particles of the gas according to kinetic theory.

	Standard Temperature and Pressure (STP)	State the values of standard temperature and pressure (STP)
	Boyle's Law	Describe the effect of change in pressure on the volume of gas.
	Charles's Law	Describe the effect of change in temperature on the volume of gas.
	Absolute Zero	Explain the significance of the absolute zero, giving its value in degree.
	Ideal Gas Equation	Derive Ideal Gas equation using Boyle's Law, Charle's Law and Avogadro's Law.
	Unit of "R"	Explain the significance and different units of ideal gas constant.
	Ideal & Non-ideal Behavior of Gases	Distinguish between Real and Ideal Gases.
	Vander waal's Equation	Distinguish between Real and Ideal Gases.
	Real and Ideal Gas	Distinguish between Real and Ideal Gases.
4. LIQUIDS	Properties Of Liquids based on Kinetic Molecular Theory	Describe simple properties of liquids e.g diffusion, compression, expansion, motion of molecules, spaces between them, inter molecular forces and kinetic energy based on kinetic molecular theory.
	Evaporation, Boiling point and Vapor Pressure	Explain physical properties of liquid such as evaporation, vapor pressure, boiling point
	Hydrogen Bonding	Describe the hydrogen bonding in H_2O, NH_3 and HF molecules.
	Intermolecular Forces	Describe simple properties of liquids e.g diffusion compression, expansion, motion of molecules, spaces between them, inter molecular forces and kinetic energy based on kinetic molecular theory.
	Anomalous behavior of Water	Anomalous behavior of water when its density shows maximum at 4 degrees centigrade.
5. SOLID	Crystalline Solids	Describe crystalline solid
	Factors Affecting the Shape of Ionic Crystals	Name three factors that affect the shape of the ionic crystals.
	Difference between Ionic and Molecular Crystals	Give brief description of ionic and molecular crystals.
	Crystal lattice	Explain the structure of a crystal lattice

	Lattice Energy	Define Lattice Energy,
6. CHEMICAL EQUILIBRUM	Chemical Equilibrium	Define chemical equilibrium in terms of reversible reaction.
		Write both forward and reverse. Describe them macroscopic characteristics of each
	Le Chatelier's principle	State Le Chatelier's principle and be able to apply it to systems in equilibrium with changes in concentration, pressure, temperature or addition of catalyst.
	Solubility Products	Define and explain solubility products.

	Common Ion Effect	Define and explain the common ion effect by giving suitable examples.
	Buffer Solution	Define buffer solution and explain types of buffers.
	Haber's Process	Explain synthesis of Ammonia by Haber's process.
7. REACTION KINETICS	Chemical Kinetics	Define chemical kinetics.
		Explain the terms: rate of reaction, rate equation.
	Factors affecting rate of reaction	Explain qualitatively factors affecting rate of reaction.
	Order of Reaction	Give the order with respect to the reactant, write the rate of law for reaction.
		Explain the meaning of the term "activation energy" and "activated complex".
		Relate the ideas of activation energy and the activated complex to the rate of reaction.
	Rate Constant	Describe the role of the rate constant in the theoretical determination of reaction rate.
8. THERMO CHEMISTRY AND ENERGETICS OF CHEMICAL REACTION	Thermodynamics	Define Thermodynamics
	Exothermic and Endothermic Reaction	Classify reactions as exothermic and endothermic
	Different Terms Used	Define the terms system, surrounding boundary, state function, heat, heat capacity, internal energy, work done and enthalpy of a substance.
	Internal Energies	Name and define the units of the Internal energy.
	Law of Thermodynamics	Explain the first law of thermodynamics of energy conservation.
	Hess's Law	Apply Hess's Law to construct simple energy cycles.
	Enthalpy	Describe enthalpy of the reaction
9. ELECTROCHEMISTRY	Redox Reaction	Give the characteristics of a redox reaction.
	Oxidation and Reduction	Define oxidation and reduction in terms of a change in oxidation number.
	Balancing Chemical Reaction	Use the oxidation number change method to identify atoms being oxidized or reduced in redox reactions.
	Standard Hydrogen Electrode (SHE)	Define Cathode, anode, electrode potential and S.H.E

		Define the standard electrode potential of an electrode.
10.CHEMICAL BONDING	VSEPR Theory	Use VSEPR Theory to describe the shape of the molecules.

	Sigma and Pi Bond	Describe the features of sigma and pi-bonds.
	Hybridization	Describe the shapes of simple molecules using orbital hybridization.
	Application of VSEPR Theory	Determine the shapes of some molecules from the number of the bonded pairs.
	Dipole Movement	Predict the molecular polarity from the shapes of molecules.
	Application of Dipole Movement	Explain what is meant by the term ionic character of the covalent bond.
		Describe how knowledge of molecular polarity can be used to explain some physical and chemical properties of the molecules.
	Bond Energy	Define bond energies and explain howthey can be used to compare bonds strength of different chemical bonds.
11. S- AND P- BLOCK ELEMENTS	Properties and their Trends	Define and explain the terms atomic radii, ionic radii, covalent radii, ionization energy, electron affinity, electro negativity,bond energy and bond length.
	S-, P-, D- & F-Block Elements	Recognize the demarcation of the periodic table into S-block, P-block, D-block and F-block.
	Reaction of Group I elements	Describe reactions of Group I elements with water, oxygen and chlorine.
	Reaction of Group II elements	Describe reactions of Group II elements with water, oxygen and chlorine.
	Reaction of Group IV elements	Describe reactions of Group IV Elements.
12. TRANSITION ELEMENTS	Electronic Structure	Describe the electronic structures of the elements and ions of d-block Elements.
13. FUNDAMENTAL PRINCIPLES OF ORGANIC CHEMISTRY	Definition and Classification of Organic Compound	Define organic chemistry and organic compound.
		Classify organic compounds on structural basis.
	Functional Group	Define functional group.
	Hybridization	
	Isomerism	Explain stereoisomerism and its types.
14. CHEMISTRY OF	Nomenclature of Alkanes	Describe the nomenclature of Alkanes.
		Define Free Radical Initiation, propagation and termination.

HYDROCARBONS	Free Radical Mechanism	Describe the mechanism of the free radical substitution in alkanes exemplified by Methane and Ethane.

	Nomenclature of Alkenes	Explain the IUPAC nomenclature of alkenes.
	Shapes of Alkenes	Explain the shapes of the Ethene molecules in terms of Sigma and Pi C-C Bonds.
	Structure and Reactivity of Alkenes	Describe the structure and reactivity of Alkenes as exemplified by Ethene.
	Preparation of Alkenes	Explain Dehydration of Alcohols and Dehydrohalogenation of RX for the preparation of Ethane
	Reaction of Alkenes	Describe the preparation of Alkenes using elimination reactions.
	MOT of Benzene Resonance and Resonance Energy	Explain the shape of Benzene Molecules (Molecular orbital treatment).
		Define resonance, resonance energy and relative stability.
	Reactivity of Benzene	Compare the reactivity of benzene with alkanes and alkenes.
	Chemical Reactions of Benzenes	Define addition reactions of benzene and methylbenzene.
		Describe the mechanism of electrophilic substitution in Benzene.
		Discuss chemistry of benzene and methylbenzene by nitration, sulphonation, halogenation, Friedal Craft's Alkylation and acylation.
	Effect of Substituents	Apply the knowledge of positions of substituents in the electrophilic substitution of benzene.
	IUPAC System of Alkynes	Use the IUPAC naming System of Alkynes.
	Preparation of Alkynes	Describe the preparation of Alkynes using elimination reactions.
	Acidity of Alkynes	Describe the acidity of alkynes
	Reactions of Alkynes	Discuss chemistry of alkynes by hydrogenation, hydro halogenation and hydration.
	Substitution vs Addition	Describe and differentiate between substitution and Addition reactions.
	Nomenclature Structure and	Name Alkyl Halides using IUPAC system.

15. ALKYL HALIDES	Reactivity	Discuss the structure and reactivity of RX.
	Substitution vs Elimination	Describe the mechanism and types of nucleophilic substitution reactions.
		Describe the mechanism and types of elimination reactions.

16. ALCOHOLS AND PHENOLS	Nomenclature, structure and reactivity of Alcohol	Explain nomenclature and structure of Alcohols.
		Explain the reactivity of Alcohols.
		Describe the chemistry of alcohols by preparation of ethers and esters.
	Nomenclature, structure and reactivity of Phenols	Explain the nomenclature, structure and reactivity of Alcohol
		Discuss the reactivity of phenol and their chemistry by electrophilic aromatic substitution.
	Alcohols and Phenols	Differentiate between an alcohol and phenol.
17. ALDEHYDES AND KETONES	Nomenclature and structure of Aldehydes and Ketones	Explain nomenclature and structure of Aldehydes and Ketones.
	Preparation	Discuss the preparation of aldehydes and ketones.
	Reactivity of Aldehydes and Ketones	Describe Reactivity of Aldehydes and Ketones and their comparison.
	Reaction of Aldehydes and Ketones	Describe Acid and Base catalyzed Nucleophilic addition reaction aldehydes and ketones.
		Discuss the chemistry of Aldehydes and Ketones by their reduction to alcohols
		Describe oxidation reactions of aldehydes and ketones.
18. CARBOXYLIC ACIDS	Nomenclature, Structure and Preparation of Carboxylic Acid	Describe nomenclature, Structure and Preparation of Carboxylic Acid.
	Chemical Reactions/Reactivity	Discuss reactivity of carboxylic acid.
	Conversion of Carboxylic Acid	Describe the Chemistry of carboxylic acid by conversion to carboxylic acid derivative: acyl halides, an acid hydrides, esters and reaction involving into conversion of these.
19. MACRO MOLECULES	Classification of Proteins	Explain the basis of classification and structure function relationship of proteins.

	Importance of Proteins	Describe the role of various proteins in maintaining body functions and their Nutritional importance.

	Enzymes as Biocatalyst	Describe the role of enzymes as Biocatalyst.
20. INDUSTRIAL CHEMISTRY	Adhesive	Know about types and application of Adhesive.
	Dyes	Know about types of dies and their uses.
	Polymers	Know about condensation and addition polymers and their sub-types.

3. PHYSICS

Units	Topics/subtopics	Learning Outcomes
1. VECTORS AND EQUILIBRIUM	Addition of Vectors (Rectangular Components)	1.1 Determine the sum of vectors using perpendicular Components
	Product of Vectors (Scalar Product)	1.2 Describe Scalar Product of two vectors in term of angle between them
	Product of Vectors (Vector Product)	1.3 Describe Vector product of two vectors in terms of angle between them.
2. FORCE AND MOTION	Displacement	2.1. Describe displacement.
	Velocity	2.2. Describe average velocity of objects.
	Displacement-time Graph	2.3. Interpret displacement-time graph of objects moving along the same straight line.
	Acceleration	2.4. Describe acceleration
	Uniform and variable acceleration	2.5. Distinguish between uniform and variable acceleration.
	Projectile motion	2.6. Explain that projectile motion is two-dimensional motion in a vertical plane.
	Ideal Projectile	2.7. Communicate the ideas of a projectile in the absence of air resistance.
	Projectile motion (Velocity)	2.8. Explain Horizontal component (VH) of velocity is constant.
		2.9. Acceleration is in the vertical direction and is the same as that of a vertically free- falling object.
		2.10. Differentiate between the characteristics of horizontal motion and vertical motion
	Projectile motion: Maximum Height Range Time of flight Maximum angle	2.11. Evaluate, using equations of uniformly accelerated motion for a given initial velocity of frictionless projectile, the following issues: a. How much higher does it go? b. How far would it go along the level land? c. Where would it be after a given time? d. How long will it remain in air? e. Determine the parameters for a projectile launched from ground height f. Launch angle that results in the maximum range g. Relation between the launch angles that result in the same range.

	Newton’s Laws of motion	2.12. Apply Newton’s laws to explain the motion of objects in a variety of context.
	Newton’s Second Law and Linear momentum	2.13. Describe the Newton’s second law of motion as rate of change of momentum.

3. PHYSICS		
	Newton's third law of motion	2.14. Correlate Newton's third law of motion and conservation of momentum.
	Collision	2.15. Solve different problems of elastic and inelastic collisions between two bodies in one dimension by using law of conservation of momentum.
	Momentum and Explosive forces	2.16. Describe that momentum is conservational situations.
	Perfectly elastic collision in one dimension	2.17. Identify that for a perfectly elastic collision, the relative speed of approach is equal to the relative speed of separation.
3- WORK AND ENERGY	Work	3.1. Describe the concept of work in terms of the product of force F and displacement d in the direction of force
	Energy	3.2. Describe energy
	Kinetic Energy	3.3. Explain kinetic energy
	Potential energy	3.4. Explain the difference between potential energy and gravitational potential energy.
	Absolute potential energy	3.5. Describe that the gravitational potential energy is measured from a reference level and can be positive or negative, to denote the orientation from the reference levels.
	Power	3.6. Express power as scalar product of force and velocity.
	Work energy theorem in resistive medium	3.7. Explain that work done against friction is dissipated as heat in the environment.
	Implications of energy losses in practical devices and Efficiency	3.8. State the implications of energy losses in practical devices
4- ROTATIONAL AND CIRCULAR MOTION	Angular displacement	4.1. Define angular displacement, express angular displacement in radians.
		4.2. Define revolution, degree and radian
	Angular Velocity	4.3. Describe the term angular velocity
	Equation of motion in circular motion.	Students will be able to derive and apply the equations of motion for circular motion

	Relation between angular and linear quantities	4.4. Find out the relationship between the following: a. Relation between linear and angular variables b. Relation between linear and angular displacements c. Relation between linear and angular velocities d. Relation between linear and angular accelerations
5. FLUID DYNAMICS	Terminal Velocity	5.1. Describe the terminal velocity of an object.
	Fluid Drag	5.2. Define and explain the term fluid drag.

3. PHYSICS		
	Fluid Flow	5.3. Define the terms: Steady (Streamline or laminar) flow, Incompressible flow and non-viscous flow as applied to the motion of an ideal fluid.
		5.4. Explain that at the sufficiently high velocity, the flow of viscous fluid undergoes a transition from laminar to turbulence conditions.
		5.5. Describe that majority of practical examples of fluid flow and resistance to motion in fluid involve turbulent rather than laminar conditions
	Equation of Continuity	5.6. Describe equation of continuity Av= constant for the flow of an ideal and incompressible fluid and solve problems using it.
		5.7. Identify that the equation of continuity is the form of principle of conservation of mass.
	Bernoulli's Equation	5.8. Interpret and apply Bernoulli's effect in Blood physics.
		5.9. Derive Bernoulli's equation for the case of horizontal tube of flow
		5.10. Describe the pressure difference can arise from different rates of flow of fluid (Bernoulli's effect).
6- WAVES	Motion of wave	6.1. Describe the meaning of wave motion as illustrated by vibrations in ropes and springs.
	Progressive waves	6.2. Demonstrate that mechanical waves require a medium for their propagation while electromagnetic waves do not.
	Characteristics of wave	6.3. Define and apply the following terms to the wave model; medium, displacement, amplitude, period, compression, rarefaction, crest, trough, wavelength, velocity.
	Wave Speed	6.4. Solve problems using the equation: $v = f\lambda$.
	Progressive waves	6.5. Describe that energy is transferred due to a progressive wave.
	Classification of progressive waves	6.6. Compare transverse and longitudinal waves.
	Speed of sound Newton's Formula for speed of sound in air	6.7. Explain that speed of sound depends on the properties of medium in which it propagates and describe Newton's formula of speed of waves.
	Laplace's Correction	6.8. Describe the Laplace correction in Newton's formula for speed of sound in air.

	Effect of various factors on speed of sound	6.9. Identify the factors on which speed of sound in air depends.
	Superposition of waves	6.10. Describe the principle of super position of two waves from coherent sources.

3. PHYSICS		
	Interference of sound waves	6.11. Describe the phenomenon of interference of sound waves.
	Stationary waves	6.12. Explain the formation of stationary waves using graphical method
		6.13. Define the terms, node and antinodes.
	Stationary waves in a stretched string	6.14. Describe modes of vibration of strings.
WAVES	Organ pipes	6.15. Describe formation of stationary waves in vibrating air columns.
	Superposition of waves	6.16. Explain the principle of Superposition
	Simple Harmonic Motion, Terminologies of SHM, Circular motion and SHM, Energy	6.17. Explain Simple Harmonic Motion (S.H.M) and explain the characteristics of S.H.M. (Chapter: Oscillation)
	Circular Motion and SHM (Acceleration and Velocity of Projection)	6.18 Describe that when an object moves in a circle, the motion of its projection on the diameter of a circle is SHM.
7- THERMODYNAMI CS	Thermal equilibrium, Heat	7.1. Describe that thermal energies transferred from a region of higher temperature to a region of lower temperature.
	Molar specific heat of gas	7.2. Differentiate between specific heat and molar specific heat.
	Work	7.3. Calculate work done by a thermodynamic system during a volume change.
	First law of thermodynamics	7.4. Describe the first law of thermodynamics expressed in terms of the change in internal energy, the heating of the system and work done on the system.
		7.5. Explain that first law of thermodynamics expresses the conservation of energy.
	Molar specific heat of gas	7.6. Define the terms, specific heat and molar specific heats of a gas.
	Relation between molar specific heat at constant volume and constant pressure	7.7. Apply the first law of thermodynamics to derive the relation $C_p - C_v = RC$ for an ideal gas
8- ELECTROSTATICS	Columb's Law	8.1. State Coulomb's law and explain that force between two-point charges is reduced in a medium other than free space using Coulomb's law

	Electric Field	8.2. Describe the concept of an electric field as an example of a field of force
	Quantization of charge	Students will be able to explain and apply the concept of quantization of electric charge
	Point charge	Students will be able to define a point charge as a charge with negligible size compared to the distance involved.
	Zero field location	Students will be able to determine the position where the net electric field becomes zero for a system of charges by vector addition of electric fields and solving for distance including identifying whether the zero-field point lies between the charges or outside them depending on the signs and magnitudes of the charges.
	Potential Gradient	Students will be able to explain the potential gradient and relate it to the electric field.

3. PHYSICS		
	Electric field intensity due to a point charge Representation of electric field by lines	8.3. Calculate the magnitude and direction of the electric field at a point due to two charges with the same or opposite signs
		8.4. Sketch the electric field lines for two-point charges of equal magnitude with same or opposite signs
	Electric field intensity due to an infinite sheet of charges	8.5. Describe and draw the electric field due to an infinite size conducting plate of positive or negative charge
	Electric potential energy and potential due to a point charge	8.6 Define electric potential at a point in terms of the work done in bringing unit positive charge from infinity to that point
	Electric potential	8.7. Define the unit of potential
	Electric potential energy and potential due to a point charge	8.8. Derive an expression for electric potential at a point due to a point charge
	Charging and discharging of a capacitor through a resistance	8.9. Demonstrate charging and discharging of a capacitor through a resistance
9- CURRENT ELECTRICITY	Steady current	9.1. Describe the concept of steady current.
	Ohm's Law	9.2. State Ohm's law.
	Factors on which resistance depends Temperature coefficient of resistivity	9.3. Define resistivity and explain its dependence upon temperature.
	Internal resistance of sources	9.4. Explain the internal resistance of sources and its consequences for external circuits.
	E.M.F	Students will be able to define electromotive force (E.M.F) as the energy supplied per unit charge by a source
	Ampere',s Law	Students will be able to state and apply Ampere's law $\oint \vec{B} \cdot d\vec{l} = \mu_0 I_{\text{enclosed}}$ $\oint B \cdot dl = \mu_0 I_{\text{enclosed}}$ to calculate the magnetic field
	Maximum power Output	9.5. Describe the conditions for maximum power transfer.
	Magnetic flux density/Magnetic field	10.1. Define magnetic flux density and its units.

10- ELECTROMAGNETISM	Magnetic flux	10.2. Describe the concept of magnetic flux Φ (Phi) as scalar product of magnetic field(B) and area(A)using the relation ØB=B⊥A=B.A.
	Motion of charged particle in magnetic field	10.3. Describe quantitatively the path followed by a charged particle hot into a magnetic field in a direction perpendicular to the field.
		10.4. Explain that a force may act on a charged particle in a uniform magnetic field.
11- ELECTROMAGNETIC INDUCTION	Faraday's Law of electromagnetic	11.1. State Faraday's law of electromagnetic induction.

3. PHYSICS		
	induction	
	Lenz's Law	11.2. Account for Lenz's law to predict the direction of an induced current and relate to the principle of conservation of energy.
	Transformer	11.3. Describe the construction of a transformer and explain how it works.
		11.4. Describe how set-up and step-down transformers can be used to ensure efficient transfer of electricity along cables.
12. ALTERNATING CURRENT	Phase of Alternating Current	12.1. Describe the phase of Alternating Current and explain how phase lag and phase lead occur in AC circuits
	AC through a. Resistor b. Capacitor. c. Inductor	12.2. Explain the flow of AC through resistors, Capacitors and Inductor
	Electromagnetic waves	12.3 Become familiar with EM spectrum (ranging from radio waves to Gamma rays)
13- ELECTRONICS	Rectification	13.1. Define rectification and describe the use of diodes for half and full wave rectifications.
	PN Junction	13.2 Describe the PN Junction and discuss its forward and reverse biasing
	Biasing of PN junction	Learning Outcome (Biasing of a PN Junction):** Students will be able to **explain and distinguish forward and reverse biasing** of a PN junction diode by describing the effect on the **depletion region barrier potential, and current**, and **interpret/plot the V–I characteristics** under both biases, including identifying **threshold voltage** and **reverse saturation current**.
14- DAWN OF MODERN PHYSICS	Quantum Theory and Radiation	14.1. Explain the particle model of light in terms of photons with energy
	Black Body Radiation	Students will be able to define a black body and black body radiation explain how the intensity/spectrum depends on temperature,
	Photoelectric effect	Students will be able to explain the photoelectric effect as emission of electrons when light of sufficient frequency strikes a metal.
	De broglie's Hypothesis	Students will be able to state and apply de Broglie's hypothesis that every moving particle has an associated matter wave

	Pair production	**Learning Outcome (Pair Production):** Students will be able to **describe pair production** as the conversion of a high-energy γ-photon into an **electron–positron pair** in the presence of a nearby nucleus and **apply energy conservation** to determine the **threshold energy (≥ 1.02 MeV)** and calculate the remaining energy as **kinetic energy** of the produced particles, including explaining why a nucleus is required for momentum conservation.
	Compton Effect	Students will be able to explain the Compton effect as the increase in wavelength (decrease in energy) of X-rays/γ-rays after scattering from electrons and apply the Compton shift equation
15- ATOMIC SPECTRA	Atomic Spectra	15.1. Describe and explain atomic spectra/ line spectrum
16- NUCLEAR PHYSICS	Composition of atomic nuclei	16.1. Describe a simple model for the atom to include protons, neutrons and electrons
	Spontaneous and random nuclear decay	16.2. Identify the spontaneous and random nature of nuclear decay.
	Half-life and rate of decay	16.3. Describe the term half-life and solve problems using the equation $\lambda = \frac{0.693}{T_{\frac{1}{2}}}$.
	Transmutation	Students will be able to define nuclear transmutation as the conversion of one element/isotope into another by a nuclear reaction or radioactive decay
	Biological and Medical uses of radiation	16.4. Describe biological effects of radiation state and explain the different medical uses of radiation.

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4. ENGLISH

Units	Topics/subtopics	Learning Outcomes
1-Scanning Skills	Scan to answer short Questions	Scan to answer short Questions
2-Deducing the meanings	Tone and Purpose	Deduce the meanings of the context
	Logical Relationships	Deduce meanings by analyzing logical relationships within a text using contextual clues.
3-**Figurative Language**	Imagery	Analyze how a writer/poet uses language to apprehend to the senses for figurative language
	Irony	Explore the use of Synonyms with varying shades of meaning used for irony parody and satire.
	Parody	Explore the use of Synonyms with varying shades of meaning used for irony parody and satire.
	Satire	Explore the use of Synonyms with varying shades of meaning used for irony parody and satire.
	Onomatopoeia	identify and interpret sound-imitative words to explain their effect on meaning and imagery in a text.
	Hyperbole	recognize exaggeration and explain how it intensifies meaning or emphasis in a text.
	Symbolism	identify symbols and infer the abstract ideas they represent within a text.
	Metaphor	identify implicit comparisons and infer the shared qualities between unlike things in a text.
	Simile	identify explicit comparisons using “like” or “as” and explain the similarity being highlighted.
	Personification	recognize human traits given to non-human entities and explain their effect on meaning and imagery.4-
4-**Contextual Vocabulary**	**Contextual Vocabulary**	deduce the meaning of difficult words from the context using contextual clues.

5-**Concord**	**Pronoun-Antecedent agreement**	Illustrate use of pronoun-antecedent agreement.
	Subject-Verb Agreement	Illustrate use of Subject verb agreement
6-**Tenses and Aspects**	**Tenses and Aspects**	Illustrate use of tenses.
7-**Infinitives and Infinitive Phrases**	**Infinitives and Infinitive Phrases**	Illustrate use of infinitives and infinitives phrases.
8-**Gerunds and Gerund Phrases**	**Gerunds and Gerund Phrases**	Illustrate the use of gerund and gerund phrases.
9-**Position of Adverbs**	**Position of Adverbs**	Recognize varying position of adverbs in sentences according to their kinds and importance.
10-**Prepositions**	**Prepositions**	Illustrate use of prepositions of position time, movements and directions.
11-**Transitional Devices**	**Transitional Devices**	Use in speech and writing all the appropriate transitional devices.
12-**Punctuation**	**Punctuation**	Illustrate use of all punctuation marks wherever applicable
13-**Word Classes and Phrase Placement**	**Word Classes and Phrase Placement**	Analyze sentences for different classes and phrases evaluate how their position in sentences when change meaning and different communication function.
14-**Sentence Inversion**	**Sentence Inversion**	Recognize and use sentence in version for various purposes.
15-**Active/Passive Voice**	**Active/Passive Voice**	Use active and passive voice appropriately in speech and writing according to the required communicative function
16-**Direct/Indirect Speech**	**Direct/Indirect Speech**	Use direct and indirect speech appropriately in speech and writing according to the e required communicative function.
17-**Proof read**	**Articles**	Proof read and edit their own peers and given text for the error of usage and style.
	Spelling Errors and Incorrect Conjunctions	Locate errors of functions and spellings
18-**Sentence Structure**	**Fragments**	identify incomplete sentences and revise them into complete grammatically correct sentences.
	Run-on Sentences	detect improperly joined independent clauses and correct them using appropriate punctuation or conjunctions.
	Comma Splice	Comma Splice

5. LOGICAL REASONING

Themes	Sub- Topics	Statements	Learning Outcomes
CRITICAL THINKING	Logical Reasoning & Argument Evaluation Reading Comprehension & Inference Analytical / Data-Based Reasoning	It is the process of evaluation which uses logic to separate truth from Falsehood, reasonable from unreasonable beliefs.	5.1.1 Develop logical arguments for the statements to be true or false. 5.1.2 Give reasons for the right beliefs. 5.1.3 Identify and critically evaluate false beliefs using logical reasoning.
LETTER AND SYMBOLS SERIES	Number Series & Arithmetic / Geometric Patterns Alphabetical (Letter) Series & Coding Mixed / Alphanumeric Pattern Series	These are sequential order of letters, number or both arranged such a way that each term in the series is obtained according to some specific rules. These rules can be based on the mathematical operations, c of letter in an alphabetical order.	5.2.1 Develop arithmetical operations as per numbers. 5.2.2 Develop geometrical progression as per numbers 5.2.3 Develop series/sequential orders as per letter and symbols (according to specific rules).
LOGICAL DEDUCTIONS	Categorical Syllogisms (All / Some / No Statements) Necessary vs Possible Conclusions Logical Fallacies in Syllogism-Based Reasoning	Logical reasoning is the type of thinking in which statements and relation between statements are used in a precise manner to make conclusions that are meant (or implied) by the statements and the relations. Logical deduction is a type of reasoning; It assesses a candidate's ability to use structured thinking to deduce from a short passage which of a number of statements is the most accurate response to a posed question.	5.3.1 Predict new relations on the basis of given relations. 5.3.2 Develop new structure on the basis of information in already drawn structures.

LOGICAL PROBLEMS	Blood Relations & Order Logic Ranking & Comparative Reasoning Applied Arithmetic & Quantitative Logic	These are the puzzles which require people to use deductive reasoning skills, meaning they need to look at different pieces of information in order to arrive at an answer	5.4.1 Infer result of one problem to resolve another problem. 5.4.2 Develop skills to solve puzzles.
COURSE OF ACTION	Logical & Appropriate Decision-Making Preventive vs Corrective Courses of Action Priority / First Response Actions	A course of action is the step or administrative decision to be taken for improvement, follow-up or further action to the problem, policy etc. based on the information given in the statement to be true and test-takers should determine which of the suggested courses of action logically follow(s) for the pursuing.	5.5.1 Develop skills to gather different parts of information. 5.5.2 Use information for making decisions. 5.5.3 Judge different courses by using arguments
5.6 CAUSE AND EFFECT	Direct Cause–Effect Relationships Statement-Based Cause & Effect Analysis Independent and Common Causes	It is the relationship between two things when one thing makes something else happen. When examining even, people naturally seek to explain why things happened. This search often results in cause-and-effect reasoning, which assert or denies that one thing causes another, or that one thing is cause by another.	5.6.1 Give reasons for incidents/events and accidents. 5.6.2 Reject false beliefs through valid arguments. 5.6.3 Build positive thinking in the society through strong arguments.