HSC 1st Year Academic Program Prime Batch [Online/Combo]

Archive Class Syllabus (English Version)

Serial No	Subject	Chapter	Lecture
01	Physics 1st Paper	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	64
02	Chemistry 1st paper	1, 2, 3, 4, 5	56
03	Higher Mathematics 1st Paper	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	84
04	Biology 1st Paper	1, 2, 3, 4, 5, 6, 7	34
05	Biology 2nd Paper	1, 2, 3, 4, 5, 6	30
		Total Chapters- 38	**Total Lectures- 268**

Physics 1st Paper Reference Book: শ্যামলাল TEXT

Chapter	Lecture	Lecture-based discussion topics
Chapter-1 Physical World and Measurement	P-01	Scope of Physics, Physics and Other Branches of Science, Evolution of Physics, Definition of concepts, formulae, postulates and theories of Physics. Measurement, Unit, Dimension, Equation of Dimension, Principle of Homogeneity, Unit conversion of physical quantities, Limitations of dimensional equations, Error, Instrumental Errors, Observational Errors, Random Errors, Systematic Errors, Least Count Error, Calculation of Error, Accuracy and Precision, Significant Figures.
	P-02	Some instruments of measurement, Vernier Scale, Slide Callipers, Screw Gauge, Spherometer, Scale Balance, All Important Formulae at a Glance, Mathematical Problems.
Chapter-2 Vector	P-03	Quantity, Scalar quantity and Vector quantity, Expression of Vector Quantity, Different types of Vectors, Addition of Vectors: Resultant.
	P-04	Law of Parallelogram, Determination of the Resultant of Two Vectors, Determination of the Direction of Resultant, Some Special Cases of the Law of Parallelogram.
	P-05	Some Characteristics of Vector Addition, Commutative Law, Associative Law, Distributive Law, Resolution of Vector, Determination of the Resultant of More than Two Vectors.
	P-06	Some Uses of Vector Resolution, Towing a boat, Lawn Roller, Concept of River and Boat.
	P-07	River, and Boat related.
	P-08	Subtraction of Vectors, Relative Velocity.
	P-09	Expression of Relative Velocity, Expression of Vectors in the Cartesian Coordinate System.
	P-10	Addition and Subtraction of Vectors Resolved into Components, Determination of Position Vector, Vector in Three-Dimensional Coordinate System.
	P-11	Multiplication of Vector, Multiplication of Vector Quantity with Scalar Quantity.
	P-12	Dot Multiplication of Vectors, Cross Multiplication of Vectors.
	P-13	Calculus, Differentiation, Integration, Functions with Multiple Variables and Partial Differentiation.
	P-14	Scalar and Vector Field, Gradient, Divergence, Curl.
Chapter-3 Dynamics	P-15	Reference Frame, Rest and Motion, Distance and Displacement, Average Velocity and Average Speed, Instantaneous Velocity and Instantaneous Speed, Acceleration. Laws of Motion for Uniform Acceleration.
	P-16	Describing motion with Graphs, Determining velocity with the concepts of slope and area.
	P-17	Motion of Free-Falling Bodies, Vertical Projectile, Some Special Equations for Vertical Projectiles, Proof of Galileo's Laws from the Equations of Motion.
	P-18	Motion of an object in a curve, Vector Equations of the Laws of Motion for Uniform Acceleration, Projectile Motion, Equations for Projectile Motion, Equations relating to Projectiles.
	P-19	Some problems related to projectiles.
	P-20	Uniform Circular Motion, Some Quantities related to Uniform Circular Motion, Centripetal Acceleration, Equations relating to Centripetal Acceleration, Resultant of Acceleration, Equations for Angular Motion.
Chapter-4 Newtonian Mechanics	P-21	Primary concept of Force, Newtonian Mechanics, Newton's first Law of motion, Inertia of rest and motion, Intuitive Idea of Force, General Characteristics of Force, Types of Force, Fundamental forces, Gravitational Force, Electromagnetic Force, Strong Nuclear force, Weak Nuclear force.
	P-22	Momentum, Newton's second law of motion, Equilibrium of Forces.
	P-23	Newton's third law of motion, System, External and Internal Force, Types of forces, Gravitational Force, Normal Force, Weight, Tension.
	P-24	Friction, Friction angle, Static Angle.

	P-25	Conservation of momentum, Vector format of Conservation of momentum, Collision, Quantities of One dimentional collision.
	P-26	Center of mass, Impulse, Application of Newton's forces, standing of the ground, Walking, running horse cart, Pulling Boat, Motion of Rocket, Relation between Newton's Laws.
	P-27	Uniform Circular motion, Centripetal force, Centrifugal force, Banking on roads. Cycle, Train/Cars.
	P-28	Rotational inertia: Moment of inertia, Radius of gyration, Perpendicular Axis theorem, Parallel axis theorem.
	P-29	Moment of inertia in various objects, Torque, equations of torque, Vector format of torque, Torque and angular acceleration.
	P-30	Angular momentum, Equivalent way of measuring angular momentum, angular momentum of circular motion, relation between torque and angular momentum, Newton's law of angular motion, Important formulas together, Mathematical Problems.
Chapter-5 Work, Energy and Power	P-31	Work, Positive, negative and zero work, Constant force and changing force, Work done for constant force.
	P-32	Work done for changing force, Spring force, Work done for rotation.
	P-33	Dependency of work done on path, Kinetic Energy and Work-Energy theorem, Kinetic energy of rotating body, Kinetic energy rotating and spinning body.
	P-34	Conservative force, non-conservative force, Potential energy, Gravitational potential energy, Elastic potential energy, Relation between force and potential energy.
	P-35	Work done and change of mechanical energy, Conservation of mechanical energy, Conservation of energy.
	P-36	Power, Efficiency, Mathematical Problems, Displacement of center of mass, Well and reservoir related problems.
Chapter-6 Gravitation and Gravity	P-37	Falling Bodies, Kepler's Law of Planetary Motion, Gravitation, Vector form of Gravitational Force, Moment of Inertia and Gravitational Mass, Gravity and gravitational acceleration.
	P-38	Determining the value of g: Relation between gravitational constant and gravitational acceleration, change of gravitational acceleration, Change of Gravitational acceleration due to earth's shape, Change of Gravitational acceleration due to height from earth's surface, change of gravitational acceleration due to depth, Change of gravitational acceleration due to earth's rotation.
	P-39	Center of Gravity, Gravitational Field, Gravitational Field Intensity.
	P-40	Gravitational Potential, Relation between Gravitational field intensity and Gravitational potential, Gravitational Potential Energy.
	P-41	Escape velocity, Application of the Laws of gravitational force, Application of the Laws of gravity in sloid sphere.
	P-42	Relation between Newton's law of gravitation and Kepler's laws, Motion of Satellite. Geo-stationary satellite, Polar Satellite, Weightlessness in space, Research and search for natural resources.
Chapter-7 Structural Properties of Matter	P-43	Inter-molecular force, Molecular force in solid, liquid and gaseous substance, Bonds, Elasticity and its classification, Attraction force and repulsion force and potential energy, Graph of force.
	P-44	Graph of Potential Energy, Summary of the graph, Quantities of elasticity, Stress and strain in various objects.
	P-45	Types of strain, Types of stress, Hooke's law, Modulus of elasticity, relation between various modulus
	P-46	Elastic potential energy, Poisson's ratio.
	P-47	Flow of fluids, turbulent flow, Viscosity, Friction and viscosity, Effect of pressure and temperature on viscosity modulus, Reynold's Number, Stokes' law.
	P-48	Terminal Velocity, Surface tension, Effects of various factors on surface tension, capillarity.
Chapter-8 Periodic Motion	P-49	Periodicity, Spatial periodicity, Temporal Periodicity, features of periodic motion, Oscillation, Simple Harmonic Motion, Ideal spring, Spring constant, Motion of an object connected to ideal spring, Conditions of simple harmonic motion, Differential equation of simple harmonic motion, Solution of the differential equation of simple harmonic motion.
	P-50	Quantities of simple harmonic motion, Displacement, velocity and acceleration in simple harmonic motion.
	P-51	Graph of simple harmonic motion, Relation between circular motion and simple harmonic motion.
	P-52	Energy of simple harmonic motion, Potential energy in spring, change of energy with time, Graph, Change of energy with displacement, graph.
	P-53	Application of simple harmonic motion, Motion in vertical plane, Motion of compound spring, Motion of simple pendulum, Explanation of the laws of simple pendulum, Application of simple pendulum.
Chapter-9 Wave	P-54	Waves, Mechanical Waves, Origin of different Mechanical Waves, Transverse Waves, Longitudinal Wave, Electromagnetic Wave, Waves and Energy, Expressions and Equations Related to Wave, Change of Medium
	P-55	Progressive Waves, Phase difference and Path difference of Progressive Waves.
	P-56	Superposition of Waves, Stationary Wave.
	P-57	Beat.
	P-58	Free and Forced Vibration, Resonance, Intensity of Wave, Standard Intensity and Intensity Level, Harmonics and Musical Scales, Musical Sound, Tone and Note, Vibration of String, Vibration of Air Column.
Chapter-10 Ideal gas and kinetics of gases	P-59	Gas, Pressure of gas, Volume of gas, Temperature of gas, amount of gas, Formulas of gas, Relation between pressure and volume, Relation between volume and temperature, law of pressure.
	P-60	Ideal gas, Features of Ideal Gas, Real gas, Molecular Kinetic Theory of gases, Postulates of gaseous atoms, Application of Molecular Kinetic Theory.
	P-61	Mean free path, Degrees of freedom.
	P-62	One molecular, two molecular and three molecular gas, Linear molecular gas, non-linear molecular gas, Law of equal distribution of energy.

	P-63	Water vapor and air pressure, Evaporation, condensation, saturated and non-saturated pressure, relation between pressure and volume of water vapor in isothermal condition, due point and relative humidity.
	P-64	Due point, Humidity, Relative humidity and due point, Devices to measure humidity, Wet and dry bulb thermometer, Some phenomena on Hygrometry.

Chemistry 1st Paper **Reference Book: শতালাল TEXT**		
Chapter	**Lecture**	**Lecture-based discussion topics**
Chapter-1 Safe Use of Laboratory	C-01	Safe use of Laboratory- Aprons, masks, safety glasses, gloves, lab rules/golden rules, Solvent measuring device and its uses- Chemical analysis, test tubes, beakers, burettes, pipettes, volumetric flasks, conical flasks, wash bottles, measuring cylinders, techniques for cleaning glassware.
	C-02	Solute measuring instruments - chemical instruments, Paul-Bunge balances, method of weighing in balances, digital balances. Concentration- Molarity, Molality, Dilution, Standard Substances (Primary & Secondary), Titration- Method, Indicator, End Point & Equivalent Point, Formulation of Titration Equations + Math.
	C-03	Heating Techniques with Laboratory Apparatus- Bunsen Burner & Flame, Heating Techniques in Round Bottom Flasks, Conical flask heating technique, Water bath heating technique, Porcelain bowl heating technique, Test tube heating technique, Beaker heating technique. Storage, Use, Precautions and Disposal of Chemicals- Storage of Chemicals, Waste Management, Use and Precautions of Chemicals.
	C-04	Effects of Chemicals on Environment and Moderate Use - Environmental Pollution by Airborne Substances, Environmental Pollution by Laboratory Solid and Liquid Substances, Effects of chemicals on Environment and Health, moderate use of chemicals, analytical methods (macro, semi-micro, micro), laboratory safety equipment and rules of use - fume hood, blanket, laboratory kit, eyecup, sink, use of fire extinguisher, first aid box, first aid and Use of first aids.
Chapter-2 Qualitative Chemistry Introduction	C-05	Fundamental particles of atoms, introduction, and atomic models- electron, proton and neutrons discussion, atomic mass unit, atomic expression, isotope, isotone, isobar, isoelectronic, isomer.
	C-06	Radioactive isotope and nuclear reaction (Transmutation, fission and fusion), Rutherford's atomic model discussion.
	C-07	Bohr's atomic model discussion, Application of atomic models and Quantum Mechanics-Derivation for v, r, n, E from Bohr's model, Related Math.
	C-08	De Broglie's equation, Heisenberg's uncertainty principle, Schrodinger's wave equation, Related Math.
	C-09	Quantum Number- Principal Quantum number, Subsidiary Quantum Number, Magnetic Quantum Number, Spin Quantum Number
	C-10	Significance of Quantum Number, Orbit and Orbital Discussion, Quantum Subshell shapes and discussion, Calculation of total orbital and electron number.
	C-11	Electronic Configuration- Aufbau Principle, Hund's Rule, Pauli's Exclusion Principle, e^- configuration of compounds and ions, stability of electronic configuration.
	C-12	Electromagnetic spectrum- Discussion, quantities related to radiation, regions of electromagnetic ray, classification of spectrum, identification of compounds using spectrum.
	C-13	spectrum of H atom + Rydberg Discussions, Related Math.
	C-14	Lines of spectrum, Uses of UV in fake money and passport identification, Uses of IR ray in medical science, Use of MRI in diagnosis.
	C-15	Solubility and Solubility Product- Mixture and Solution, Solubility, Factors influencing solubility.
	C-16	solubility product, ionic product, Related Math.
	C-17	Principle of Solubility Product, Application of the principle of Solubility Product Common ion and its effect to change solubility
	C-18	Application of common ion, effect of pH on solubility, Related Math.
	C-19	Qualitative Analysis (Ion identification)- Flame test, wet test (+ve and –ve ion identification), detecting presence of Carbon in organic compounds, detection of Hydrogen in organic compounds, Detection of N, S, X (F, Cl, Br, I) in organic compounds.
	C-20	Applications of Qualitative Chemistry (Physical Analysis)- crystallization, distillation and partial distillation, steam distillation, sublimation, low pressure distillation,
	C-21	solvent extraction.
	C-22	Nernst's distribution formula, chromatography, column chromatography, thin layer chromatography, paper chromatography, importance of qualitative analysis.
Chapter-3 Periodic Properties and Bonding in Elements	C-23	History, idea and significance of periodic table, Classification of elements based on e^-configuration, Block elements (s, p, d, f) characteristics.
	C-24	Chemical properties of block elements (Chemical properties of s block elements).
	C-25	Chemical properties of block elements (Chemical properties of p block elements) Part-01
	C-26	Chemical properties of block elements (Chemical properties of p block elements) Part-02
	C-27	Chemical properties of block elements (Chemical properties of d block elements, Chemical properties of f block elements).
	C-28	Transitional Element, properties of transitional element.
	C-29	Periodic properties- atomic size, Ionization energy, electron affinity.
	C-30	Electronegativity, Melting point/Boiling point, Acidity/Basicity of oxides.
	C-31	Chemical Bonds- Ionic bond, Metallic bond, Covalent bond, Classification of covalent bond, lewis dot structure.
	C-32	Orbital overlapping. Hybridization, Classification of Hybrid orbitals.

	C-33	Determination of Hybridization state of central atom, Relation between Shapes of covalent compounds and hybrid orbitals, Effect of lone pair electrons on Molecular shapes.
	C-34	Ligand, Coordinate covalent bond.
	C-35	Effect of electronegativity on compounds with chemical bonds- Polarization or deformation of ion, Covalent properties in ionic compounds, Fajan's rule, Effect of polarization on salt.
	C-36	Weak chemical bonds- Vander Waals force, H bond, Importance of H bond, Naming of inorganic compounds.
Chapter-4 Chemical Changes	C-37	Chemical Reaction and Rate of Reaction- Green Chemistry, Reaction Direction:(Irreversible Reaction and Reversible reaction), Rate of reaction.
	C-38	Rate constant
	C-39	Order of reaction
	C-40	molecularity of reaction
	C-41	Effect of temperature on rate of reaction (Arrhenius equation), Activation energy, Collision theory.
	C-42	Effect of Pressure on rate of reaction, Effect of concentration on rate of reaction, Effect of catalyst on rate of reaction.
	C-43	Equilibrium of Chemical Reaction- Equilibrium and its Dynamics, Le-Chatelier's Principle
	C-44	Effect of temperature, pressure and concentration on equilibrium, Use in industry (Le-Chatelier's Principle).
	C-45	Law of mass action, Discussion about equilibrium constant (K_p and K_c).
	C-46	Derivation of mathematical expression of K_p and K_c,
	C-47	Acid-Base equilibrium- Theories related to acid-base, Ionic product of water
	C-48	Dissociation constant of acid-base, Degree of dissociation, Acid-Base strength.
	C-49	P_H & P_{OH}
	C-50	Buffer solution
	C-51	Thermochemistry- Law of conservation of mass and energy, Thermochemical equation, Heat of reaction.
	C-52	Bond energy, Lavoisier and Hess's law, determining heat of reaction using Lavoisier and Hess's law.
Chapter-5 Vocational Chemistry	C-53	Food Safety- (Chemistry in enhancing food production, Importance of various elements as fertilizers, Role of chemistry in food preservation, Drying method of foodstuff, Cooling method of foodstuff).
	C-54	Food Preservatives- (Natural Food Preservatives, Artificial Food Preservatives, Anti-Microbial Agents, Antioxidants, Vinegar).
	C-55	Food Fractionation- (Stages of Fractionation Fruit Fractionation, Vegetable Fractionation, Fish Fractionation).
	C-56	Mixture- (Colloid, Colloid filtration, Suspension, Preparation of Butter from Milk), TOILETRIES & PERFUMERIES- Rose water preparations, hair oil preparations, telcom powder preparations, vanishing cream preparations, cold cream preparations, lipstick preparations, after shave preparations, henna extract), Cleaners and detergents- (glass cleaner, toilet cleaner).

H.Math 1st Paper **Reference Book:** শ্যামলাল TEXT		
Chapter	**Lecture**	**Lecture-based discussion topics**
Chapter-1 Matrix and Determinant	HM-01	Exercise – 1.1; Types of Matrix, Problems Related to Types of Matrix, Addition and subtraction of matrices, Problems on Matrix Addition and Subtraction, Equality of matrices, Problems on Equality of matrices.
	HM-02	Exercise – 1.1; Scalar Product of Matrix, Matrix multiplication of matrices, Problems related to multiplication of matrix, Exponent of matrix, Problems related to polynomials in matrices, Some special matrices, Properties of some special matrices.
	HM-03	Exercise – 1.1; Related to trace of matrix, Matrix in Real life, Problems related to Matrix in Real life, Exercise – 1.2; Minor of determinant, Co-factor, Value of Determinant, Determinant values, coefficients, regression problems.
	HM-04	Exercise – 1.2; Singular and Non-singular matrix, Problems related to singular and non-singular matrix, Inverse Matrix, Problems related to inverse matrix.
	HM-05	Exercise – 1.2; Properties of determinant, Invariant Proof Problems with Determinants, prove without expansion, Solving equations with determinants.
	HM-06	Exercise – 1.2; Solving set of equations – Cramer's Method, Solving Set of Equations – Inverse Matrix Method, Problems related to solving set of equations, Special formulas regarding the value of determinants, Special formulas for determining value of determinants.
Chapter-2 Vector	HM-07	Exercise – 2; Quantity, Types of vector quantities or different types of vectors, Addition of Vectors, Vector Subtraction, Internal and external division of a line segment between two points, Geometric proofs using vector addition-subtraction concepts, Components of vectors, Projection & Component, Representation of a vector in two-dimensional cartesian coordinate, Representation of a Vector in Three Dimensional Cartesian Co-ordinariates.
	HM-08	Exercise – 2; Problems related to addition, subtraction and quantification of vectors, Determination of unit vector towards, to the opposite or to the parallel of a vector, Multiplication of Vectors, Multiplication of vectors by a scalar quantity, Dot Product of Vectors (scalar multiplication).
	HM-09	Scalar Product of Vectors and Problems Related to Two Perpendicular Vectors, Problems Related to Another Vector in The Same Plane As Two Other Vectors, Problems Related To Determination Of Included Angle Between Two Vectors, Determination Of Perpendicular Projection and Component of Vectors, Vector/cross multiplication/product, Problems related to Vector Cross Product and Two Parallel Vectors.
	HM-10	Exercise – 2; Unit Vector Perpendicular to The Plain Formed by Two Vectors, some information related to area, Problems Related to Determination of the Area of Polygons Using Vectors, the volume of the solid and conditions for three vectors to be coplanar, Vector of

		Straight line and Cartesian Equations in a Three-Dimensional Co-ordinate System, Vector and Cartesian Equation of a Straight Line Passing Through Two Fixed Points.
Chapter-3 Straight line	HM-11	Exercise – 3.1; Coordinate system and distance between two points, Cartesian coordinate system, Polar coordinate system, transformation of coordinate systems related.
	HM-12	Exercise – 3.1; Distance between two points, Problems relating to the distance between two points.
	HM-13	Exercise – 3.2; Bisector formula, with respect to the coordinates of the internal/external bisector point.
	HM-14	Exercise – 3.2; Parallelogram/Square/Triangle/Circle related, Exercise – 3.3; Area of a polygon, finding area of a triangle by coordinates of vertices of a triangle.
	HM-15	Exercise – 3.3; Displacement parallel to axis, related to finding area, condition of three points being parallel, related to determining the ratio of the bisector of one line by another line.
	HM-16	Exercise – 3.4; Locus, related to determining the equation of locus.
	HM-17	Exercise – 3.5; Slope and equation of a straight line, Problems on Slope and equation of a straight line.
	HM-18	Exercise – 3.5; Relation in terms of two equations pointing to the same straight line, conversion from the general equation of a straight line to an equation of different shapes, intersection of two straight lines.
	HM-19	Exercise – 3.5; Area related, Locus, Exercise – 3.6; The condition that three straight lines are concentric, two parallel straight lines related, Regarding straight lines parallel to a straight line.
	HM-20	Exercise – 3.6; Regarding two straight lines perpendicular to each other, equation of a straight line through the point of intersection of two straight lines.
	HM-21	Exercise – 3.6; Angles included by two straight lines, at different centers.
	HM-22	Exercise – 3.7; Perpendicular distance from a given point to a given straight line, position of the point with respect to the straight line.
	HM-23	Exercise – 3.7; segmentation of the segment joining two points by a line, The perpendicular distance between two parallel straight lines, the equation of the bisector of the angle between two non-parallel straight lines.
	HM-24	Exercise – 3.7; Find the equation of the isosceles of the angle under various conditions, Regarding image.
Chapter-4 Circle	HM-25	Exercise - 4.1; Concept of Circle, Equation of the circle with center at the origin and radius r, Equation of a circle with specific center and radius, General Equation of Circle, Some Characteristics of general equation of circle/Conditions for the equation of circle, The sign of g and f in different quadrants, Classification of Circle, Position of a point according to the circle.
	HM-26	Exercise - 4.1; Determination of the equation of a circle using terminal points of diameter, Determining the end points of diameter of a circle Intersection of axes by circle and regarding tangent, Equation of circle not touching or intersecting any of the axes, Equation of circle when its center and any point on the circumference is given.
	HM-27	Exercise - 4.1; Equation of circle passing through the intersection of a straight line/circle and another circle, Equation of circle passing through three fixed points, Equation of circle with center residing on a specific straight line, Related to Circumcircle and Incircle, Exercise - 4.2; Equation of tangent and normal of circle at a fixed point.
	HM-28	Exercise - 4.2; Problems on tangents drawn from points outside the circle, Regarding the determination of the length of a chord of a circle, Determining the coordinates of the nearest and farthest point of the circle from the specified point/line.
	HM-29	Exercise - 4.2; Relative position of two circles, Radical axis and common chord.
	HM-30	Exercise - 4.2; Number of common tangents of two circles and determination of their equation, Polar Equation of Circle, Parametric Equation of Circle.
Chapter-5 Permutation and Combinations	HM-31	Exercise - 5.1; Addition & multiplication rules of counting Permutation, Factorial & use of nP_r formula, permutation of identical objects, Total permutation of arrangement in n numbers of colors letters(items) taken all at a time, Permutation in case of repetition.
	HM-32	Exercise - 5.1; Keeping some letters (items) together or separate, Not keeping some letters (items) in consecutive position, the position of the letter (or object) is specific, related to rearrangement, Some specific letters (or items) will not change their order.
	HM-33	Exercise - 5.1; Changing of relative positions of some specific letters (or items), Permutation of specific letters from words with different letters, Number formation of specific digits, Formation of odd numbers, Formation of even numbers, Smallest and greatest number from a specific number.
	HM-34	Exercise - 5.1; Cyclic permutation, Exercise - 5.2; Combination, Difference between Permutation and Combinations, Supplementary Combination, Problems related to the use of nC_r formula, Selection Related, Conditional combination – accepts or excludes a specified number of objects.
	HM-35	Exercise - 5.2; Word formation through combination, forming a team or committee, Determine the number of factors, Construct straight lines, triangles, polygons, diagonals and planes from points.
	HM-36	Exercise - 5.2; Determine the intersection point, Division into teams or groups, Problem related to division into teams or groups, Divisibility.
Chapter-6 Trigonometric ratio	HM-37	Exercise - 6; Types of trigonometry, Quadrant, Two-Dimensional Angle, Measurement of two-dimensional angles, Radian angle is a constant angle, Relation between Degrees and Radians, Three-Dimensional Angle and its Measurement, Problems related to interconversion of sexagesimal, centesimal, and circular systems of angle, Determination of length of arc, Determination of area of sector.
	HM-38	Exercise - 6; Angle between hour and minute hands of a clock, Interior Angle of Polygon, Similar Triangle, Ratio of trigonometric angles, Basic theory, Trigonometric ratio of axial angles, Relationship between ratios of trigonometric angles.

	HM-39	Exercise - 6; Problems related to mutual conversion and determination of values of trigonometric ratios, Proof related problems, Trigonometric identities related problems, Circular functions and their domain range.
	HM-40	Exercise - 6; Graphs of trigonometric functions, Problems related to Graphs, Period of Trigonometric functions, Different changes in the graph of trigonometric functions, Related to Fundamental Period.
Chapter-7 Trigonometric Ratio of Associated Angle	HM-41	Exercise – 7.1; θ or Trigonometric ratio of positive acute angle: (-θ) or Trigonometric ratio of negative angle: (90° – θ), i.e. Trigonometric ratio of θ angle: Co-Function: (90° + θ), (180° – θ), (180° +θ), (270° - θ), (270° + θ) are the trigonometric ratios of the angles, Trigonometric Equations and Problems involving Associated Angles, Sum of Squares of Trigonometric Ratios and Problems.
	HM-42	Exercise – 7.1; Properties and problems of tangent or cotangent ratios, determination of values and problems using various trigonometric formulae, Exercise - 7.2; Trigonometric Proportions of Compound Angles, A and B are positive acute angles where A > B, Problems on Trigonometric ratios.
	HM-43	Exercise - 7.2; Formulas and Problems on A±B, Expansion related problem, $\frac{coscos\ A \pm sinsin\ A}{coscos\ A \mp sinsin\ A}$ formula related problems, A + B = constant related problems.
	HM-44	Exercise - 7.2; Determination of maximum/minimum values of trigonometric expressions, Exercise - 7.3; Formulas and problems related to $sin(A+B) \pm sin\ (A-B)$ or $cos(A\ +B) \pm cos(A\ -\ B)$.
	HM-45	Exercise - 7.3; $TF_1C \pm TF_2D$ related problems, $sinA\ +\ cosA$ related problems.
	HM-46	Exercise - 7.4; Trigonometric Ratios of Multiple Angles, Formulas and Problems related to Trigonometric Ratios of Angles 2A, Series (Arithmetic and Geometric series) and Problems.
	HM-47	Exercise - 7.4; Periodic Square Roots related and Problems, Trigonometric Ratios of 3A Angles and Problems related to Trigonometric Ratios of 3A Angles, Trigonometric Ratios of Certain Angles.
	HM-48	Exercise - 7.5; Formulas and problems related to proof, problems related to determination of values of various trigonometric ratios from values of $cos\ x\ +\ cos\ y$ and $sinx\ +\ siny$.
	HM-49	Exercise - 7.6; problems related to tangent and cotangent, related to sine and cosine.
	HM-50	Exercise - 7.7; Related to sine rule of triangle, tangent rule or Napier's formula, Tangent rule related problems.
	HM-51	Exercise - 7.7; Cosine rule, Cosine rule of triangle, Projection rule, Perpendicular projection, Progression Related, Trigonometric ratios and formulas of half-angles of triangles.
	HM-52	Exercise - 7.7; Area of Triangle, Relationship between Inradius and Circumradius: Area, Determining nature of triangle subject to conditions, Others.
Chapter-8 Functions & Graph	HM-53	Exercise - 8; Set and its types, Interval, Set mapping & cartesian product, relation and their identification, clear idea of set through mapping, Domain. Range and Co-domain, role of constant and co-efficient in function, Function and its graph, Piecewise Function, problems related to value determination of function.
	HM-54	Exercise - 8; One-one function and many-one function, Onto function, Bijective function.
	HM-55	Exercise - 8; Inverse function related, Inverse function and inverse relation, Discussion related to domain range determination.
	HM-56	Exercise - 8; Interconversion of function and relation, graph shifting or translation, graph, scaling graph reflecting Symmetry of graph.
	HM-57	Exercise - 8; Square root functions, rational functions, $\left(f(x) = \frac{P(x)}{Q(x)}\right)$.
	HM-58	Exercise - 8; n^{th} root functions, Absolute value function, exponential functions, $(y = a^x;\ a > 0, a \neq 1)$, logarithmic functions, Composite function.
Chapter-9 Differentiation	HM-59	Exercise - 9.1; Primary discussion of limit, Undefined, Indeterminate limits, Existence of limit, Limit, Characteristics of limit, limits at infinity, infinite limits, some special limits.
	HM-60	Exercise - 9.1; $Existence\ of$ limits and general limits, factorization, $\lim_{x\to a} \frac{x^n - a^n}{x-a}$, Multiplying numerator and denominator by conjugate, infinite limit.
	HM-61	Exercise - 9.1; $\lim_{x\to 0} \frac{sinx}{x}$; $\lim_{x\to 0} \frac{tanx}{x}$; Continuity of function, Sandwich Theorem.
	HM-62	Exercise - 9.2; Differentiability of a function, Differentiation by first principle.
	HM-63	Exercise - 9.2; General formulas related to differentiation. Exercise - 9.3; Differentiation of product of functions.
	HM-64	Exercise - 9.3; Differentiation of quotient of functions, Exercise - 9.4; Differentiation of composite function.
	HM-65	Exercise - 9.4; Inverse trigonometric function, Differentiation using logarithm.
	HM-66	Exercise - 9.4; $L'Hôpital's\ Rule$ (Admission Special),
	HM-67	Exercise - 9.5: Derivative of implicit function, Differentiation of parametric equations.
	HM-68	Exercise - 9.5: Differentiation of a function with respect to another function, Exercise - 9.6; Successive differentiation, nth derivative.
	HM-69	Exercise - 9.6; Proof related to different successive differentiations, Exercise - 9.7; Physical Application.
	HM-70	Exercise - 9.7; Geometrical Application.
	HM-71	Exercise - 9.8; Increasing function, decreasing function, maxima, minima.
	HM-72	Exercise - 9.8; Problems related to maxima and minima.
Chapter-10 Integration	HM-73	Exercise – 10.1; Primary discussion of Integration, Some Properties of Integration.
	HM-74	Exercise – 10.1; Integration using general formulae, Integration after simplification, Exercise – 10.2; Method of Substitution, $\int (ax+b)^n dx$, $\int sin^n x\ dx$, $\int cos^n x\ dx$.
	HM-75	Exercise – 10.2; In the form of $\int \sin Ax \cos Bx\ dx$, $\int \sin Ax \sin Bx\ dx$, $\int \cos Ax \cos Bx\ dx$, $\int \sin^m x \cos^n x\ dx$, , In the form of $\int \frac{dx}{1+\sin ax}$, $\int \frac{dx}{1+\cos ax}$.
	HM-76	Exercise – 10.3; Ideal Integral, In the form of $\int f(x) \cdot f'(x) dx$, $\int f(g(x))\ g'(x) dx$, In the form of $\int \frac{f'(x)}{f(x)} dx = \ln\lvert f(x)\rvert + c$, $\int \frac{f'(x)}{\sqrt{f(x)}} = 2\sqrt{f(x)} + c$.

	HM-77	Exercise – 10.3; Fractions of Quadratic Equation and Irrational Forms, In the form of $\int \frac{ax+b}{cx+d}dx$, $\int \frac{ax+b}{\sqrt{cx+d}}dx$, $\int \frac{ax+b}{(cx+d)^n}dx$, Related to $a^2 + x^2$, $a^2 - x^2$, $x^2 - a^2$, In the form of $\int \frac{dx}{a\cos^2 x+b\sin^2 x+c}$; $\int \frac{dx}{a\cos^2 x+c}$; $\int \frac{dx}{a\cos^2 x+b\sin^2 x}$; $\int \frac{dx}{a\cos^2 x+b\sin^2 x}$.
	HM-78	Exercise – 10.3; $\int \frac{x^2\,dx}{ax^4+bx^2+c}$; $\int \sqrt{\frac{a+x}{a-x}}dx$, $\int \frac{\sqrt{ax+b}}{\sqrt{cx+d}}dx$ form, $\int \frac{a\cos x+b\sin x}{c\cos x+d\sin x}dx$; form, $\int \frac{dx}{a+be^{mx}}$, $\int \frac{dx}{a+be^{-mx}}$ and $\int \frac{dx}{ae^{mx}+be^{-mx}}$ form, $\int \frac{e^{mx}+e^{nx}}{e^{px}+e^{qx}}dx$ where, $m-n=p-q$, $\int \frac{dx}{g(x)\sqrt{\phi(x)}}$; where $g(x)$ & $\phi(x)$ are polynomial function
	HM-79	Exercise – 10.4; Integration by Parts, Use of LIATE, $\int \sec^n x\,dx$; $\int \operatorname{cosec}^n x\,dx$, $\int e^{ax}\{a\,f(x)+f'(x)\}dx$ form.
	HM-80	Exercise – 10.5; Integration with help of Partial Fractions, $\frac{x}{(x-1)(x-2)}$, $\frac{x}{(x-1)^2(x-2)}$, $\frac{x}{(x-1)(x^2+1)}$ form, $\frac{x^3}{(x-1)(x-2)(x-3)}$ form.
	HM-81	Exercise – 10.6; Concept of Definite Integral, Definite Integral, Method of Substitution for Definite Integrals.
	HM-82	Exercise – 10.6; Special Characteristics of Definite Integral, Net Marked Area, Definite Integral of Even & Odd Functions.
	HM-83	Exercise – 10.7; Area by Using Integration, The Area of the Region Enclosed by the Curve y = f(x) and x Axis within Certain Limits, The Area of the Region Enclosed by the Curve x = f(y) and y Axis within Certain Limits, The Area of the Region Enclosed by Two Curves and Two Straight Lines Parallel to y-Axis (Determination of Area in Respect of x-Axis), The Area of the Region Enclosed by Two Curves and Two Straight Lines Parallel to x-Axis (Determination of Area in Respect of y-Axis), Difference Between Integration and Area.
	HM-84	Exercise – 10.7; Symmetry, Problems Related to Determining Area.

Zoology **Reference Book:** প্যারালাল TEXT		
Chapter	**Lecture**	**Lecture-based discussion topics**
Chapter-1 Cell and its Structure	B-01	Cells, endosymbiosis, cell characteristics, cytology, cell theory, cell types, plant cell, cell wall.
	B-02	Protoplast, cell membrane, cytoplasm and organelles, ribosomes.
	B-03	Endoplasmic reticulum, Golgi bodies, lysosomes, mitochondria.
	B-04	Plastid, centriole, cytoskeleton, peroxisome, glyoxysome, vacuole.
	B-05	Nucleus, Cell inclusions, Chromosome.
	B-06	Hereditary material, DNA, RNA.
	B-07	DNA replication, Transcription, Reverse Transcription.
	B-08	Translation, Central Dogma of Biology, Gene, Genetic Code.
Chapter-2 Cell Division	B-09	Amitosis, Cell Cycle: Cell Cycle Regulators, Interphase: G_1 Phase, S Phase, G_2 Phase.
	B-10	M-phase (prophase, prometaphase, metaphase, anaphase, telophase)
	B-11	Importance of mitosis, uncontrolled mitosis, cell death. Meiosis Cell Division: Meiosis-1: Prophase-1, Metaphase-1, Anaphase-1, Telophase-1, Interkinesis-1
	B-12	Meiosis-2: Prophase-2, Metaphase-2, Anaphase-2, Telophase-2, Cytokinesis-2, Characteristics of Meiosis, Importance of Meiosis, Crossing over.
Chapter-3 Cell Chemistry	B-13	Carbohydrates: Properties of Carbohydrates, Types of Carbohydrates (Sugars): Monosaccharides (Triose, Tetrose, Pentose).
	B-14	Monosaccharides (hexose, heptose), disaccharides.
	B-15	Oligosaccharides, Polysaccharides, Functions of Carbohydrates.
	B-16	Amino acid, classification of amino acoid, protein, classification of protein.
	B-17	Lipid, classification of lipid, function of lipid.
	B-18	Enzymes: Properties of Enzymes, Mechanism of action of Enzymes, Types of Enzymes, Effectors on Enzymes, Uses of Enzymes.
Chapter-4 Microbes	B-19	Viruses: Contribution of scientists to the discovery of viruses, structure of viruses, types of viruses, parasitism of viruses, emerging viruses, subviral entities, T_2 bacteriophage, corona virus causing COVID-19.
	B-20	Life cycle of viruses, importance of viruses, viral diseases at a glance, description of some viral diseases.
	B-21	Bacteria: Characteristics of bacteria: Distribution and habitat of bacteria: Types of bacteria, structure of ideal bacteria.
	B-22	Reproduction of bacteria, importance of bacteria, description of some bacterial diseases.
	B-23	Malaria: Malaria infection, treatment, prevention and control of malaria, life cycle of malaria parasite in human body.
	B-24	Life cycle of malaria parasite in mosquito body, alteration of generation of malaria parasite.
Chapter-5 Algae and Fungi	B-25	Algae (Characteristics, Physical Structure, Celluler Structure), Reproduction of Algae (Vegetative Reproduction, Asexual Reproduction, Sexual Reproduction).
	B-26	Ulothrix (Habitat, Physical Structure, Reproduction), Economic Importance of Algae.
	B-27	Fungi (Characteristics, Physical Structure, Cellular Structure), Reproduction of Fungi (Vegetative Reproduction, Asexual Reproduction, Sexual Reproduction), Importance of Fungi (Beneficial and Harmful Effects).
	B-28	Agaricus (Habitat, Physical Structure), Economic Importance of Agaricus, Fungal Diseases, Lichen (Habitat, Characteristics, Structure, Classification), Importance of Lichen.
Chapter- 6 Bryophyta and Pterydophyta	B-29	Bryophyta: Introduction to Bryophytes, Characteristics of Bryophytes, Riccia: Characteristics, External Structure, Internal Structure, Reproduction of Riccia,Alteration of generation of Riccia.
	B-30	Pteridophyta: Characteristics of Pteridophyta, Pteris: Physical structure, Internal structure, Reproduction of Pteris, Alteration of generation of Pteris, Economic importance of Pteris.
Chapter- 7 Gymnosperm and Angiosp	B-31	Gymnosperm (Introduction, Characteristics), Cycas (Characteristics, Structure, Reproduction).
	B-32	Angiosperm (Introduction, Characteristics), Difference Between Gymnosperms and Angiosperms, Introduction to angiosperms: Habitat, Root, Stem, Leaf, Inflorescence.

	B-33	Aestivation, Placentation, Fruits.
	B-34	Floral formula, floral diagram, Poaceae family, Malvaceae family, differences between Poaceae and Malvaceae families, differences between monocots and dicots.

Zoology **Reference Book:** প্যারালাল TEXT		
Chapter	**Lecture**	**Lecture-based discussion topics**
Chapter-1 Animal diversity and Classification	Z-01	Animal diversity: Types, Animal classification: Basis and principles of Animal classification.
	Z-02	Nomenclature of Animals, codes of Nomenclature of Animals, Major phylums of animal kingdom: Non-chordates.
	Z-03	Poriphera, Cnidaria, Platyheminthes.
	Z-04	Nematoda, Mollusca, Annelida.
	Z-05	Arthropoda, Echinodermata.
	Z-06	Chordata: Characteristics of the various subphylums and classes of the order Chordata, classification of vertebrata.
Chapter-2 Introductio n to Animal	Z-07	Hydra, external structure of hydra, internal structure of hydra, cells of epidermis, structure of ideal cnidocyte, types of nematocyst, technique of nematocyst discharge.
	Z-08	Cells of Gastrodermis, Mesoglia, Coelenteron, Feeding and Digestion mechanism of Hydra, Locomotion of Hydra, Reproduction of Hydra, Regeneration of Hydra, Division of Labor in Hydra, symbiosis.
	Z-09	Grasshopper, external structure of grasshopper, regions of grasshopper, Mouthparts of grasshopper.
	Z-10	Alimentary system (alimentary canal, alimentary glands), feeding and digestion of grasshopper.
	Z-11	Circulatory system, respiratory system, excretory system.
	Z-12	Sensory organs of grasshopper, Compound eye of grasshopper, vision mechanism, reproduction process, metamorphosis, role of hormones in metamorphosis.
	Z-13	The Rohu fish, external structure, scale, circulatory system, blood, heart, blood vessels (arterial system).
	Z-14	Fish venous system, respiratory system, structure of gills, respiratory mechanism, air bladder, reproduction and life cycle of fish.
Chapter-3 Human Physiology: Digestion and Absorption	Z-15	Digestion, types of digestion, digestive system, oral cavity, digestion of food inside oral cavity, dental formula, pharynx, oesophagus.
	Z-16	Stomach, digestion of food inside stomach, small intestine, digestion of food inside small intestine, large intestine.
	Z-17	Digestive glands: salivary gland, Liver, pancreas, gastric gland, intestinal gland, role of nervous system and hormone in digestion.
	Z-18	Absorption of digested food materials, fate of absorbed food materials, obesity.
Chapter-4 Human Physiology: Blood and Circulation	Z-19	Blood, blood components, plasma, red blood corpusle.
	Z-20	White blood corpusle, types, platelet.
	Z-21	Blood coagulation process, lymph, lymphatic system, types of blood vessels.
	Z-22	Human heart (location, shape, covering, wall), structure of cardiac muscle, chambers of the heart, valves of the heart, circulation of blood through the heart.
	Z-23	Heartbeat: cardiac cycle, myogenic control, conduction of impulses.
	Z-24	Blood Pressure and Baroreceptors, Blood Circulation in the Human Body (Systemic, Pulmonary, Coronary, Portal)
	Z-25	Heart disease, chest pain or angina, heart attack, heart failure, treatment concepts, mechanical pacemaker, open heart surgery, coronary bypass surgery.
Chapter-5 Human Physiology: Breathing and Respiration	Z-26	Respiration, Stages of Respiration (Exhalation and Inhalation), Difference between Exhalation and Inhalation, Parts of Respiratory System.
	Z-27	Lungs, Function of the respiratory system, ventilation mechanism, Gaseous exchange.
	Z-28	Control of ventilation, Diseases of respiratory system, Artificial respiration.
Chapter-6 Human Physiology: Wastes and Excretion	Z-29	Different types of waste products of animals, human excretory system, structure and function of kidney, ultrastructure of kidney-nephron, function of nephron.
	Z-30	Physiology of excretion (nitrogenous waste production and urine formation), urine, role of kidney in excretion and osmoregulation, renal failure, dialysis, renal transplantation, hormonal action.