

Units	Topic/ Portion Deleted
Unit II: Kinematics	Frame of reference(Inertia and non-inertia frames), Motion in a straight line – Position-time graph
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. (Recapitulation only).
Unit V: Motion of System of Particles and Rigid Body	Statement of parallel and perpendicular axes theorem and their applications.
Unit VI: Gravitation	Kepler's laws of planetary motion. Acceleration due to gravity.
Unit VII: Properties of Bulk Matter	Elastic behaviour, shear modulus of rigidity, poisson's ratio; elastic energy. Newton's law of cooling.
Unit-VIII Thermodynamics	Heat engines and refrigerators
Unit X: Oscillations and Waves	Fundamental mode and harmonics, Doppler Effect

### Section A Activities

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

### Section B Activities

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

**COURSE STRUCTURE**  
**Class 11 (Theory)**

<b>One Paper</b>	<b>Time 3 Hours</b>	<b>Max. Marks: 70</b>
<b>Units</b>	<b>Titles</b>	<b>Weightage</b>
I	Physical World & Measurement	04
II	Kinematics	09
III	Laws of Motion	06
IV	Work, Energy & Power	09
V	Motion of System of particles & Rigid Body	06
VI	Gravitation	08
VII	Properties of Bulk Matter	11
VIII	Thermodynamics	04
IX	Behaviour of Perfect Gas & Kinetic Theory of Gases	04
X	Oscillations & Waves	09
<b>Total</b>		<b>70</b>

**Unit I: Physical World and Measurement**

Physics: Scope and excitement; nature of physical laws; Physics, technology and society.

*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:**

Elementary-concepts of differentiation and integration for describing motion: Motion in a straight line: speed and velocity. Uniform and non-uniform motion, average speed and instantaneous velocity. Uniformly accelerated motion, velocity-time and position-time graphs, relations for uniformly 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 vectors. Resolution of a vector in a plane -rectangular components.

Scalar and Vector products 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. (Recapitulation only).

Law of conservation of linear momentum and its applications.

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

*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 collisions 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 equation of rotational motion, comparison of linear and rotational motions; moment of inertia, radius of gyration. Values of M.I. for simple geometrical objects( no derivation).

#### **Unit VI: Gravitation**

The universal law of gravitation. Acceleration due to gravity (recapitulation) and its variation with altitude and depth.

Gravitational potential energy; gravitational potential. Escape velocity, orbital velocity of a satellite. Geostationary satellites.

#### **Unit VII: Properties of Bulk Matter**

Stress-strain relationship, Hooke's law, Young's modulus, bulk modulus.

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, Reynolds'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 capillary rise.

Heat, temperature (recapitulation only), thermal expansion; thermal expansion of solids, liquids, and gases. Anomalous expansion. Specific heat capacity:  $C_p$ ,  $C_v$  — calorimetry; change of state — latent heat capacity.

Heat transfer-conduction and thermal conductivity, convection and radiation (recapitulation only). Qualitative ideas of Black Body Radiation, Wein's displacement law, Stefan's law and Green House effect.

#### **Unit VIII :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.

### **Unit IX: Behaviour of Perfect Gas and Kinetic Theory**

Equation of state of a perfect gas; work done on compressing a gas.

*Kinetic theory of gases:* Assumptions, concept of pressure. Kinetic energy and temperature; rms speed of gas molecules; degrees of freedom, law of equipartition 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**

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

Simple harmonic motion(SHM) and its equation; phase; oscillations of a spring - restoring force and force constant; energy in SHM — 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, standing waves in strings and organ pipes, beats.



**Sample Blue Print : Physics - 11**

Forms of Question/ Topic	Knowledge			Understanding			Application			HOTS			Total		
	Obj	SA I	SA II	LA	Obj	SA I	SA II	LA	Obj	SA I	SA II	LA			
Physical World & Measurement	1(1)								3(1)				4(2)		
Kinematics	1(1)			5(1)						2(1)			9(4)		
Laws of Motion			3(1)		1(1)				2(1)				6(3)		
Work, Energy and Power	1(1)			5(1)					3(1)				9(3)		
Motion of System of Particles & Rigid Body			3(1)			2(1)							6(3)		
Gravitation	1(1)						3(1)						8(4)		
Properties of Bulk Matter			3(1)			2(1)						5(1)	11(4)		
Thermodynamics		2(1)											4(3)		
Behaviour of Perfect Gas & Kinetic Theory of Gases	2(2)	2(1)							2(2)				4(3)		
Oscillations & Waves		2(1)					3(1)					3(1)	9(4)		
Sub - total	5(6)	6(3)	9(3)		1(1)	4(2)	10(2)	5(1)	2(1)	9(3)	5(1)	2(2)	2(1)	3(1)	70(33)
<b>Total</b>			<b>21(12)</b>				<b>21(7)</b>			<b>21(10)</b>			<b>7(4)</b>		

**Note :** 1) The figures in the bracket denotes the number of questions.

2) This is only a sample Blue Print. The question setter may develop his/her own Blue Print as per the question design.

## PRACTICALS

### Class 11

Every student will perform at least 8 experiments (from any section).

#### Section A

##### Experiments.

1. To measure diameter of a small spherical/cylindrical body using Vernier callipers.
2. To measure internal diameter and depth of a given beaker/calorimeter using Vernier callipers and hence find its volume.
3. To measure diameter of a given wire using screw gauge.
4. To measure thickness of a given sheet using screw gauge.
5. To measure volume of an irregular lamina using screw gauge.
6. To determine radius of curvature of a given spherical surface by a spherometer.
7. To determine the mass of two different objects using a beam balance,
8. To find the weight of a given body using parallelogram law of vectors.
9. Using a simple pendulum, plot L-T and L-T<sup>2</sup> graphs. Hence find the effective length of a second's pendulum using appropriate graph.
10. To study the relationship between force of limiting friction and normal reaction and to find the coefficient of friction between a block and a horizontal surface.
11. 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 ( $\theta$ ) by plotting graph between force and  $\sin \theta$ .

#### Section B

##### Experiments

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 a 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 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. To determine specific heat capacity of a given (i) solid (ii) liquid, by method of mixtures.
8. (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 and tension for constant frequency using sonometer.
9. To find the speed of sound in air at room temperature using a resonance tube by two resonance positions.