

Physics - Theory

Class - XI

Sr. No.	Time/ Periods	Topic	Subject Matter	Activities/TLM
1.	9	Unit - I Physical World & Measurement	<p>* Physics – Scope and Excitement * Nature of Physical laws *</p> <p>Physics, technology and society * Forces in nature * Conservation laws * Need for measurement * Units of measurement.</p> <p>* System of Units * S.I. Units</p> <p>* Fundamental and derived units * Length, mass and time measurement.</p> <p>* Accuracy and precision of measuring instruments * Errors in measurements * Significant figures.</p> <p>* Dimensions of physical quantities * Dimensional analysis and its applications.</p>	<p>* Observing free fall of two stones of different masses, piece of paper and stone from same height.</p> <p>* Collecting photographs of Indian Physicists and world Physicists of repute.</p> <p>* Estimate number of hair on the head of your friend.</p> <p>* Find out the number of molecules in your laboratory.</p>
2.	24	Unit - II	* Motion in straight line	* Design a situation

		Kinematics	<ul style="list-style-type: none"> *Position time graph *Speed and velocity *relations for uniformly accelerated motion (graphical treatment) *Elementary concepts of differentiation and integration for describing motion. *Scalar and vectors quantities *Position and displacement vector *General vectors and notations * Equality of vectors *Multiplication of vectors by a real number *Addition and subtraction of vectors *Unit vectors * Resolution of a vector in a plane – rectangular components. * Relative velocity *Motion in a plane * Cases of uniform velocity and uniform acceleration – projectile motion *Uniform circular motion. 	<p>in which a particle has zero velocity And not zero acceleration at a given instant.</p> <ul style="list-style-type: none"> * Visualize the situation in which two buses are moving w.r.t. ground and not moving w.r.t. observed in each bus. * Draw x-t and v-t graph for uniform motion from given data and find out velocity and acceleration respectively. * Make a list of the moving bodies in your surrounding experiencing +ve, zero and –ve acceleration.
3.	18	Unit - III Laws	*Intuitive concept of	* Visualize a situation

		of Motion	<p>force *Force and inertia *Newton's 1st law of Motion</p> <p>*momentum *Newton's 2nd law of motion</p> <p>*impulse *Newton's 3rd law of motion</p> <p>*Law of conservation of linear momentum and its application – recoil of gun and explosion of bomb.</p> <p>*Equilibrium of concurrent forces</p> <p>* Static and Kinetic friction</p> <p>*Laws of friction</p> <p>*rolling friction</p> <p>*lubrication</p> <p>*Dynamics of uniform circular motion.</p> <p>*centripetal force * examples of circular motion (Vehicle on level road while taking turn, vehicle on banked circular road).</p>	<p>in which force acts on the body in opposite direction to that of its motion and making some angle with it.</p> <p>* Prove that 2nd law is real law and is consistent with 1st and 3rd law.</p> <p>* Calculate maximum value of static friction with the help of duster and spring balance.</p> <p>* Experience centrifugal force while rotating a stone in horizontal circle.</p> <p>* Experience different magnitude of force while catching a ball by varying time of catch.</p>
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4.	16	Unit - IV Work, Energy & Power	<ul style="list-style-type: none"> * Scalar product of vectors *work done by constant and variable force *Kinetic energy *Power *Potential energy of spring *Conservative force *Conservation of mechanical energy (Kinetic and Potential energy) * Non-Conservative force. *Elastic and in-elastic collision in one and two dimensions. 	<ul style="list-style-type: none"> *Point out those situations in which work done is +ve, zero and –ve. *Make a simple calculation of work done by gravity when a body of given mass falls from a certain height. *Estimate the amount of energy released in burning 1 kg of coal/ LPG.
5.	18	Unit - V Motion of System of Particles and Rigid Body	<ul style="list-style-type: none"> * Centre of mass of two particle system * Momentum conservation and center of mass motion *Centre of mass of rigid body – circular ring, rod, disc and sphere. * Cross product of vectors *Moment of force *Torque *angular momentum *conservation of angular momentum with some examples. 	<ul style="list-style-type: none"> * With the help of your teacher find out why problem is necessary to roll a disk on any surface. *Try to locate C.M. of sphere, ring, disc and rod. *Find out those bodies in which C.G. coincides with their C.M.'s. *Visualise a situation in which total external force is zero while external torque is non-zero.

			<ul style="list-style-type: none"> *Equilibrium of rigid body *Rigid body rotation and equations of rotational motion *Comparison of linear and rotational motion *Moment of Inertia *Radius of gyration *Moment of Inertia of circular ring, disc and rod (without derivation) *Statements of parallel and perpendicular axis *Theorems of moment of Inertia (without proof) and their applications. 	<ul style="list-style-type: none"> *Angular velocity of minutes hand of a watch has same velocity at any instant of time (Discover for yourself).
6.	14	Unit - VI Gravitation	<ul style="list-style-type: none"> * Universal law of Gravitation * Acceleration due to gravity and its variation with altitude and depth. * Gravitational potential energy *Gravitational potential *escape speed/velocity *Orbital velocity of satellite *Weightlessness (elementary idea) *Motion of satellite 	<ul style="list-style-type: none"> *In a village fair experience the approximate weightlessness in a messy ground. * Find the reason why gravitational shielding is not possible. *Try to locate a moving satellite in clear night sky. *Make a chart of India's space programme yearwise

			<p>*Geostationary and polar satellite</p> <p>*Statement of Kepler's laws of planetary motion * proof of Kepler's Second Law.</p>	
7.	30	Unit - VII Properties of Bulk Matter	<p>* Elastic behaviour * Stress-Strain relationship * Hook's laws * Young's modulus * Bulk Modulus * Shear Modulus</p> <p>* Pressure due to fluid column *Pascal's law and its applications (hydraulic lift and hydraulic brake) *effect of gravity on fluid pressure.</p> <p>*Viscosity and Stoke's law *Terminal velocity *Reynold's number *Stream line and Turbulent flow *Bernoullis theorem and its applications.</p> <p>*Surface energy and surface tension *Angle of contact * Application</p>	<p>*Make a spring ball model for explaining elastic behaviour of solids.</p> <p>* Measurement of shear strain using book placed on a rough surface and a spring balance.</p> <p>*Draw a tension extension graph using rubber band and spring balance.</p> <p>* Try to float a needle on free surface of water at rest using blotting paper.</p> <p>*When you watch water falling from a tap, why do you see the water falling from it tapers down.</p> <p>* When you close</p> <p>*</p> <p>*</p> <p>*</p> <p>*</p>

			<p>of surface tension ideas to drops, bubbles and capillary rise.</p> <p>*Heat *Temperature *Thermal expansion and its application</p> <p>*Specific heat capacity *Calorimetry *Change of state * Latent heat.</p> <p>*Heat transfer conduction, convection and radiation *Thermal conductivity and its applications *Newton's law of cooling.</p>	
8.	9	Unit - VIII Behaviour of Perfect Gas & Kinetic Theory	<p>*Equation of state of a perfect gas, Work done on compressing a gas</p> <p>*Kinetic theory of gases *Assumptions *Concept of pressure * Kinetic energy and temperature</p> <p>*Mean, root mean square velocity (rms) and most probable speed of gas molecules * Degrees of freedom *Law of equipartition of energy (Statement only) and</p>	<p>*Watch zig-zag motion of dust particles in a beam of sunlight.</p> <p>*Collect photograph of Dalton, Avogadro, James Clark and Boltzmann.</p> <p>*Why do the molecules of air in a room not fall on the floor due to gravity? *Estimate mean free path for water molecules in water vapours at 373k with</p>

			<p>application to specific heat capacity of gases</p> <p>*Dulong Peter's law</p> <p>*Concept of Mean free path</p> <p>*Avogadro's number.</p>	the help of teacher.
9.	12	Unit - IX Thermodynamics	<p>*Thermal equilibrium and definition of temperature (Zeroth law of thermodynamics)</p> <p>*Heat, work and internal energy</p> <p>*First law of thermodynamics.</p> <p>* Second law of thermodynamics</p> <p>*Reversible & Irreversible process.</p> <p>*Heat engines and refrigerators.</p> <p>*Third law of Thermodynamics (Statement only).</p>	<p>*Make a list of irreversible and approximately reversible processes in nature.</p> <p>* Make a list of efficiencies of :</p> <p>(1) Steam engine</p> <p>(2) Petrol engine</p> <p>(3) Diesel engine</p> <p>(4) Carnot's engine.</p>
10.	30	Unit - X Oscillations & Waves	<p>*Periodic motion- period, frequency, displacement as a function of time, periodic functions, simple harmonic</p>	<p>* Calculate your time period while swinging on a swing.</p> <p>*Make a list of periodic motions which you observe in</p>

Physics - Theory
Class - XII

Sr. No.	Time/ Periods	Topic	Subject Matter	Activities/TLM
1.	26	Unit - I Electrostatics	*Mechanism of electrification *Electric charges and their conservation *Coulomb's law-forces between two point charges *forces between multiple charges. *Superposition principle and continuous charge distribution * Electric field *Electric field due to point charge *Electric field lines *Electric dipole *electric field due to dipole *Torque on a dipole in uniform electric field.	*Rub a comb with your dry hair and bring it near small pieces of paper and observe what happens? *Find the ratio gravitational and electrostatic force between two electrons. *With the help of your teacher find out why gravity is more dominating and pervasive force than electrostatic force? *Quantization of electric charge is a basic law of nature; do you find analogous law on quantization of

			<p>*Electric flux</p> <p>*statement of Gauss's theorem and its applications to find field due to infinitely long straight wire, uniformly charged infinitely plane sheet and uniformly charged thin spherical shell. (Inside and Outside).</p> <p>* Electric potential</p> <p>*Potential difference</p> <p>*Electric potential due to point charge, a dipole and system of charges *equipotential surfaces *electric potential energy of system of two point charges and of electric dipole in an electrostatic field.</p> <p>*Conductors and Insulators *free charge and bound charges inside a conductor</p> <p>*Dielectrics and electric polarization</p> <p>*Capacitor and capacitance</p>	<p>mass?</p> <p>*Find out the properly on which the super position principle is based.</p> <p>*The reception of a transistor set inside train is not good; explain with electrostatic shielding.</p>
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			<p>*Combination of capacitor in series and parallel *Capacitance of parallel plate capacitors with and without dielectric medium between plates *Energy stored in capacitor *Van De Graff generator.</p>	
2.	25	Unit - II Current Electricity	<p>*Electric Current *Flow of electric charges in metallic conductor *drift velocity and mobility and their relation with electric current *Ohm's law *electrical resistance * V-I characteristics (linear and non-linear) *electrical energy and power *electrical resistivity and conductivity *Carbon resistors *colour code for carbon resistor *Series and Parallel combination of resistors *temperature dependence of resistance *Joule's law of heating</p>	<p>*Draw a graph between V v/s I for a good conductor * Discuss with your friends the origin of resistance in conductors. *Why connecting wires in electrical circuits are not heated up? *Connect three resistors first in series and then in parallel, observe which combination offers more resistance. *Explain why e.m.f. is not a force. *Why minute current of the order of 0.1 A through human body</p>

			<p>* Internal resistance of a cell,*potential difference and emf of cell *combination of cells in series and parallel.</p> <p>* Thermoelectricity and its Origin *Variation of thermo e.m.f. with temperature, Thermopile *Kirchhoff's laws and simple applications *Wheat Stone bridge *meter bridge.</p> <p>*Potentionmeter – principle and applications to measure potential difference and for comparing emf of two cells. *measurement of internal resistance of cell.</p>	is fatal and risky – reach the answer through discussion.
3.	26	Unit - III Magnetic Effects of Current and Magnetism	*Concept of magnetic field *Oersted's experiment *Biot-Savart's law and its application to current carrying circular loop.	*Make a list of para, ferro and Dia-magnetic substances. *Suspend a magnet with thread and define magnetic axis

			<p>*Ampere's law and its applications to infinitely long straight wire, straight and toroid solenoids *Force on moving charge in uniform magnetic field and electric field</p> <p>*Cyclotron *Force on current carrying conductors in a uniform magnetic field</p> <p>*Force between two parallel current carrying conductors – definition of ampere</p> <p>*Torque experienced by a current loop in a magnetic field *Moving coil Galvanometer – its current sensitivity and conversion to ammeter and voltmeter.</p> <p>*Current loop as a magnetic dipole and its magnetic dipole moment *Magnetic dipole moment of revolving electron</p> <p>*Magnetic field intensity due to a magnetic dipole (bar</p>	<p>of earth.</p> <p>* With the help of your classmates find out that diamagnetism is independent of temperature.</p> <p>*Is there torque on a bar magnet due to its own field?</p> <p>*Make a list of Dip values for metropolitan cities in India.</p>
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			<p>magnet) along its axis and perpendicular to its axis. Torque on a magnetic dipole (bar magnet) in a uniform magnetic field</p> <p>*Bar magnet as an equivalent solenoid</p> <p>*Magnetic field lines</p> <p>*Earth's magnetic field and magnetic elements</p> <p>*Para, Dia and Ferromagnetic substances with examples</p> <p>*Electromagnets and factors affecting their strengths</p> <p>*Permanent magnets</p> <p>*Hysteresis loop.</p>	
4.	20	<p>Unit - IV</p> <p>Electromagnetic Induction and Alternating Currents</p>	<p>*Electromagnetic induction</p> <p>*Faraday's law</p> <p>* induced e.m.f. and current</p> <p>*Lenz's law</p> <p>*Eddy currents</p> <p>*Self and Mutual inductance.</p> <p>*Alternating currents</p> <p>*Peak and rms value of alternating current/voltage</p> <p>*Reactance and impedance</p> <p>*L.C.</p>	<p>* With the help of your teacher study the Faradays experiment.</p> <p>*Changing magnetic flux can produce induced e.m.f. even if the circuit is open. Discuss with friends.</p> <p>*A copper plate oscillating between pole pieces of magnets. Study the time period before</p>

			<p>Oscillations (qualitative treatment only) *LCR series circuit</p> <p>*Resonance *Power in A.C. circuits *Wattless current.</p> <p>*AC generator and transformer</p>	<p>and after cutting starts in the plates.</p> <p>*Why even a very strong magnetic field can not generate in a conducting loop held stationary.</p> <p>*Make a mode of transformer. Why average current over a cycle in an ac circuit is not important?</p> <p>*Two parallel wires carrying ac current don't attract or repel. Explore.</p>
5	11	Unit - V Electro-magnetic Waves	<p>*Need for displacement current</p> <p>*Hertz experiment</p> <p>*Electro-magnetic waves and their characteristics *List of Maxwell equations.</p> <p>*Electromagnetic spectrum (radio waves, micro waves, infrared, visible, ultraviolet, x-rays an gamma rays) including elementary facts about their uses.</p>	<p>* Draw on a charge different layers of earth's atmosphere.</p> <p>*Draw a chart of classification of e.m. waves according to frequency and wavelength Also label the uses of different members of e.m. spectrum.</p> <p>*Which member of e.m. spectrum have highest frequency , wavelength and velocity. Discuss with</p>

				other students.
6.	30	Unit - VI Optics	<p>*Reflection of light</p> <p>*Spherical mirrors</p> <p>*Mirror formula</p> <p>*Refraction of light</p> <p>*Total internal reflection and its application</p> <p>*Optical fibres</p> <p>*Refraction at spherical surfaces</p> <p>*Lenses</p> <p>*Thin lens formula</p> <p>*Lens maker's formula</p> <p>*Magnification</p> <p>*Power of lens</p> <p>*Combination of thin lenses in contact</p> <p>*Refraction and dispersion of light through a prism.</p> <p>*Scattering of light – blue colour of sky and reddish appearance of sun at sun rise and sunset.</p> <p>*Optical Instruments:</p> <p>Human eye image formation and accommodation</p> <p>*Correction of eye defects (myopia, hypermetropia,</p>	<p>*With the help of plane mirror and pins prove that $\angle i = \angle r$</p> <p>*Prove that the distance of image formed is distance of object from plane mirror.</p> <p>*Discuss with your friends why vehicles have to plane and convex mirrors.</p> <p>*A coin placed at bottom of water bucket appears raised?</p> <p>*A stick partially immersed obliquely in water looks bent.</p> <p>*Observe the dispersion of white light through prism and discuss the order of colours.</p> <p>*Why can not be thread a needle easily with one eye closed?</p> <p>*Discuss with your friends why a telescope does not act as microscope if</p>

			<p>presbyopia and astigmatism) using lenses *Microscopes and astronomical telescopes (reflecting and refracting) and their magnifying powers.</p> <p>*Wave Optics: Wave front and Huygen's principle *Reflection and refraction of plane wave at plane surface using wavefronts</p> <p>*Proof of laws of reflection and refraction using Huygen's principle</p> <p>*Interference *Young's double slit experiment and expression for fringe width</p> <p>*Diffraction due to single slit *Width of central maxima</p> <p>*Resolving power of microscopes and astronomical telescopes</p> <p>*Polarisation *Plane polarized light</p> <p>*Brewster's law *Uses</p>	<p>one looks through its objective.</p> <p>*Discuss – Why phenomenon of interference is not observed if size of light source is large (in case of Young's double slit experiment).</p> <p>*Observe the phenomenon of total internal reflection with the help of a diode laser (toy) and a glass full of water.</p> <p>*Obtain diffraction pattern on a b wall with the help of toy laser and slit made with the help of two pieces of shaving blade.</p>
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			of plane polarized light and polaroids.	
7.	8	Unit – VII Dual Nature of Matter and Radiations	<p>Photoelectric effect</p> <ul style="list-style-type: none"> *Hertz and Lenard's observations *Einstein's photoelectric equation –particle nature of light *Matter waves – wave nature of particles * De-Broglie relation *Davisson–Germer experiment. 	<ul style="list-style-type: none"> *Can light behave as particle and wave simultaneously, discuss. *Why can not be observe particle behaviour of light in daily life?
8.	12	Unit - VIII Atom and Nuclei	<ul style="list-style-type: none"> *Alpha particle scattering experiment *Rutherford's model of atom *Bohr's Model (energy, radius and velocity of electron) *Energy level diagram *Hydrogen spectrum. *Composition and size of nucleus * Atomic mass *Isotopes *Isobars *Radioactivity –alpha, beta and gamma particles/rays and their properties *Radioactive decay law *Mass-Energy relation *Mass defect *Binding energy per nucleon 	<ul style="list-style-type: none"> * Make a chart showing variation of binding energy per nuclei with mass number of different nuclei. *Compare the volume of a water drop of 1 mm radius with that of a nuclei of Hydrogen atom. *Compare the nuclei density with density of water. *Why protons stay together in nucleus inspite of Coloumb's repulsion between them? *Make a model of

			and its variation with mass number *Nuclear fission and fusion.	chain reaction.
9.	12	Unit – IX Electronic Devices	<p>*Band theory of solids *Semi-conductors *Semi-conductor diode *I-V characteristics in forward and reverse bias *Diode as rectifier *I-V characteristics of LED *Photodiode *Solar cell *Zener diode as voltage regulator.</p> <p>*Junction transistor *Transistor action *Characteristics of transistor *Transistor as amplifier (Common emitter configuration) *An Oscillator *Logic gates (OR, AND, NOT, NAND and NOR *Transistor as a switch.</p>	<p>* Identify base, emitter and collector of a given transistor. * Make a list of devices based on solar cell. *Prepare a chart showing variation of TV diode and LED.</p>
10.	10	Unit – X Communication System	<p>* Elements of communication system (Block diagram only) *Band width of signal (Speech, TV and Digital data) *Band width of transmission medium *Propagation</p>	<p>* Make a chart showing components of communication system in a block diagram. *Find out the ranges of MW, Short wave bands and FM band</p>

			of e.m. waves in atmosphere *Sky and space wave propagation *Need for modulation *Production and detection of an amplitude modulated wave *Frequency modulation (Qualitative ideas only).	from your radio receiver. *Find out broad cast frequency of Shimla, Hamirpur and Dharmshala radio stations.
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