Physics: Electricity 2

Whole unit overview

Learning Outcomes		Suggested Teaching Activities	Resources
4.2 (a)	Describe simple experiments to show the production and detection of electrostatic charges. State that there are positive and negative charges. State that unlike charges attract and that like charges repel. Describe an electric field as a region in which an electric charge experiences a force. Distinguish between electrical conductors and insulators and give typical examples.	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.	This site has useful introductory work on static electricity http://sciencemadesimple.com/static.html For teachers' interest, look at http://www.amasci.com/emotor/sticky.html
	State that charge is measured in coulombs. State the direction of lines of force and describe simple field patterns. Give an account of charging by induction. Recall and use the simple electron model to distinguish between conductors and insulators.	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.	This site seeks to deal with some common misconceptions about static electricity – good background for the teacher. http://www.eskimo.com/~billb/emotor/stmiscon.html For an interesting way to teach about charge and current using an overhead projector demonstration see http://www.eskimo.com/~billb/redgreen.html

4.3 (a) & (b)	Draw and interpret circuit diagrams containing sources, switches, resistors (fixed and variable), lamps, ammeters, voltmeters, magnetising coils, transformers, bells, fuses, relays. Understand that the current at every point in a series circuit is the same. Give the combined resistance of two or more resistors in series. State that, for a parallel circuit, the current from the source is larger than the current in each branch. State that the combined resistance of two resistors in parallel is less than that of either resistor by itself.	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. 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.	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' http://www.brainpop.com/science/electricity/batteries/index 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. http://jersey.uoregon.edu/vlab/Voltage/
	Draw and interpret circuit diagrams containing diodes and transistors. 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. 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. Calculate the effective resistance of two resistors in parallel.	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.	

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.	