

## Physics: Electricity 2

### Whole unit overview

Learning Outcomes		Suggested Teaching Activities	Resources
4.2 (a)	<p>Describe simple experiments to show the production and detection of electrostatic charges. State that there are positive and negative charges.</p> <p>State that unlike charges attract and that like charges repel.</p> <p>Describe an electric field as a region in which an electric charge experiences a force.</p> <p>Distinguish between electrical conductors and insulators and give typical examples.</p>	<p>Use simple experiments with strips of insulating material (e.g. Perspex and cellulose acetate) rubbed with a cloth to show attraction and repulsion. Balloons or cling film can also be used to give a larger scale result.</p>	<p>This site has useful introductory work on static electricity</p> <p><a href="http://sciencemadesimple.com/static.html">http://sciencemadesimple.com/static.html</a></p> <p>For teachers' interest, look at <a href="http://www.amasci.com/emotor/sticky.html">http://www.amasci.com/emotor/sticky.html</a></p>
	<p>State that charge is measured in coulombs.</p> <p>State the direction of lines of force and describe simple field patterns.</p> <p>Give an account of charging by induction.</p> <p>Recall and use the simple electron model to distinguish between conductors and insulators.</p>	<p>For more able students electric field patterns can be demonstrated. (e.g. two electrodes dipped in castor oil, contained in a petri dish. The electrodes are connected to a high voltage supply and semolina sprinkled around the electrodes show the field pattern). Also charging by induction can be shown using a gold-leaf electroscope.</p>	<p>This site seeks to deal with some common misconceptions about static electricity – good background for the teacher.</p> <p><a href="http://www.eskimo.com/~billb/emotor/stmiskon.html">http://www.eskimo.com/~billb/emotor/stmiskon.html</a></p> <p>For an interesting way to teach about charge and current using an overhead projector demonstration see <a href="http://www.eskimo.com/~billb/redgreen.html">http://www.eskimo.com/~billb/redgreen.html</a></p>

<p>4.3 (a) &amp; (b)</p>	<p>Draw and interpret circuit diagrams containing sources, switches, resistors (fixed and variable), lamps, ammeters, voltmeters, magnetising coils, transformers, bells, fuses, relays.</p> <p>Understand that the current at every point in a series circuit is the same.</p> <p>Give the combined resistance of two or more resistors in series.</p> <p>State that, for a parallel circuit, the current from the source is larger than the current in each branch.</p> <p>State that the combined resistance of two resistors in parallel is less than that of either resistor by itself.</p>	<p>Students can be given experience of these components as parts of working circuits (perhaps a circus arrangement), setting circuits up from given diagrams and drawing circuit diagrams of actual circuits.</p> <p>Measurements of current in series and parallel circuits (e.g. with cells and lamps) should form the basis of the work on combinations of resistors.</p>	<p>This site is based around a movie with an interactive quiz whilst the movie is being loaded (this does not take too long). The picture quality – it is a cartoon – is good. There are many possible movies here, for example ‘batteries’ <a href="http://www.brainpop.com/science/electricity/batteries/index">http://www.brainpop.com/science/electricity/batteries/index</a></p> <p>This site shows the relationship between voltage current (unfortunately called ‘amperage’) and resistance. Students can change the resistance and voltage in a circuit, switch on and see the effect on the lamp.</p> <p><a href="http://jersey.uoregon.edu/vlab/Voltage/">http://jersey.uoregon.edu/vlab/Voltage/</a></p>
	<p>Draw and interpret circuit diagrams containing diodes and transistors.</p> <p>Recall and use the fact that the sum of the p.d.s. across the components in a series circuit is equal to the total p.d.s. across the supply.</p> <p>Recall and use the fact that the current from the source is the sum of the currents in the separate branches of a parallel circuit.</p> <p>Calculate the effective resistance of two resistors in parallel.</p>	<p>This work can then be extended with more able students to circuits containing a diode (perhaps a ‘problem-solving’ exercise) and to a more detailed approach to series and parallel circuits.</p>	

4.4  (b)	State the hazards of  (i) damaged insulation (ii) overheating of cables (iii) damp conditions  Show an understanding of the use of fuses and/or circuit-breakers.	The heating effect work can be extended to use a very thin wire (e.g. strand of iron wool in a circuit powered by two 1.5V cells). A short piece of iron wool will 'burn out' illustrating the action of a fuse.	
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