PHYSICS (PHYS)

CLASS - XI

Full Marks 100

Theory Marks: 70

		Marks
Unit – I	Physical World & Measurement	02
Unit – II	Kinematics	10
Unit – III	Laws of motion	10
Unit- IV	Work, energy & Power	05
Unit – V	Motion of System of particles & Rigid Body	06
Unit- VI	Gravitation	07
Unit- VII	Properties of Bulk Matter	10
Unit- VIII	Thermodynamics	05
Unit- IX	Behaviour of perfect Gas & Kinetic theory of Gases	05
Unit- X	Oscillations & waves	10
	Total-	**70**

Unit – I Physical World & Measurement

Physics – scope and excitement; nature of physical laws; physics technology and society.

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

Dimensions of physical quantities, dimensional analysis and its applications.

Unit – II Kinematics

Frame of reference (inertial and non-inertial frames). 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, position-time graphs, relations for uniformity accelerated motion (graphical treatment).

Scalar and vector quantities; position and displacement vectors, general vectors and notation, 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.

Unit – III 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 of friction, rolling friction.

Dynamics of uniform circular motion; centripetal force, examples of circular motion (vehicle on level circular road, vehicle on banked road).

Unit- IV: 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: conservation of mechanical energy (kinetic and potential energies); non-conservative forces; motion in a vertical circle, elastic and inelastic in one and two dimensions.

Unit- V: Motion of System of Particles and Rigid body

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 uniform rod.

Moment of a force, torque, angular momentum, conservation of angular momentum with some examples.

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.

Unit-VI: Gravitation

Keplar's laws of planetary motion. The universal law of gravitation.

Acceleration due to gravity and its variation with attitude, depth and rotation of earth.

Gravitational potential energy; gravitational potential. Escape velocity. Orbital velocity of a satellite. Geo-stationary satellites.

Unit-VII: Properties of Bulk Matter

Elastic behaviour, stress-strain relationship, Hooke's law , Young modulus, bulk modulus, shear, modulus of rigidity, poison's ratio; elastic energy

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

Viscosity, stoke's law , terminal velocity Reynold's number, streamline and turbulent flow. Critical velocity Bernoulli's theorem and its applications.

Surface energy and surface tension, angle of contact, excess of pressure, application of surface tension ideas to drops, bubbles and capaillary rise.

Heat temperature thermal expansion; thermal expansion of solids, liquids and gases ideal gas laws, isothermal and adiabatic processes; anomalous expansion and its effect, specific heat capacity; Cp, Cv- calorimetry; change of state – specific latent heat capacity.

Heat transfer – conduction; convection and radiation, blackbody radiation Kirchoff's law, absorptive and emissive powers and green house effect thermal conductivity, Newton's law of cooling, Wein's displacement law, stefan's law.

Unit-VIII: Thermodynamics

Thermal equilibrium and definition of temperature (zeroth law of Thermodynamics). Heat, work and internal energy. First law of thermodynamics.

Second law of thermodynamics; reversible and irreversible processes. Heat engines and refrigerators.

Unit-IX: Behaviour of Perfect Gas and Kinetic Theory

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

Kinetic theory of gases- assumptions; concept of pressure. Kinetic energy and temperature.

Speed of gas molecules; degrees of freedom, law of equilibrium of energy (statement only) and application to specific heats of gases; concept of mean free path, Avagadro's number.

Unit- X: Oscillation and waves

Periodic motion – 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.

Wave motion Longitudinal and transverse waves, speed of wave motion.

Displacement relation for a progressive wave. Principle of superposition of waves, reflection of waves in string and organ pipes, fundamental mode and harmonics, beats , Doppler effect.

PHYSICS (PRACTICALS)

Note; Every student will perform 15 experiments (8 from Section A & 7 from Section B). The activities mentioned are for the purpose of demonstration by the teachers only. These are not to be evaluated during the academic year. For evaluation in examination, student would be required to perform two experiments- 1 out of 3 from Section A & 1 out of 3 from Section B.

Total Marks 2x15=30marks

SECTION A

Experiments

(Any 8 experiments out of the following to be performed by the students)

1. To measure diameter of a small spherical/cyclindrical body using Vernier callipers.
2. To measure internal diameter and depth of a given beaker/calorimeter using Vernier Capllipers and hence find its volume.
3. To measure diameter of a given wire using screw guage.
4. To measure thickness of a given sheet using screw guage.
5. To measure volume of an irregular lamina using screw guage
6. To determine radius of curvature of a given spherical surface by a spherometer.
7. To find the weight of a given body using parallelogram law of vectors.
8. Using a simple pendulum plot L-T and L-T2 graphs. Hence find the effective length of second's pendulum using appropriate graph.
9. To study the relationship between force of limiting friction and normal reaction and to find co-efficient of friction between a block and a horizontal surface.
10. 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 sinθ

Activities (for the purpose of demonstration only)

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 metre scale by principle of moments.
3. To plot a 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 range of a jet of water with 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 A

Experiments

(Any 7 experiments out of the following to be performed by the students)

1. To determine Young's modulus of elasticity of the material of a given wire.
2. To find the force constant of a helical spring by plotting graph between load and extension.
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 I/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 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. To determine specific heat of a given (i) solid (ii) liquid by method of mixtures.
8. To study the relation between frequency and length of a given wire under constant tension using sonometer.
9. To study the relation between the length of a given wire and tension for constant frequency using sonometer.
10. To find the speed of sound in air at room temperature using a resonance tube by two – resonance positions.

Activities (for the purpose of demonstration only)

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 observations.
4. To study the effect of detergent on surface tension by observing capillary rise.
5. To study 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.