

PHYSICS

Higher Secondary stage of school education is a stage of transition from general education to discipline - based focus on curriculum. The present updated syllabus keeps in view the rigour and depth of disciplinary approach as well as the comprehension level of learners. Due care has also been taken that the syllabus is comparable to the international standards. Salient features of the syllabus include:

- Emphasis on basic conceptual understanding of the content.
- Emphasis on use of SI units, symbols, nomenclature of physical quantities and formulations as per international standards.
- Providing logical sequencing of units of the subject matter and proper placement of concepts with their linkage for better learning.
- Reducing the curriculum load by eliminating overlapping of concepts/content within the discipline and other disciplines.
- Promotion of process-skills, problem-solving abilities and applications of physics concept.

Besides, the syllabus also attempts to

- strengthen the concepts developed at the secondary stage to provide firm foundation for further learning in the subject.
- expose the learners to different processes used in Physics-related industrial and technological applications.
- develop process-skills and experimental, observational, manipulative, decision making and investigatory skills in the learners.
- promote problem solving abilities and creative thinking in learners.
- develop conceptual competence in the learners and make them realize appreciate the interface of physics with other disciplines.

		No. of Periods	Marks
Unit - I	Physical World and Measurement	10	} 23
	Chapter - 1 : Physical World		
	Chapter - 2 : Units and Measurements		
Unit - II	Kinematics	24	
	Chapter - 3 : Motion in a Straight Line		
	Chapter - 4 : Motion in a Plane		
Unit - III	Laws of Motion	14	
	Chapter - 5 : Laws of Motion		

Units - IV	Work, Energy and Power	12	} 17	
	Chapter - 6 : Work, Energy and Power			
Units - V	Motion of System of Particles and Rigid Body	18		
	Chapter - 7 : System of Particles and Rotational Motion			
Units - VI	Gravitation	12		
	Chapter - 8 : Gravitation			
Units - VII	Properties of Bulk Matter	24	} 20	
	Chapter - 9 : Mechanical Properties of Solids			
	Chapter - 10 : Mechanical Properties of Fluids			
	Chapter - 11 : Thermal Properties of Matter			
Units - VIII	Thermodynamics	12		
	Chapter - 12 : Thermodynamics			
Units - IX	Behavior of perfect Gases and Kinetic Theory of Gases.	08		
	Chapter - 13 : Kinetic Theory			
Units - X	Oscillations and Waves	26		} 10
	Chapter - 14 : Oscillations			
	Chapter - 15 : Waves			
	Total 160		160	70

Unit I : Physical World and Measurement

10 Periods

Chapter - 1 : Physical World

Physics - scope and excitement; nature of physical laws; Physics, technology and society.

Chapter - 2 : Units and Measurements

Need for measurement : Units of measurement; systems of units; SI units, fundamental and derived units. Length, mass and time measurements; accuracy and precision of measuring instruments; errors in measurement; significant figures.

Dimensions of physical quantities, dimensional analysis and its applications.

Unit II : Kinematics

24 Periods

Chapter - 3 : Motion in a Straight Line

Frame of reference, Motion in a straight line : Position - time graph, speed and velocity.

Elementary concepts of differentiation and integration for describing motion, uniform and non uniform motion, average speed and instantaneous velocity, uniformly accelerated motion, velocity - time graphs.

Relations for uniformly accelerated motion (graphical treatment)

Chapter - 4 : Motion in a Plane

Scalar and vector quantities; position and displacement vectors, general vectors and their notations; equality of vectors, multiplication of vectors by a real number; addition and subtraction of vectors, relative velocity unit vector; resolution of a vector in a plane, rectangular components, Scalar and Vector product of vectors.

Motion in a plane, cases of uniform velocity and uniform acceleration-projectile motion, uniform circular motion.

Units III: Laws of Motion

14 Periods

Chapter - 5 : Laws of Motion

Intuitive concept of force, Inertia, Newton's first law of motion; momentum and Newton's second law of motion; impulse; Newton's third law of motion.

Law of conservation of linear momentum and its applications.

Equilibrium of concurrent forces, Static and kinetic friction, laws friction, rolling friction, lubrication.

Dynamics of uniform circular motion : Centripetal force, examples of circular motion (vehicle on a level circular road, vehicle on a banked road).

Units IV: Work Energy and power

12 Periods

Chapter - 6 : Work, Energy and Power

Work done by a constant force and a variable force; kinetic energy, work-energy theorem, power.

Notion of potential energy, potential energy of a spring, conservative forces: motion in a vertical circle; elastic and inelastic collisions in one and two dimensions.

Units V : Motion of System of particles and Rigid Body

18 Periods

Chapter - 7 : System of Particles and Rotational Motion

Centre of mass of a two-particle system, momentum conservation and centre of mass motion.

Centre of mass of a rigid body; centre of mass of a uniform rod.

Moment of a force, torque, angular momentum, laws of conservation of angular momentum and its applications.

Equilibrium of rigid bodies, rigid body rotation and equations of rotational motion, comparison of linear and rotational motions.

Moment of inertia, radius of gyration, values of moments of inertia for simple geometrical objects (no derivation). Statement of parallel and perpendicular axes theorems and their applications.

Units VI : Gravitation

12 Periods

Chapter - 8 : Gravitation

Kepler's laws of planetary motion, universal law of gravitation.

Acceleration due to gravity and its variation with altitude and depth.

Gravitational potential energy and gravitational potential, escape velocity, orbital velocity of a satellite, geo-stationary satellites.

Unit VII : Properties of Bulk Matter

Chapter - 9 : Mechanical Properties of Solids

Elastic behavior, Stress - strain relationship, Hooke's law, young's modulus, bulk modulus, shear modulus of rigidity, Poisson's ratio; elastic energy.

Chapter - 10 : Mechanical Properties of Fluids

Pressure due to a fluid column; pascal's law and its applications (hydraulic lift and hydraulic brakes), effect of gravity on fluid pressure.

Viscosity, stokes law, terminal velocity, streamline and turbulent flow, critical velocity, Bernoulli's theorem and its applications.

Surface energy and tension, angle of contact, excess of pressure across a curved surface, applications of surface tension ideas to drops, bubbles and capillary rise.

Chapter - 11 : Thermal Properties of Matter

Heat, temperature, thermal expansion; thermal expansion of solids, liquids and gases, anomalous expansion of water; specific heat capacity; C_p , C_v - calorimetry; change of state latent heat capacity.

Heat transfer-conduction, convection and radiation, thermal conductivity, qualitative ideas of Black body radiation, Wein's displacement Law, Stefan's law, Green house effect.

Unit VIII: Thermodynamics

12 Periods

Chapter - 12 : Thermodynamics

Thermal equilibrium and definition of temperature (zeroth law of thermodynamics), heat, work and internal energy. First law of thermodynamics, isothermal and adiabatic processes.

Second law of thermodynamics: reversible and irreversible processes, heat engine and refrigerator.

Unit IX : Behavior of perfect gases and Kinetic Theory of Gases

08 Periods

Chapter - 13 : Kinetic Theory

Equation of state of a perfect gas, work done in compressing a gas.

Kinetic theory of gases - assumptions, concept of pressure. Kinetic interpretation of temperature; rms speed of gas molecules; degrees of freedom, law of equi-partition of energy (Statement only) and application to specific heat capacities of gases; concept of mean free path, Avogadro's number.

Unit X : Oscillations and Waves

26 Periods

Chapter - 14 : Oscillations

Periodic motion - time period, frequency, displacement as a function of time, Periodic functions.

Simple harmonic motion (S.H.M) and its equation; phase; oscillations of a spring-restoring force and force constant; energy in S.H.M. Kinetic and potential energies; simple pendulum derivation of expression for its time period.

Free, forced and damped oscillations (qualitative ideas only), resonance.

Chapter - 15 : Waves

Wave motion : Transverse and longitudinal waves, speed of wave motion, displacement relation for a progressive wave, principle of superposition of waves, reflection of waves, standing waves in strings and organ pipes, fundamental mode and harmonics, Beats, Doppler effect.

PRACTICALS

Total Period : 60

The record, to be submitted by the students, at the time of their annual examination, has to include:

- Record of at least 15 Experiments [with a minimum of 6 from each section], to be performed by the students.
- Record of at least 5 Activities [with a minimum of 2 each from section A and section B], to be demonstrated by the teachers.
- Report of the project to be carried out by the students.

EVALUATION SCHEME

Time Allowed: Three hours

Max. Marks: 30

Two experiments one from each section	8+8 Marks
Practical record (experiment and activities)	6 Marks
Investigatory Project	3 Marks
Viva on experiments, activities and project	5 Marks
Total	30 Marks

SYLLABUS FOR PHYSICS PRACTICAL

Total Marks-30

Section-A

Experiments :

1. Use of Vernier Callipers
 - (i) To measure diameter of a small spherical/cylindrical body.
 - (ii) To measure dimensions of a given regular body of known mass and hence find its density.
 - (iii) To measure internal diameter and depth of a given beaker/calorimeter and hence find its volume.
2. Use of screw gauge.
 - (i) To measure diameter of a given wire.
 - (ii) To measure thickness of a given sheet.
 - (iii) To measure volume of an irregular lamina.
3. To determine radius of curvature of a given spherical surface by a spherometer.
4. To determine the mass of two different objects using a beam balance.
5. To find the weight of a given body using parallelogram law of vectors.
6. Using a simple pendulum, plot L-T and L-T² graphs. Hence find the effective length of a second's pendulum using appropriate graphs.
7. To study the relationship between force of limiting friction and normal reaction and find the coefficient of friction between a block and a horizontal surface.
8. To find the downward force, along an inclined plane, acting on a roller due to gravitational pull of the earth and study its relationship with the angle of inclination by plotting graph between force and $\sin \theta$.

Activities :

1. To make a paper scale of given least count, e.g. 0.2cm. 0.5cm.
2. To determine mass of a given body using a meter scale by principle of moments.
3. To plot of graph for a given set of data, with proper choice of scales and error bars.
4. To measure the force of limiting friction for rolling of a roller on a horizontal plane.
5. To study the variation in the range of a jet of water with the angle of projection.
6. To study the conservation of energy of a ball rolling down on inclined plane (using a double inclined plane).
7. To study dissipation of energy of a simple pendulum by plotting a graph between square of amplitude and time.

Section-B

Experiments :

1. To determine young's modulus of elasticity of the material of a given wire.
2. To find the force constant and effective mass of a helical spring by plotting T^2 -m graph method of oscillation.
3. To study the variation in volume with pressure for a sample of air at constant temperature by plotting graphs between P and V, and between P and $1/V$.
4. To determine the surface tension of water by capillary rise method.
5. To determine the coefficient of viscosity of a given viscous liquid by measuring the terminal velocity of a given spherical body.
6. To study the relationship between the temperature of a hot body and time by plotting a cooling curve.
7. (i) To study the relation between frequency and length of a given wire under constant tension using sonometer.
(ii) To study the relation between the length of a given wire tension for constant frequency using sonometer
8. To find the speed of sound in air at room temperature using a resonance tube by two resonance position.
9. To determine specific heat capacity of a given (i) solid (ii) liquid, by method of mixtures.

Activities :

1. To observe change of state and plot a cooling curve for molten wax.
2. To observe and explain the effect of heating on a bi-metallic strip.
3. To note the change in level of liquid in a container on heating and interpret the observation.
4. To study the effect of detergent on surface tension of water by observing capillary rise.
5. To study the factors affecting the rate of loss of heat of a liquid.
6. To study the effect of load on depression of a suitably clamped meter scale loaded
 - (i) at its end
 - (ii) in the middle.