HSC 2nd Year Academic Program

(Online/Combo Batch)

Pioneer Batch

Regular Class Syllabus

Serial No.	Subject	Chapter	Lecture
1	Physics 2nd Paper	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	68
2	Chemistry 2nd Paper	1, 2, 3, 4, 5	64
3	H.Math 2nd Paper	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	74
4	Biology 1st Paper	7, 8, 9, 10, 11, 12	25
5	Biology 2nd Paper	7, 8, 9, 10, 11, 12	31
		Total: 38	**Total: 262**

Physics 2nd Paper		
Chapter	**Lecture**	**Lecture-based discussion topics**
Chapter-1 Thermodynamics	P-01	Principles of measurement of temperature, Thermal Equilibrium, Zero'th law of Thermodynamics, Measurement of Temperature, Method of two points, relation between various scales, Faulty thermometer, One point method.
	P-02	Thermal System, Thermal quantities, Thermal Processes, Heat, Work done and Internal Energy, First law of thermodynamics and general mathematical problems.
	P-03	CQ and Admission Standard questions on First law of thermodynamics, Molar Heat capacity, Thermal function of static and path, Isobaric Process, Isochoric Process.
	P-04	Isothermal Process, Adiabatic Process, General mathematical problems on Isothermal and Adiabatic process.
	P-05	CQ and Admission standard mathematical problems on Isothermal and Adiabatic process, Concept of Second law of thermodynamics, Thermal Engine, Efficiency of thermal engines, Reversible and Irreversible process, Factors of Irreversible process.
	P-06	Carnot Cycle, Efficiency of Carnot engine and general mathematical problem.
	P-07	CQ & Admission Standard mathematical problems on Engine, Refrigerator, Efficiency coefficient of refrigerator, Refrigeration cycle of Carnot, Mechanism of refrigerator, Entropy, Entropy in reversible and irreversible process, Change of Entropy for the change of physical state.
	P-08	Change of entropy in various process, Entropy and disorder, Thermal death of the universe.
Chapter-2 Static Electricity	P-09	Concept of Charge, Nature of charge, Quantization of charge, Conservation of charge, Surface Charge density, Coulomb's Law, Vector format of Coulomb's Law, Limitations of Coulombs\'s Law.
	P-10	Electric Field on a point for point charge, Law of superposition of electricity intensity, Field line, Uniform electric field, Electric field intensity, General Mathematical problems for Electric intensity.
	P-11	CQ and Admission standard mathematical problems for Electric force and field intensity.
	P-12	Electric Potential, Equations of electric potential, Potential Difference, Relation of potential difference with intensity, Flow of charge.
	P-13	CQ and Admission standard Mathematical Problems for Potential, Electric potential and intensity of a charged conductor sphere, Plane density and electric intensity.
	P-14	Dipole moment, Potential and intensity for a dipole.
	P-15	Insulator and dielectric, Capacitor and Capacitance, Spherical and Parallel plate capacitor, Connection of capacitors, energy stored in capacitor, energy stored in capacitor, capacitor related general mathematical problem.
	P-16	CQ and Admission standard Mathematical Problems related to capacitors, Use of capacitors.
	P-17	Torque of a dipole in uniform electric field, Work done by rotation of dipole, Potential energy of a dipole, Gauss' Theorem, Electric flux, Electric flux in a closed surface, Gauss' law from Coulomb's law.
	P-18	Use of Gauss's theorem, Electric field for charged conductor sphere, Electric field for charged insulator sphere, Electric field for line of charges, Electric field for charged conductor plate, Electric field for charged conductor parallel plates.
Chapter-3 Current Electricity	P-19	Current flow, Direction of current flow, Drifting velocity of electron, Current density, Ohm's Law, Resistance, Conductivity, Effect of temperature on resistance, Conductivity coefficient, Electric cell, Electromotive force of a cell, Internal resistance of a cell.
	P-20	Electric Circuit, Resistance combination, Series combination, Parallel combination, Equivalent resistance, Work done by electricity and electric force, Joule's thermal law.

	P-21	Voltage divider law, Current divider law, Shunt, Relation between shunt current and galvanometer current, Use of shunt on ammeter, Increasing the range of ammeter, Use of Shunt on voltmeter, Increasing the range of voltmeter.
	P-22	kWh, Rating of Electrical Devices, Rating of Voltage, Rating of Watt, Security fuse, Voltage on various points of a circuit, Combination of cells, Series and parallel connection, Mixed connection.
	P-23	Kirchhoff's law: First law, second law, General mathematical problems related to Kirchhoff's law.
	P-24	CQ and admission standard mathematical problems related to Kirchhoff's law, Wheatstone Bridge, Potentiometer, Meter Bridge.
Chapter-4 Magnetic Effects of Current and Magnetism	P-25	Basic concepts of magnetic materials, magnetic field, magnetic force, Lorentz force, and related mathematical problems, motion of a charge in a magnetic field, circular motion, and related mathematical problems.
	P-26	Spiral motion of a charge and mathematical problems, Hall effect, Hall voltage, and related mathematical problems, force on a current-carrying conductor in a magnetic field, Fleming's left-hand rule, and related mathematical problems.
	P-27	Force between two infinitely long parallel current-carrying conductors, torque acting on a closed current loop in a magnetic field, and general mathematical problems.
	P-28	Determination of the magnitude and direction of the magnetic field at the center of a current-carrying circular coil, Ampere's law, applications of Ampere's law, and general mathematical problems related to magnetic field determination.
	P-29	CQ & Admission Standard mathematical problems related to magnetic field determination,
	P-30	CQ & Admission Standard mathematical problems related to force and torque in a magnetic field, magnetic field due to the orbital motion of an electron and the expression for magnetic dipole moment, magnetic dipole moment due to the spin of an electron or its rotation about its own axis.
	P-31	Geomagnetism, several definitions related to geomagnetism, and hysteresis.
Chapter-5 Electromagnetic Induction and Alternating Current	P-32	Electromagnetic Induction, Magnetic Flux, Faraday's Laws of Electromagnetic Induction, First Law, Second Law, Lenz's Law, Lenz's Law and the Conservation of Energy, and Related Mathematical Problems.
	P-33	CQ & Admission Standard Mathematical Problems on Faraday's Law and Lenz's Law, Self-Induction, Determination of Self-Inductance Coefficient, Direction of Induced Electromotive Force Due to Self-Induction, and General Mathematical Problems
	P-34	CQ & Admission Standard Mathematical Problems on Self-Induction, Non-Inductive Coil, Mutual Induction, Applications of Mutual Induction: Transformer and General Mathematical Problems.
	P-35	CQ & Admission Standard Mathematical Problems on Mutual Induction, Alternating Current, Various Parameters of Alternating Current, Generation of Alternating Current,
	P-36	Average and Root Mean Square Value of Alternating Current. All Mathematical Problems Related to Alternating Current.
Chapter-6 Geometrical Optics	P-37	Reflection of Light, Mirrors, Refraction of Light, Refractive Index, General Form of Snell's Law, Image Formation Due to Refraction, Critical Angle.
	P-38	Fermat's Principle, Concept of Fermat's Principle, Refraction at a Spherical Surface, Sign Conventions and Related Mathematical Problems.
	P-39	Lenses, Types of Lenses, Functioning of Lenses, Essential Quantities Related to Lenses, Ray Diagrams in Lenses, Image of an Extended Object.
	P-40	Lens Formula, Lens Maker's Formula, and General Mathematical Problems.
	P-41	CQ & Admission Standard Mathematical Problems on Lenses, Power of a Lens, Combination of Lenses, and Equivalent Lens.
	P-42	Prism, Refraction of Light in a Prism, Prism, Spectrum, Dispersion of Light, Newton's Experiment, and General Mathematical Problems on Prisms.
	P-43	CQ & Admission Standard Mathematical Problems on Prisms, Optical Instruments, Human Eye, Vision Aids or Optical Instruments, Various Types of Microscopes and Their Variants, and General Mathematical Problems.
	P-44	Telescope and General Mathematical Problems, CQ & Admission Standard Mathematical Problems on Optical Instruments
Chapter-7 Physical Optics	P-45	Primary concepts of light, Newton's particle theory, Electromagnetic wave, Pointing vector, Electromagnetic spectrum, Wave and wavefront, Huygen's wave theory.
	P-46	Explanation of reflection and refraction with Huygen's theorem, Superposition of Wave, Coherent source.
	P-47	Interference, Young's double slit experiment, Central maximum, Position of light and dark points, Constructive interference, Destructive interference, Fringe distance, Fringe width, General Mathematical problems.
	P-48	CQ & Admission Standard Mathematical problems related to Interference.
	P-49	Diffraction, Fraunhofer diffraction, Grating diffraction.
	P-50	Polarization of light, Malus' Law, Intensity of light in polarization, Polarization in double refraction.
Chapter-8 Introduction of Modern Physics	P-51	Concept of modern physics, Intertial and non-inertial reference frame, Relation between various inertial reference frame, Michelson-Morley's experiment, Special theory of relativity, Galiliam transformation, Lorentz transformation.
	P-52	Time dilation, Length contraction, Relativity of mass, General mathematical problems related to relativity.
	P-53	CQ & Admission Standard mathematical problems related to relativity, Relation of mass-energy, Momentum of light, Fundamental force, Travelling in space, Black-body radiation and atomic mass unit.
	P-54	Photo-electric effects, Limitations of electromagnetic theory of light, Theory of Photon and photoelectric effect.
	P-55	Stopping potential, Mathematical Problems, X-ray, Producing X-ray, Properties and types of x-ray.
	P-56	Mathematical Problems on X-rays and Photoelectric Effect, De Broglie's Matter Waves, Wave-Particle Duality, Mathematical Examples.
	P-57	Compton Effect, Mathematical Examples on Compton Effect, Heisenberg's Uncertainty Principle, Mathematical Examples.

Chapter-9 Atomic Model & Nuclear Physics	P-58	Structure of Atom, Thomson's atomic model. Rutherford's alpha-particle experiment, Solar model, Bohr's atomic model, atomic radius and energy, Structure of nucleus, Quantities of nucleus.
	P-59	Radioactivity, Radioactive ray, Alpha, Beta and gamma radiation, Rules of radioactive transformation, Radioactive decay, Equation of decay, Transformation law.
	P-60	Half-life and average-life, Mass defect and binding energy, nuclear reaction, Fission, fusion and nuclear reactor.
Chapter-10 Semi-Conductor & Electronics	P-61	Energy band, Conductor, Semi-conductor and insulator with respect to band theory, Effect of temperature on semi-conductor, Pure and impure semi-conductor, P-type and n-type semi-conductor, p-n junction diode.
	P-62	Biasing in p-n junction, Forward and reverse bias, Ideal diode model, Model of constant voltage drop, General mathematical problems related to Diode.
	P-63	General mathematical problems related to Diode, use of diode as a rectifier.
	P-64	Structure of transistor, Basic combinations of transistors, Mechanism of p-n-p transistor, Properties of a transistor
	P-65	Use of transistor as an amplifier, Use of transistor as a switch, Applying Kirchhoff's law in a transistor.
	P-66	Numeric system, Introduction to various numeric system, Transformation of various numeric system, Binary addition, subtraction, multiplication and division.
Chapter-11 Astronomy	P-67	The Mystery of the Creation of the Universe; The Fate of the Universe in the Light of Physics.
	P-68	Fundamental Matter and Events of the Universe, Principles–Radio Telescope, Optical Telescope, Gamma and X-rays, Artificial Satellites.

Chemistry 2nd Paper		
Chapter	**Lecture**	**Lecture-based discussion topics**
Chapter-1 Environmental Chemistry	C-01	Gas, Components of atmosphere, Atmospheric temperature, Effect of pressure and density, Cyclone and tidal bore
	C-02	Boyle's law, Charle's law, Avogadro's law, Gay-Lussac's law, related math
	C-03	Combined law, Ideal gas equation (PV = nRT), Explanation of R, related math
	C-04	Dalton's law of partial pressure, Graham's law of diffusion.
	C-05	Diffusion, Effusion, Rate of diffusion and formula, Kinetic theory of gas, Postulates of kinetic theory, Calculation of kinetic energy.
	C-06	Real gas, Ideal gas, Deviation, Coefficient of compressibility, Amagat's curve, Vander Walls equation.
	C-07	Gas cylinderisation, Reactions occurred during lightning, Fixation of N_2 in soil.
	C-08	Greenhouse gas, Source of greenhouse gas, Effect of greenhouse gas, Introduction to CFC and its use, origination of O_3 layer, Damage of O_3 layer.
	C-09	Concept related to acid base- Acid base theory, Arrhenius concept, Bronsted-Lowry concept (Theory, conjugate), Luis theory, Acid rain, Cause of acid rain, Effect of acid rain, Prevention of acid rain.
	C-10	Source of surface water, Importance of surface water, Criteria of purity of Surface water, Hardness, pH, DO, BOD, COD, TDS, Water pollution, Reason and cause of water pollution, Natural pollutant, Arsenic pollutant, Effect of water pollution.
Chapter-2 Organic Chemistry	C-11	Introduction and Classification of Organic Chemistry- Introduction to organic compounds, Hydrocarbon and organic compounds, Roll of carbon in hydrocarbon, Classification of organic compounds, Homologous series, Functional group.
	C-12	Nomenclature of Organic Compounds- (Tribal system, derived system, IUPAC system)
	C-13	Isomerism- Introduction, Classification, Structural isomerism, Types of structural isomerism (Chain isomerism, Position isomerism Functional group isomerism, Metamerism, Tautomerism),
	C-14	Geometric isomerism (cis-trans isomerism, E-Z isomerism, Syn-Anti isomerism)
	C-15	Stereo Isomerism (Cyral carbon, Enantiomer, Diastereomer, Racemic mixture)
	C-16	Technique of Organic Reaction- Division of bond (uniform and ununiform), Electrophile, Nucleophile, Carbocation, Carbanion.
	C-17	Aliphatic hydrocarbon- Saturated hydrocarbon (Alkane and everything of alkane)
	C-18	Unsaturated hydrocarbon (Alkene and everything of alkene)
	C-19	Unsaturated hydrocarbon (Alkyne and everything of alkyne)
	C-20	Benzene and Its Discussion, Source of Benzene, Characteristics and specialty of benzene, Aromaticity and Huckle law.
	C-21	Preparation and technique of benzene reaction, Homologous of benzene.
	C-22	Toluene and everything of it
	C-23	Alkyl halide and everything about it.
	C-24	Nucleophile substitution (S_N1 and S_N2), Electrophilic elimination (E1 and E2)
	C-25	Aryl Halide and everything of it
	C-26	Everything about alcohol and ether.
	C-27	Phenol and everything about it.
	C-28	Aldehyde-Ketone introduction & preparation
	C-29	Aldehyde-Ketone chemical reaction and everything else
	C-30	Aromatic aldehyde-ketone and everything of it.

	C-31	Carboxylic acid and everything about it.
	C-32	Benzoic acid and everything about it.
	C-33	Amine and everything about it.
	C-34	Aneline and everything of it
	C-35	Aromatic Nitro compound and everything of it.
	C-36	Benzene Diazonium Chloride and everything of it.
	C-37	Polymer and Plasticity- Introduction, Classification, Different polymer compounds, Organic polymer.
	C-38	IR spectroscopy, biomolecule, conversion of organic compounds
Chapter-3 Stoichiometric Chemistry	C-39	Chemical Calculation and Concentration- Chemical calculation, Mole and Mole number + Math, Molar mass and volume + Math.
	C-40	Determination of molar volume of products from chemical equation + Math, Determination of mass and volume of gaseous components, Limiting reactant.
	C-41	Molar concentration and substance (Primary and secondary), Molarity, Molality, Normality,
	C-42	Percentage (%W/V, %W/W, %V/V), ppm, ppb, ppt, Dilution.
	C-43	Acid-base reaction- Introduction and neutralization reaction, Acid base titration + Math
	C-44	Indicator, Titration, Neutralization point, Titration graph.
	C-45	Oxidation number, Valency and latent valency, Oxidation-reduction (Basic concept), Compatibility, Incompatibility, Auto oxidation-reduction.
	C-46	Balancing oxidation-reduction.
	C-47	Oxidation-reduction titration (Determination of amount of metal ion and impurity,)
	C-48	iodimetry and iodometry
	C-49	Use of beer-lambert law to determine conc. Of solution, atomic absorption spectroscopy.
	C-50	UV-Vis spectroscopy, HPLC, Gas chromatography.
Chapter-4 Electro-chemistry	C-51	Electric conductivity and classification, Specific conductance, equivalent conductance and molar conductance of electrolyte.
	C-52	Reactivity series of metal, Electric cell, Classification and technique of electrolyte, Factors having effect on electrolyte.
	C-53	Faraday's law + Math.
	C-54	Electrode and Electrode potential – Elements of electrochemical cell, Oxidation-reduction half-cell reaction, Electrode and classification, Single and double chamber electrochemical cell + usage, Galvanic cell, Standard electrode potential, Salt bridge and its use.
	C-55	Electrode indicator, Math of standard electrode potential, Math of safe container.
	C-56	Electric cell, Cell potential and its effect- Nernst equation + Math, Relation of Gibbs free energy, pH Meter.
	C-57	Nernst equation derivation+ related math.
	C-58	Structure of chemical cell and converting electric energy into chemical energy, single and duel channel cell, electrolytic cell, structure and characterisrtics of galvanic cell.
	C-59	Rechargable battery(lead storage & lithium), pros and cons of these batteries, benefit of using lithium ion battery, fuel cell and it's varients, anode & cathod of fuel cell, comparison between fuel cell and battery.
	C-60	sturcture of hydrogen fuel cell & chemical reaction, PEM fuel cell, benefit of hydrogen fuel cell, pH meter & it's usage, determining pH by using pH meter+ related math.
Chapter-5 Economical chemistry	C-61	gas fields in bangladesh, components of natural gas, coal field in bangladesh,, usage of coal and it's quality, possibilities in bd according to the resource, remarkable industry based on resources in bangladesh, principle of urea preparation
	C-62	Principle of glass preparation, Principle of ceramic preparation, Principle of paper preparation, Principle of cement preparation, Principle of leather tanning, pollutants of cemant industry, pollutants of urea industry, pollutants of leather industry, pollutants of textile industry
	C-63	Principle to maintain air pollution, ETP Principle, recycling of iron, alluminium, glass, paper, plastic, social and environmental usage of iron.
	C-64	Importance of recycling of iron, alluminium, glass,paper, plastic, pros and cons of using coal based electric field, nano particles, comparison between nano particles and molecules, industrial use of nano particles.

H.Math 2nd Paper		
Chapter	**Lecture**	**Lecture-based discussion topics**
Chapter-1 Real number and inequality	HM-01	Exercise-1.1 - Classification of real numbers, sets-subsets of real numbers, geometric representation, postulates of real numbers, concept of inequality and postulates related to inequality.
	HM-02	Exercise-1.1 – Interval, absolute value, solution of inequalities related to absolute value, proof involving absolute value.
	HM-03	Exercise-1.1 Completeness of real numbers, set bounded above, set bounded below (Supremum & Infimum), Exercise 1.2 Solution of inequalities with one variable (linear and quadratic).
	HM-04	Exercise 1.2 Solution of inequalities with one variable (polynomial), linear inequalities with two variables and solution with graph.

Chapter-2 Linear Programming	HM-05	Exercise-2 – Drawing graph from linear inequalities, solution region, general problems with bounded solution region.
	HM-06	Exercise-2 - Practical problems with bounded solution region, open solution region, model of linear programs, advantages and use
Chapter-3 Complex numbers	HM-07	Exercise-3; Concept and significance of i, power and series of i, rotation by i.
	HM-08	Exercise-3; Real axis and imaginary axis, previous introduction to complex numbers, Argand diagram of complex numbers, modulus and argument of complex numbers.
	HM-09	Exercise-3; Polar form of complex numbers. Algebraic calculation of complex numbers, addition, subtraction, multiplication and division of complex numbers, adjoint complex numbers.
	HM-10	Exercise-3; Religion of complex numbers, expression in the form A+iB.
	HM-11	Exercise-3; Square root and quadratic root of complex numbers.
	HM-12	Exercise-3; Cube root and sexagesimal root of complex numbers. ω related series, ω related expression value determination and analysis of product.
	HM-13	Exercise-3; Mathematical significance of $\|z_1 - z_2\|$. Geometric application of complex numbers (transmission path) related.
	HM-14	Exercise-3; Proof and determination of values under conditions related.
Chapter-4 Polynomials and Polynomial equations	HM-15	Exercise-4; Polynomial functions and polynomial equations, roots of polynomial equations, some theorems related to polynomials, solving quadratic equations with the help of factors.
	HM-16	Exercise-4; General solution of quadratic equations, discriminant, determining the nature of roots of quadratic equations
	HM-17	Exercise-4; Properties of roots in terms of coefficients, root-coefficient relationship of quadratic equations.
	HM-18	Exercise-4; Polynomial equations with real coefficients, polynomial equations with rational coefficients, forming equations from roots.
	HM-19	Exercise-4; Determining the x-intercept of a polynomial function related, maximum and minimum values of a quadratic polynomial function, determining the line of symmetry of a quadratic function. Drawing a graph of any quadratic function.
	HM-20	Exercise-8; Graph of $y = f(x) = ax^n + b$[n odd and even], common root, Relationship between coefficients and roots of cubic equations.
	HM-21	Exercise-4; Relationship between coefficients and roots of polynomial equations and formation of polynomial equations, equations with symmetric roots.
	HM-22	Exercise-4; Trigonometric polynomial functions and their types, equations with roots included in the progression, value of symmetric terms of roots.
Chapter-5 Binomial expansions	HM-23	Exercise-5.1; Basic concepts of binomial expansion, Pascal's triangle, binomial theorem, proof of binomial expansion theorem in ascending order.
	HM-24	Exercise-5.1; Number of terms, algebraic sum of coefficients of expansion, properties of coefficients of binomial expansion, common terms.
	HM-25	Exercise-5.1; Terms without variables in expansion, middle term, equidistant terms, ratio of two consecutive terms related, coefficients of two terms being equal related.
	HM-26	Exercise-5.2; Concept of binomial expansion in infinite series, condition of expansion for $(a + x)^n$.
	HM-27	Exercise-5.2; Convergence of binomial series related, finding common terms.
	HM-28	Exercise-5.2; Finding coefficients related, finding sum of series using expansion, largest possible term.
Chapter-6 Conics	HM-29	Exercise-6.1; Introduction and properties of conic (section of conic, different elements of conic, eccentricity), parabola, standard equation of parabola.
	HM-30	Exercise-6.1; Axis shift, focal distance.
	HM-31	Exercise-6.1; Parametric equation of parabola, polar equation of parabola, determining equation of parabola from definition of conic.
	HM-32	Exercise-6.1; Minimum distance of parabola from external point, determining equation of parabola from end point of latus rectum, application of parabola equation in real life problems.
	HM-33	Exercise-6.2; Ellipse, standard equation of parabola, axis shift.
	HM-34	Exercise-6.2; Determine the equation of the ellipse from various elements, $SP + S'P$ =length of the major axis, parametric coordinates of the ellipse.
	HM-35	Exercise-6.2; Determining the equation of an ellipse from the definition of a conic, determining the equation from a focus, its opposite diretix and eccentricity of an ellipse related, special problems, Exercise-6.3; Hyperbola, standard equation of hyperbola.
	HM-36	Exercise-6.3; Axis transfer, determining the equation of a hyperbola from various materials.
	HM-37	Exercise-6.3; $\|SP - S'P\|$ = minor axis length, asymptote, rectangular hyperbola, parametric coordinates of a hyperbola, determining the equation of a hyperbola from the definition of a conic.
	HM-38	Exercise-6.3; General equation of conic, location of point with respect to conic, tangent and intersection of conic related, identification of conic.
Chapter-7 Inverse Trigonometric	HM-39	Exercise-7.1; Conditions and graph of inverse trigonometric function (proof of formula, and examples), Arc function.
	HM-40	Exercise-7.1; Value of inverse trigonometric function, domain range of inverse trigonometric function, some necessary relations.
	HM-41	Exercise-7.1; Transformation of inverse trigonometric function, formula of inverse trigonometric function.

Functions and Trigonometric Equations	HM-42	Exercise-7.1; Determination of value of inverse trigonometric function related problems, solution and proof of inverse trigonometric function related problems.
	HM-43	Exercise-7.2; General solution of trigonometric equation, solution of trigonometric equation in certain range, square related problems.
	HM-44	Exercise-7.2; Extraneous root, a sin θ + b cos θ = c related solution.
	HM-45	Exercise-7.2; Solve secant/cosecant related problems using the formula for tan (x + y).
	HM-46	Exercise-7.2; Solution from the sum of trigonometric expressions, solution from the product of trigonometric expressions.
Chapter-8 Statics	HM-47	Exercise-8.1; Basic concepts of mechanics, triangles in solving statics problems related Definition of some topics, resultant of two forces acting on a particle, addition of forces, determination of magnitude and direction of resultant of two forces acting at an angle α to each other.
	HM-48	Exercise-8.1; Application of parallelogram law in determining resultant, determination of angle included between two forces, direction of resultant unchanged related.
	HM-49	Exercise-8.1; Resolution of force, determination of resolved parts of force, application of sine law of force related, determination of resultant of force with the help resolved parts.
	HM-50	Exercise-8.1; Resultant of three or more forces, the application of the theorem of resolved parts or direct formula to determine the resultant of two or more forces related problems
	HM-51	Exercise-8.2; Equilibrium of forces, triangle law of equilibrium, conditions for equilibrium of co-planer forces, determination of the internal angle between three forces that creates equilibrium, Lami's theroem of equilibrium, inverse of Lami's theorem.
	HM-52	Exercise-8.2; Mathematical problems related to Lami's theorem.
	HM-53	Exercise-8.2; Different centers of triangle related problems, inverse formula of triangle law in equilibrium and its application related mathematical problems.
	HM-54	Exercise-8.2; Problems related to proof of equilibrium using the theorem of resolved parts, equilibrium of an inclined plane
	HM-55	Exercise-8.3; Resultant of parallel forces acting on paired objects, determining the magnitude of the resultant of two similar parallel forces, determining direction and point of action.
	HM-56	Exercise-8.3; Determining the magnitude of the resultant of two unlike parallel forces, their direction and point of action, mathematical problems.
	HM-57	Exercise-8.3; Triangle related problems in the case of similar parallel forces, determining the pressure and reaction forces related problems.
	HM-58	Exercise-8.3; Moment of force, couple.
Chapter-9 Motion of particles in a plane	HM-59	Exercise-9.1; Displacement, velocity, average speed and velocity, distance between moving objects, finding the velocity.
	HM-60	Exercise-9.1; Crossing a river related problem.
	HM-61	Exercise-9.2; Determining relative velocity, determining relative velocity related problems.
	HM-62	Exercise-9.3; Uniform acceleration, laws of motion of a particle moving in a straight line with uniform acceleration, description of motion with the help of diagrams and solution of laws of motion problems.
	HM-63	Exercise-9.3; Bullet related, tiger-deer and bus-passenger related problems.
	HM-64	Exercise-9.3; Train collision, distance covered in t-th second. Exercise-9.4; Freely falling object and its laws.
	HM-65	Exercise-9.4; Object thrown downwards from a certain height, Maximum height and flight time of an object thrown above the ground, Object thrown upwards from a certain height.
	HM-66	Exercise-9.4; Speed of an object thrown from a moving platform, Object falling into a well; Exercise-9.5; Motion of a particle projected on a vertical surface (projectile), determination of the position and velocity of the particle at a given time, determination of the velocity and direction of the particle at a given height.
	HM-67	Exercise-9.5; Equation of various quantities of projectile (range, maximum height, travel time).
	HM-68	Exercise-9.5; Equation of the trajectory of projectile, projectile thrown from a given height.
Chapter-10 Measures of Dispersions and Probability	HM-69	Exercise-10.1; Categorized and uncategorized data, population, Population census, mean, median, standard deviation, central tendency, measure of dispersion, range, coefficient of range, mean deviation, coefficient of mean deviation.
	HM-70	Exercise-10.1; Variance, standard deviation, quartile deviation, coefficient of quartile deviation.
	HM-71	Exercise-10.2; Concept of probability, topics related to probability, sample area, event, probability measurement.
	HM-72	Exercise-10.2; Probability relation for mutually exclusive and non-exclusive events, probability multiplication formula, conditional probability.
	HM-73	Exercise-10.2; Complementary events; Determining probability using binomial distribution.
	HM-74	Exercise-10.2; Probability and permutation combination.

Botany		
Chapter	**Lecture**	**Lecture-based discussion topics**
Chapter-07 Gymnosperms and Angiosperms	B-01	Gymnosperms (Introduction, characteristics), *Cycas* (Characteristics, Structure, Reproduction)
	B-02	Angiosperms (Introduction, characteristics), Differences between Gymnosperm and angiosperm, Introduction to angiosperm families, Characteristics, Root, Stem, Leaf.
	B-03	Inflorescence, Aestivation, Placentation, Fruits, Floral Formula, Floral Diagram.
	B-04	Poaceae Family, Malvaceae Family, Differences between Poaceae and Malvaceae family, Differences between Monocot plant and Dicot plant.
Chapter-08 Tissue and Tissue System	B-05	Meristematic Tissue, Types of meristematic tissue, Differences between permanent and meristematic tissue
	B-06	Epidermal tissue system, stomata, hydathode.
	B-07	Ground tissue system, Vascular tissue system.
	B-08	Internal structure of monocot root and monocot stem, Primary internal structure of dicot stem.
Chapter-09 Plant Physiology	B-09	Mineral salt absorption, Essential elements for plants, Availability of mineral salts for plants, Mechanism of mineral salt absorption by plants.
	B-10	Transpiration, Types of transpiration, Factors of transpiration, Structure of stomata.
	B-11	Explanation of some relevant terms related to transpiration, Mechanism of opening and closing of stomata.
	B-12	Photosynthesis, Photosynthetic organs and pigments, Absorption spectrum of light, Effective spectrum of light, Photosystem, Mechanism of photosynthesis, Light dependent phase, cyclic and non-cyclic photophosphorylation.
	B-13	Light independent phase, Calvin cycle, Hatch and Slack cycle, Comparison between C_3 and C_4, plants, Comparison between Calvin cycle and Slack cycle, Characteristics and importance of C_4 plants.
	B-14	Source of the oxygen (O_2) released in photosynthesis, factors of photosynthesis, limiting factor, Rate of photosynthesis, Importance of photosynthesis in living world.
	B-15	Respiration, Aerobic Respiration, Steps of Aerobic Respiration, Glycolysis, Oxidation of Pyruvic Acid, Kreb's Cycle.
	B-16	Transfer of electron and oxidative phosphorylation, Anaerobic respiration, Use of anaerobic respiration in various industries, Respiratory rate/quotient, Factors of respiration, Importance of respiration.
Chapter-10 Plant reproduction	B-17	Sexual reproduction, development of pollen grain, development of male gametophyte, development of ovule.
	B-18	Development and formation of female gametophyte, pollination, fertilization.
	B-19	Asexual reproduction, through asexual spore production, through body parts, unconventional methods of reproduction, artificial propagation of plants.
Chapter-11 Biotechnology	B-20	Plant tissue culture methods, applications of plant tissue culture.
	B-21	Genetic engineering, steps of genetic engineering.
	B-22	Gene cloning, use of biotechnology: application of recombinant DNA technology, genome sequencing, provisions of biosafety in the application of biotechnology.
Chapter-12 Environment, distribution, and conservation of organisms	B-23	Species, population, biotic community, biosphere, ecosystem, energy flow.
	B-24	Adaptations of animals, aquatic adaptations, desert adaptations, adaptations to saline environments.
	B-25	Biome, flora and fauna of the Oriental region, forests of Bangladesh, biodiversity and biodiversity conservation.

Zoology		
Chapter	**Lecture**	**Lecture-based discussion topics**
Chapter-07 Human Physiology: Locomotion and Body Movement	Z-01	Skeletal system (classification, functions, components, parts), bones of the adult human skeleton, axial skeleton (skull).
	Z-02	Axial skeleton (vertebral column, ribcage).
	Z-03	Appendicular skeleton.
	Z-04	Bone, Haversian system, cartilage, types of cartilage.
	Z-05	Muscle tissue, types of muscles, muscles can pull but cannot push, functions of skeleton and the 'rods and lever system'
	Z-06	Bone and muscle coordination in knee movement, bone fracture and first aid, joint injuries and first aid.
Chapter-8 Human Physiology: Coordination and Control	Z-07	Nervous coordination, function of the nervous system, neurons, types of neurons, neuroglia, neurotransmitters, synapses, transmission of stimuli through synapses.
	Z-08	Central nervous system, brain, forebrain, midbrain, hindbrain.
	Z-09	Brain ventricles, cerebrospinal fluid, human cranial nerves (names, origins, branches, distribution, nature and functions), spinal cord.
	Z-10	Human sensory organs, eye-organ of vision, eyeball, accessory parts of the eye, image formation and mechanism of vision, accomodation, binocular vision.
	Z-11	Ear - organ of hearing and balance (external ear, middle ear, inner ear), role of the ear in hearing and balance.

	Z-12	Chemical coordination, endocrine system, location of endocrine glands, hormones secreted and their functions, effects of hormones on body growth, effects of hormones on physiological functions of the body, effects of hormones on behavior change, consequences of uncontrolled hormone use.
Chapter-9 Continuation of human life	Z-13	Reproductive system, male reproductive system, female reproductive system, different stages and phases of reproduction, puberty, menstrual cycle.
	Z-14	formation of gamete (spermatogenesis, sperm formation, oogenesis, formation of ovum).
	Z-15	Fertilization, implantation, placenta, foetal membranes, human embryogenesis, embryo and fetus development.
	Z-16	Family planning and contraceptive methods, IVF method, reproductive system problems, reproductive hormone imbalances.
	Z-17	Problems during fetal development, sexually transmitted diseases.
Chapter-10 Defence system of Human Body	Z-18	Immunity and immunology, components of the immune system.
	Z-19	The human body's defense system and the layers of the immune system, first line of defense, second line of defense.
	Z-20	Third line of defense, innate and acquired immunity, innate immunity, acquired immunity.
	Z-21	Antigens and antibodies: Structure, types, and function of antigens and antibodies.
	Z-22	Role of vaccines in immunity, types of vaccines, vaccination, vaccination program in Bangladesh, role of memory cells in body immunity.
Chapter-11 Genetics and Evolution	Z-23	Explanation of terms related to genetics, Mendel's first law.
	Z-24	Exception to the first law (incomplete dominance, co-dominance), lethal gene.
	Z-25	Second law, exceptions to Mendel's second law (complementary genes), epistasis (dominant epistasis, duplicate recessive epistasis), polygenic inheritance.
	Z-26	Principle of Sex determination, sex linked disorders, red-green color blindness, hemophilia, muscular dystrophy.
	Z-27	ABO blood group and problems caused by Rh.
	Z-28	Evolution, Lamarckism or the theory of inheritance of acquired characteristics, Darwinism or the theory of natural selection, Neo-Darwinism, Evidence for evolution.
Chapter-12 Animal Behavior	Z-29	Nature of behavior, stimulus, behavioral changes due to stimulus, relationship between behavior and heredity, innate behavior, taxis
	Z-30	Reflexes, instincts, Tests for instincts.
	Z-31	Learned behavior, Types of learned behavior, Social Behavior, Altruism, Altruism in the social behavior of the bees.