

Physics (Class XII)

Learning Outcomes	Sources/ Resources	Suggestive Activities (to be guided by teachers)
<p>The learner</p> <ul style="list-style-type: none"> explains processes and phenomena with the understanding of the relationship between nature and matter on scientific basis, such as, force between charges, electric field and potential due to charges; force on charges in an electric field. derives formulae, equations, and laws, such as, torque on a dipole in uniform electric field, effective capacitance of combination of capacitors in series and in parallel, energy stored in a capacitor. plans and conducts investigations and experiments to arrive at and verify the facts, principles, phenomena, or to seek answers to queries on their own, such as, to estimate the charge induced on each one of the two identical Styrofoam balls 	<p>The following list of resources is suggestive. In addition to these, the teachers may curate more resources from internet for sharing with their Learners.</p> <ul style="list-style-type: none"> <i>Physics, Textbook</i> for Class XII, Part I, Published by NCERT <ul style="list-style-type: none"> http://ncert.nic.in/textbook/textbook.htm?l_1=1-8 http://ncert.nic.in/textbook/textbook.htm?l_1=2-8 Many web links are given in the side margins of the above-mentioned textbook. These may also be accessed. In addition, the 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. The links of those e-resources are 	<p>WEEK 1</p> <p>Unit I: Electrostatics</p> <p>Chapter 1: Electric Charges and Fields</p> <ul style="list-style-type: none"> Using Gmail group as well as a WhatsApp group of all learners in the class, the teacher may encourage the learners to attempt to explore and understand the following concepts on their own, using the textbook and the web resources— <ul style="list-style-type: none"> electric charges; conservation of charge, Coulomb's law - force between twopoint charges, forces between multiple charges; superposition principle, continuous charge distribution, electric field, electric field due to a point charge, electric field lines, electric flux The learners may be facilitated to use PhET interactive simulations to explore the concepts of static electricity, electric charges and fields. They can also observe how changing the sign and magnitude of the charges and the distance between them affects the electrostatic force. Learners should also attempt to solve concept-based problems given in the resources on a daily basis (in-text examples, exercises at the end of the chapter in textbook, and in Exemplar problems) The learners may do an Investigatory Project 'To estimate the charge induced on each one of the two identical Styrofoam (or pith) balls suspended in a vertical plane by making use of Coulomb's law' and share their findings with each other. The learners may collect information from internet and explain in their own words for 'How did the scientist Coulomb arrive at the inverse square law?'

<p>suspended in a vertical plane. analyses and interprets data, graphs, and figures, and draws conclusion, such as, field due to a uniformly charged thin spherical shell is zero at all points inside the shell.</p> <ul style="list-style-type: none"> • communicates the findings and conclusions effectively. • uses SI Units, symbols, nomenclature of physical quantities and formulations as per international standards, such as, coulomb (C), farad (F). • applies concepts of physics in daily life while decision-making and solving problems, such as, if a certain capacitance is required in a circuit across a certain potential difference then suggesting a possible arrangement using minimum number of capacitors of given capacity which can withstand a given potential difference. • exhibits creativity and out-of-the-box thinking in solving problems, such as, will a 	<p>given below also</p> <ul style="list-style-type: none"> – https://www.youtube.com/watch?v=FpzlZq_wDL4 – https://nroer.gov.in/55ab34ff81fccb4f1d806025/file/5b20ab8616b51c01f44555f0 – https://h5p.org/h5p/embed/181155 – https://www.youtube.com/watch?v=GDvecCS6UXk – https://www.easel.ly/index/embedFrame/easel/6186012 • Exemplar Problems – Physics, Class XII, Published by NCERT – http://ncert.nic.in/ncerts/1/leep101.pdf – http://ncert.nic.in/ncerts/1/leep102.pdf • Laboratory Manual of Physics, Class XII, Published by NCERT – http://ncert.nic.in/ncerts/1/elm314.pdf • Physics - PhET Simulations – https://phet.colorado.edu/en/simulation/balloons-and-static-electricity – https://phet.colorado.edu/en/simulation/charges-and-fields 	<ul style="list-style-type: none"> • Using the ideas given at the suggested web link, the learners may make toys using ordinary throw away stuff at home to further explore science concepts and deepen their understanding • The learners may be encouraged to enroll in MOOCs on Swayam portal for Physics Class XII developed by NCERT. • Using desktop, laptop, tablet or mobile handset, the teacher may develop videos in regional language as per the context of learners, each video corresponding to roughly one period of the school timetable. These videos may be shared with the learners, one video per day. (In Physics at higher secondary level, lots of figures and mathematical equations are involved, and hence, for developing the videos, the teacher may develop power point presentations superimposed with her/his voice explaining the concepts. Or if the teacher happens to have a white board at home, she/he may record a video of her/him explaining on the white board, the way she/he does in the class). • Then the learners can post their doubts on the group the same day by a certain time fixed by the teacher. Some time may be allocated for the Learners clear any doubts amongst them by interacting with each other via online group discussion. The teacher may also be part of this to ensure that the discussion remains on track. • Finally, the teacher can have a face to face interaction with learners via Skype facilitating the clarification of doubts. • If it is possible to connect to all the learners simultaneously for a longer duration via skype, the teacher may also take a live class online. • All through this the teacher should be continuously assessing learners' learning progress while motivating and keeping their morale up. <p>WEEK 2</p> <p>Unit I: Electrostatics Chapter 1: Electric Charges and Fields (contd.)</p> <ul style="list-style-type: none"> • Following the same approach as of the first week, the teacher may facilitate the
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<p>man get an electric shock if he touches the large aluminium sheet fixed outside his house on the top of a two-metre-high insulating slab?</p> <ul style="list-style-type: none"> • takes initiative to learn about the newer research, discoveries and inventions in Physics, such as, research on the possibility of static electricity charging electronic devices. • recognises different processes used in Physics-related industrial and technological applications, such as, using electrostatic shielding in protecting sensitive instruments from outside electrical influences. • realises and appreciates the interface of Physics with other disciplines, such as with Chemistry as various materials give rise to interesting properties in the presence or absence of electric field. • develops positive scientific attitude, and appreciates the role and impact of Physics and technology 	<ul style="list-style-type: none"> – https://phet.colorado.edu/en/simulation/coulombs-law – https://phet.colorado.edu/en/simulation/capacitor-lab-basics – https://phet.colorado.edu/en/simulation/legacy/capacitor-lab • 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. • MOOCs at Swayam https://swayam.gov.in/nd2_nce19_sc07/preview • NCERT Official – YouTube channel https://www.youtube.com/channel/UCT0s92hGjqLX6p7qY9BBrSA • Arvind Gupta Toys http://www.arvindguptatoys.com/electricity-magnetism.php 	<p>learners' attempt to explore and understand—</p> <ul style="list-style-type: none"> – Electric dipole, electric field due to a dipole, – Torque on a dipole in uniform electric field, – Continuous Charge distributions, Statement of Gauss' theorem, – Applications of Gauss' Law to find field due to infinitely long straight uniformly charged wire and uniformly charged infinite plane sheet, – Uniformly charged thin spherical shell (field inside and outside) <ul style="list-style-type: none"> • Using PhET interactive simulations, the learners may arrange positive and negative charges in space and view the resulting electric field. They may also create models of electric dipole. • Learners should also attempt to solve concept-based problems given in the resources on a daily basis. • The learners may be encouraged to read up (using internet) on the ongoing research on the possibility of static electricity charging electronic devices. They may then have an online discussion amongst themselves. <p>WEEK 3</p> <p>Unit I: Electrostatics Chapter 2: Electrostatic Potential and Capacitance</p> <ul style="list-style-type: none"> • Following the same approach as of the first week, the teacher may facilitate the learners' attempt to explore and understand the following— <ul style="list-style-type: none"> – electric potential, potential difference, electric potential due to a point charge; – electric potential due to an electric dipole – electric potential due to a system of charges, – equipotential surfaces, relation between field and potential, – electrical potential energy of a system of charges, – potential energy of a single charge and of a system of two charges in an external field;
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<p>towards the improvement of quality of life and human welfare.</p> <ul style="list-style-type: none"> exhibits values of honesty, objectivity, rational thinking, and freedom from myth and superstitious beliefs while taking decisions, respect for life, etc. 		<ul style="list-style-type: none"> The learners may plot equipotential lines and discover their relationship to the electric field using PhET interactive simulations The learners should also attempt to solve problems given in the resources on a daily basis The learners may collect information about 'Faraday cage' from internet. They may then develop a theoretical idea for an innovative application of Faraday cage in daily life. <p>WEEK 4</p> <p>Unit I: Electrostatics Chapter 2: Electrostatic Potential and Capacitance (contd.)</p> <ul style="list-style-type: none"> Following the same approach as of the first week, the teacher may facilitate the learners' attempt to understand the following— <ul style="list-style-type: none"> potential energy of electric dipole, in an external field; electrostatics of conductors; dielectrics and electric polarisation, capacitors and capacitance, capacitance of a parallel plate capacitor with and without dielectric medium between the plates; combination of capacitors in series and in parallel, energy stored in a capacitor; Using PhET interactive simulations, the learners can explore how a capacitor works. They can change the size of the plates and the distance between them; add a dielectric to see how it affects capacitance. They can also change the voltage and see charges build up on the plates. Learners should also attempt to solve problems given in the resources on a daily basis Learners may be encouraged to find out where capacitors are used in daily life and for what purpose, by collecting information from internet.
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