PHYSICS (CLASSES XI-XII)

Physics (Class XI)

Learning Outcomes	*Sources/ Resources*	*Suggested Activities (to be guided by teachers)*
The learner – explains that the disciplinary approach of Physics is a transition from general sciences. – analyses the observations from the surroundings to appreciate the basic conceptual understanding of physics. – promotes process-skills, problem-solving abilities and applications of concepts/content in Physics, useful in real-life situations for making Physics learning more relevant, meaningful and interesting. – explains the fact that the theory and experiments go hand in hand in physics and help each other's progress. – explains domains of interest in physics: macroscopic (classical physics), mesoscopic and microscopic. Also, understands the scope and excitement of physics. – explains the scientific methods for developing the hypothesis, axioms, models and laws. – analyses through examples, the connection between physics, technology and society; and physics-related technological/industrial aspects to cope up with changing demand of society committed to the use of physics, technology and informatics.	**NCERT/State Physics Textbook for Class XI; Part - I** http://ncert.nic.in/textbook/textbook.htm?keph1=0-8 Physics - PheT Simulations https://phet.colorado.edu/en/simulations/category/physics **NCERT Official – YouTube** https://www.youtube.com/channel/UCT0s92hGjqLX6p7qY9BBrSA National Repository of Open Educational Resources (NROER) https://nroer.gov.in/home/e-library/ *Apply filter for Level (Higher Secondary) and Subject (Physics) to view the relevant e-resources.* *Laboratory Manual of Physics*, Class XI, Published by the NCERT http://www.ncert.nic.in/exemplar/labmanuals.html http://ncert.nic.in/ncerts/l/kelm101.pdf http://ncert.nic.in/ncerts/l/kelm102.pdf	**WEEK 1** **Unit I** Physical World and Measurement **Chapter 1** Physical World Using the resources, learners may be asked to explore and learn about 1. Science, Natural Science, Physics, Experiments and Theory in Physics and overlaps of Physics with other natural sciences 2. Scope and excitement of physics; Interrelationship of physics with technology, society and informatics. 3. Nature of fundamental forces; Unification of forces 4. Nature of physical laws ***Project*** Learners may prepare life sketches of prominent physicists. Using the Internetand other reference books. A learner is envisaged as reading about the explanations and demonstrations of some classic experiments in physics. **WEEK 2** **Chapter 2** Units and Measurements Using the resources, learners may be asked to explore and learn about

– explains the fundamental forces in nature – gravitational, electromagnetic, strong and weak nuclear forces; and unification of forces. – explains the nature of fundamental laws such as conservation laws, etc. – uses international system of units (SI Units), symbols, nomenclature of physical quantities and formulations; SI base and derived quantities and their units. – derives methods of measurement of lengths – large as well as small; measurement of mass; and measurement of time. – explains the range of lengths, masses and time intervals. – explains the need of accuracy, precision, errors and uncertainties in measurement; and classify errors. – explains the rules for arithmetic operations with significant figures; rounding off the digits. – derives dimensional formulae and dimensional equations using the dimensions of physical quantities. – applies understanding of dimensional analysis in checking the dimensional consistency of relations and deducing the relations between different physical quantities. – gets acquainted with the Greek alphabet; Common SI prefixes and symbols for multiples and sub-multiples; Important constants; Conversion factors; Mathematical formulae; SI derived units	Bibliography of physics books for additional reading on the topics covered (reference: *Physics, Textbook for Class XI*, Part II, p. 405 – 406, Published by the NCERT http://ncert.nic.in/textbook/textbook.htm?keph2=an-7 A list of 14 websites for downloading textbooks free of charge can be obtained at https://www.ereader-palace.com/14-sites-download-textbooks-free/ Another website for downloading books free of cost is www.pdfdrive.com Textbook contains QR codes and one can access e-resources linked to those QR codes by following step by step guide given at the beginning of textbook.	1. Need of standard units; base and derived units; different unit systems and relationship between corresponding units of different physical quantities; SI system of units; SI base quantities and units (with their definitions as per new IAPAP rules). 2. Measurement of length – large distances (parallax methods) and very small distances (indirect methods); Measurement of mass and time intervals; Range and orders of lengths, masses, and time intervals. 3. Accuracy, precision, certainty and errors in measurements of physical quantities; Systematic, random and least count errors; Absolute, relative and percentage errors; Combination of errors. 4. Significant figures; Rules for arithmetic operations with significant figures; Rounding off digits in measurements (or calculations); Determining the uncertainties in expressing results. 5. Dimensions of physical quantities; Dimensional formulae and dimensional equations; Applications of dimensional analysis. 6. Appendices: The Greek alphabet; Common SI prefixes and symbols for multiples and sub-multiples; Important constants; Conversion factors; SI derived units (expressed in SI base units); SI derived units with special names;

(expressed in SI base units); SI derived units with special names; Guidelines for using symbols for physical quantities, chemical elements and nuclides; Guidelines for using symbols for SI units etc.; Dimensional formulae of physical quantities. – explains motion as change in position with time. – differentiates between distance and displacement; speed and velocity; rectilinear and curvilinear motions; kinematics and dynamics; inertial and non-inertial frames of references; average, relative, and instantaneous velocity and speed etc. – derives (graphically) kinematic equations for uniformly accelerated motion – explains elementary calculus (both differential and integral) that is required to describe motion. – plans and conducts investigations and experiments to arrive at and verify the equations of motion of bodies under uniformly accelerated motions. – handles tools and laboratory apparatus properly; measures physical quantities using appropriate apparatus, instruments, and devices, such as, scales, balances, watches, etc. (optional) – analyses and interprets data, graphs, and figures, and draws conclusion about the state of motion, speed (and velocity),		Guidelines for using symbols for physical quantities, chemical elements and nuclides; Guidelines for using symbols for SI units etc.; Dimensional formulae of physical quantities. 7. Revision, doubt clearing and practice solving problems ***Project*** Learners may be given the suggestion to measure astronomical distances, such as, the distance between earth and an identified star etc., using the parallax method. Learners may be advised to look at the BIPM/IAPAP website to prepare a chart on the definitions of SI base units. Using vernier callipers/screw gauze/spherometer learners may perform activities and experiments to measure small lengths and radius of curvature, etc. (optional) **WEEKS 3 AND 4** **Unit II** Kinematics **Chapter 2** Motion in a Straight Line Learners may be asked to make observations about their surroundings and use the following resources to learn about: 1. State of motion; Frames of reference; Position,

acceleration (uniform and non-uniform), distances (and displacements) covered, etc. **Learning Outcomes cut across different themes** ***The learner*** – communicates the findings and conclusions effectively. – applies concepts of physics in dailylife while making decisions and solving problems. – takes initiatives to learn about the newer research, discoveries and inventions in Physics. – realises and appreciates the interface of Physics with other disciplines, such as with Chemistry as various materials. – develops positive scientific attitude, and appreciates the role and impact of Physics and technology towards the improvement of quality of life and human welfare – exhibits values of honesty, objectivity, rational thinking, and freedom from myth and superstitious beliefs while taking decisions, respect for life, etc.		path length and displacement 2. Elements of Calculus (Appendix 3.1) 3. Mathematical Formulae (Appendix A5 placed at the end of textbook) 4. Average velocity and average speed 5. Instantaneous velocity and instantaneous speed 6. Acceleration; Solving problems; and discussion on learners' doubts 7. Kinematic equations for uniformly accelerated motion – graphical method; 8. Free fall; Reaction time; and Relative velocity 9. Solving problems ***Project*** Ask children to calculate their own reaction time.