D.A.V. PUBLIC SCHOOL, UPPAL'S SOUTHEND, SECTOR 49, GURUGRAM

CLASS XI (PHYSICS)

Academic plan for 2019-2020

UNIT	NAME OF UNIT	WEIGHTAGE
1. **2.** **3.**	Physical World and Measurement Kinematics Laws of Motion	**23**
4. **5.** **6.**	Work, Energy and Power Motion of system of particles and Rigid Body Gravitation	**17**
7. **8.** **9.**	Properties of bulk matter Thermodynamics Behavior of perfect gas and kinetic theory of gases	**20**
10.	Oscillations and Waves	**10**
TOTAL		**70**

CURRICULUM PLANNER FOR CLASS XI

MONTH	CHAPTER	NO.OF TEACHING DAYS
April	**Physical world and measurement**	**11**
Learning Objectives:	After studying this unit, students would: • Know what is meant by S.I. units, mks units and cgs units. • Learn about conversion factors and would be able to use them to convert from one system of units into another. • Learn to find the dimensions of a quantity. • Be able to calculate the absolute, relative and percentage error in various problems. • Develop the habit of taking a large number of readings while performing experiments so as to reduce the random error by an appreciable amount. • Apply the knowledge of dimensions to derive the relation between different physical quantities. • Learn to use dimensional analysis to check the consistency of various relations and to find the dimensions of constants in a relation.	
Topics:	**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.	

MONTH	CHAPTER	NO.OF TEACHING DAYS
May	**Kinematics**	**25**
Learning Objectives:	After studying this unit, students would: • Be able to add and subtract vectors using triangle law or parallelogram law of vector addition and graphically. • Appreciate the concept of rectangular components of a vector. • Understand the difference between dot product and vector product of vectors. • Analyze and appreciate the concept of differentiation and Integration. • Learn to calculate average speed and average velocity. • Use the kinematic equations to solve problems for objects moving with constant acceleration and during free fall. • Interpret and draw various graphs for uniformly accelerated motion.	
Topics:	**Unit II : Kinematics** Scalar and vector quantities; general vectors and notation; equality of vectors, multiplication of vectors by a real number; unit vector; Position and displacement vectors, Resolution of a vector in a plane - rectangular components. Addition and subtraction of vectors Scalar and Vector product of vectors.	

	Elementary concepts of differentiation and integration for describing motion. Frame of reference, Motion in a straight line: Position-time graph, speed and velocity. Uniform and non-uniform motion, average speed and instantaneous velocity. Uniformly accelerated motion, velocity-time, and position-time graphs. Relation for uniformly accelerated motion (graphical treatment).
Web links:	https://bit.ly/1mbW740

MONTH	**CHAPTER**	**NO.OF TEACHING DAYS**
July	**Kinematics** **Laws of Motion**	**25**
Learning Objectives:	After studying this unit, students would: • Appreciate the fact that in a projectile motion, the horizontal and vertical motions are independent. • Know the meaning of range and time of flight for a projectile and would be able to derive expressions for these terms. • Be able to understand that for motion along any curve, the acceleration of a particle can in general be resolved into a component dv/dt tangential to the curve and a component v^2/r perpendicular to the curve. • Understand the difference between linear variables and angular variables in case of circular motion. • Be able to define relative velocity and explain various real world problems. • Describe how mass and weight are related. • Calculate apparent weight and explain weightlessness in case of freely falling bodies. • Understand the significance of law of conservation of linear momentum and use it to solve various problems. • Be able to analyze and solve problems based on connected motion. • Be able to define Newton's laws and apply them in a systematic way to the solution of a variety of mechanics problems. • Be able to apply Newton's laws to work problems involving friction. • Know that the maximum static friction force and kinetic friction force are proportional to the normal force between the surfaces involved.	
Topics:	**Unit II : Kinematics** (contd..) Relative velocity. 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, lubrication.	

	Dynamics of uniform circular motion: Centripetal force, examples of circular motion (vehicle on level circular road, vehicle on banked road).motion in a vertical circle.
Web links:	https://bit.ly/2KpWcbK , http://www.nbclearn.com/nfl

MONTH	**CHAPTER**	**NO.OF TEACHING DAYS**
August	**Work, Energy and Power** **Motion of System of Particles and Rigid Body**	**22**
Learning Objectives:	After studying this unit, students would: • Be able to calculate the work done by a constant and variable force. • Understand the criterion for a force to be conservative and differentiate between conservative and non – conservative forces. • Be able to derive work – energy theorem and use it to solve various problems. • Be able to calculate the potential energy function associated with a given conservative force. • Learn to apply law of conservation of energy to various situations. • Explain the difference between work, energy and power. • Be able to calculate energy stored in a spring graphically as well as numerically when it is compressed or stretched. • Understand the importance of reference level while finding the gravitational potential energy. • Understand the difference between elastic and inelastic collision. • Explain the difference between work, energy and power. • Be able to find the center of mass of a discrete system of particles and of a continuous body.	
Topics:	**Unit IV: Work, Energy and Power** Work done by a constant force and a variable force; kinetic energy, work-energy theorem, power. concept of potential energy, potential energy of a spring, conservative forces: conservation of mechanical energy (kinetic and potential energies); non-conservative forces. 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 center of mass motion. Centre of mass of a rigid body; center of mass of a uniform rod.	
Web links:	https://bit.ly/1dSVz5t , https://www.exploratorium.edu/snacks/take-it-from-top , https://bit.ly/2U2Zwt3 , https://bit.ly/2F0ySdx , https://bit.ly/2Gcq2fM	

MONTH	**CHAPTER**	**NO.OF PERIODS**
September	**Revision** **Discussion of Sample Question Paper**	**08**

FIRST TERM EXAMINATION

MONTH	CHAPTER	NO.OF TEACHING DAYS
October	**Motion of System of Particles and Rigid Body Gravitation**	**15**
Learning Objectives:	After studying this unit, students would: • Be able to derive relations for torque and angular momentum. • Know and analyze the situation under which angular momentum of a system is conserved. • Understand the relation of areal velocity with angular momentum. • Learn to apply theorems of parallel axis and perpendicular axis to find the moment of inertia along various axes. • Be able to understand Kepler's three laws of planetary motion • Recognize and appreciate that all free-falling bodies accelerate at the same rate due to gravity, regardless of their mass. • Be able to explain the difference between orbital velocity and escape velocity. • Differentiate between gravitational field intensity and gravitational potential for a source mass. • Learn to apply the concept of gravitational potential energy to various problems.	
Topics:	**Unit V: Motion of System of Particles and Rigid Body (contd..)** 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** Kepler's laws of planetary motion. The universal law of gravitation. Acceleration due to gravity and its variation with altitude and depth. Gravitational potential energy; gravitational potential. Escape velocity. Orbital velocity of a satellite. Geo-stationary satellites.	
Web links:	https://bit.ly/1dSVz5t	

MONTH	CHAPTER	NO.OF TEACHING DAYS
November	**Properties of Bulk Matter**	**22**
Learning Objectives:	After studying this unit, students would: • Differentiate between various kinds of stress, strain and moduli of elasticity. • Differentiate between specific heat capacity, molar specific heat, heat capacity and latent heat. • Appreciate the usage of the concept of thermal expansion in various daily life situations. • Understand the differences between conduction, convection and radiation and apply these to variety of observations in daily life. • State Wien's displacement law and Stefan's law. • Appreciate the use of Pascal's law in fluids and would learn to apply it to hydraulic lift and hydraulic brakes. • Understand the concept of surface tension and apply it to a variety of daily life situations. • Derive an expression for surface energy and excess pressure in a water drop and an air bubble. • Understand and derive ascent formula . • State Poiseuille's formula and apply it to solve a variety of numerical. • Write an expression for terminal velocity and use it to reason some observations in daily life. • Understand Bernoulli's equation and how it is related to the conservation of energy in liquid flow.	
Topics:	**Unit VII: Properties of Bulk Matter** Elastic behavior, Stress-strain relationship, Hooke's law, Young's modulus, bulk modulus, shear modulus of rigidity, Poisson's ratio; elastic energy. Heat, temperature, thermal expansion; thermal expansion of solids, liquids and gases, anomalous expansion; specific heat capacity; Cp, Cv - calorimetry ; change of state - latent heat capacity. Heat transfer- conduction, convection and radiation, thermal conductivity, qualitative ideas of blackbody radiation, Wien's displacement law, Stefan's Law, green house effect. Pressure due to a fluid column; Pascal's law and its applications (hydraulic lift and hydraulic brakes). Effect of gravity on fluid pressure. Surface energy and surface tension, excess of pressure. Angle of contact, application of surface tension ideas to drops, bubbles and capillary rise. Viscosity, Stokes'law, terminal velocity, Reynolds's number, streamline and turbulent flow. Critical velocity. Bernoulli's theorem and its applications.	
Web links:	https://bit.ly/2Gcq2fM , https://www.youtube.com/watch?v=WsksFbFZeeU	

MONTH	CHAPTER	NO.OF TEACHING DAYS
December	**Thermodynamics** **Oscillations and Waves**	**21**
Learning Objectives:	After studying this unit, students would: • Understand the basic terminology of thermodynamics as presented and used in this chapter (be able to give examples of each): system, surroundings, state of a system. • Identify valid processes as those that satisfy both the first and second laws of thermodynamics. • Derive a relation between specific heat at constant volume and specific heat at constant pressure using first law of thermodynamics. • Write the expressions for work done in adiabatic process and isothermal process. • Describe the Carnot cycle and introduce heat engines, refrigerators, and heat pumps. • Define simple harmonic motion and give various examples of this kind of motion from daily life. • Write the equations of displacement, velocity and acceleration of simple harmonic motion. • Calculate work done by the restoring force and energy in S.H.M. • Derive the expression for the time period of a simple pendulum. • Draw graphs showing the phase relationship between displacement, velocity and acceleration for a particle in S.H.M. • Differentiate between forced, free and resonant oscillations. • Distinguish between longitudinal wave and transverse wave and give examples of each. • Point out the error in Newton's formula for speed of sound and apply Laplace's correction to it. • Discuss the formation and characteristics of a stationary wave • Draw the various modes of vibration for string and organ pipes. • Reason out why is an open organ pipe is a better musical instrument than a closed organ pipe. • Describe the formation of beats and understand why the difference in the frequencies of two sources should be less than 10 for the formation of beats. • Discuss the applications of beats in our daily life. • Understand and apply Doppler's effect to a variety of numerical problems.	
Topics:	**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. Heat engines and refrigerators.	

	Unit X :Oscillations 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 and forced and damped oscillations (qualitative ideas only), resonance. 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.
Web links:	https://bit.ly/2VxN5a4 , https://bit.ly/2Gcq2fM

MONTH	**CHAPTER**	**NO.OF TEACHING DAYS**
January	**Behavior of Perfect Gas and Kinetic Theory**	**18**
Learning Objectives:	After studying this unit, students would: • State the postulates of kinetic theory of a gas. • Derive an expression for pressure exerted by a gas and relate the expression with kinetic energy of molecule of a gas. • Calculate degrees of freedom for monoatomic, diatomic and triatomic gas. • Compare mean velocity, root mean square velocity and most probable velocity of a gas molecule. • Define mean free path and state law of equipartition of energy.	
Topics:	**Unit IX: Behavior 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; r.m.s. 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.	
Web links:	https://www.youtube.com/watch?v=fbvEOdfSnEs	

MONTH	**CHAPTER**	**NO.OF PERIODS**
February	**Revision** **Discussion of Sample Question Paper**	**10**

FINAL TERM EXAMINATION