

Electricity and Circuits

Opportunities for Breadth and Challenge: Practical work, opportunities for A Level crossover in units 12&13			
Links to Sequencing for Learning: This unit links to previous work on Y8 P1 Electricity and magnetism This unit prepares pupils for work in CP11 Electromagnetic Induction			
Section	What we are learning (key knowledge)	Key words	Assessment
1	How does the structure of atoms affect the flow of electric current? What are the names and symbols of components used in electric circuits? What are the differences between series and parallel circuits?	Atom, Nucleus, Protons, Neutrons, Electrons	Prior knowledge
2	How is electric current measured? What happens to the electric current at a junction in the circuit? What is potential difference and how do you measure it?	Series, Parallel, Amperes, Ammeter	Retrieval Qs of keywords
3	What is a coulomb? What is the connection between the electric current and the amount of charge that flows in a circuit? What is the equation that relates electric charge, potential difference and the energy transferred in a circuit?	Potential Difference, Voltage, Volts, Voltmeter	Homework: independent research for poster
4	What is electrical resistance? What is the connection between voltage, current and resistance? What are the different effects of adding resistors in series and parallel?	Resistance, Ohms, Direct Proportion	MUM: poster
5a	Core practical <i>Construct electrical circuits to a) investigate the relationship between potential difference, current and resistance for a resistor and filament lamp and b) test series and parallel circuits using resistors and filament lamps.</i>	Diodes	
5b	How does potential difference affect current and resistance in fixed resistors, lamps and diodes? How do light intensity and temperature affect resistance in LDRs and thermistors? How are circuits used to explore resistance in lamps, diodes, thermistors and LDRs?		
6	What are the advantages and disadvantages of the heating effect of a current? How can the energy transfer that causes the heating effect be explained? How can unwanted energy transfer be reduced in wires?	Thermal energy, Dissipated,	
7	What is power and what units are used to measure it? How is power related to the energy used in joules? How can you calculate power when you know current, potential difference and/or resistance?	Power, Watts	
8	How is energy transferred from electrical cells or batteries to motors and heating devices? What is the difference between direct and alternating, for both current and voltage?	Direct current, Alternating current	

	What is the voltage and frequency of the UK domestic electricity supply?		
9	What is the difference between the live and the neutral wires? How do earth wires and fuses make circuits safer? What are potential differences between the live, neutral and earth wires?	Circuit breaker	
10	Revision End of Unit Test Test Feedback		Class assessment sheet EUT Test feedback sheet

Lacon Childe School Science Department – Physics Scheme of Work – Year 11 TS Topic 11

Static Electricity (TS only)

Opportunities for Breadth and Challenge:			
Links to Sequencing for Learning: This unit links to previous work on Y8 P1 Electricity and magnetism, Previous Y10 electricity unit This unit prepares pupils for work in CP11 Electromagnetic Induction			
Section	What we are learning (key knowledge)	Key words	Assessment
1 TS only	Static Electricity Theory <ul style="list-style-type: none"> • Explain how an insulator can be charged by friction, through the transfer of electrons • Explain how the material gaining electrons becomes negatively charged and the material losing electrons is left with an equal positive charge • Recall that like charges repel and unlike charges attract 		
2 TS only	Everyday Static & Other Uses Explain common electrostatic phenomena in terms of movement of electrons, including <ul style="list-style-type: none"> • shocks from everyday objects • lightning • attraction by induction such as a charged balloon attracted to a wall and a charged comb picking up small pieces of paper Explain some of the uses of electrostatic charges in everyday situations, including insecticide sprayers		
3 TS only	Earthing & Dangers of Static <ul style="list-style-type: none"> • Explain how earthing removes excess charge by movement of electrons • Describe some of the dangers of sparking in everyday situations, including fuelling cars, and explain the use of earthing to prevent dangerous build-up of charge 		
4 TS only	Electric Fields <ul style="list-style-type: none"> • Define an electric field as the region where an electric charge experiences a force 		

	<ul style="list-style-type: none"> Describe the shape and direction of the electric field around a point charge and between parallel plates and relate the strength of the field to the concentration of lines Explain how the concept of an electric field helps to explain the phenomena of static electricity 		
5 TS only	Revision End of Unit Test Test Feedback		Class assessment sheet EUT Test feedback sheet

Lacon Childe School Science Department – Physics Scheme of Work – Year 11 TS Topic 12&13

Magnetism, The Motor Effect and Electromagnetic Induction

Opportunities for Breadth and Challenge: Motor kits			
Links to Sequencing for Learning: This unit links to previous work on Y8 P1 Electricity and magnetism, Y10 Previous unit - Electric circuits This unit prepares pupils for work in GCSE paper			
Section	What we are learning (key knowledge)	Key words	Assessment
1	How are magnets used? What shape are magnetic fields and how can they be plotted? What is the evidence that the Earth has a magnetic field?	Permanent magnet, magnetic materials, magnetic field, induced magnet, plotting compass	Prior knowledge
2	How is the magnetic field around a wire related to the current? What factors affect the strength of the magnetic field around a wire? How does the magnetic field around a wire change when the wire is made into a coil?	Solenoid, electromagnet, temporary magnet	Retrieval Qs of keywords
3	How can electricity and magnetism combine to produce forces? How is the force on a wire in a magnetic field used to make an electric motor turn? How can we calculate the size of the force produced by a current in a magnetic field?	Motor effect, Flemings Left hand rule, magnetic flux density, tesla, $F = BIl$	Homework: independent research for poster
4 TS only	Motors <ul style="list-style-type: none"> Explain how the force on a conductor in a magnetic field is used to cause rotation in electric motors 		
5 TS only	Induced current		

	<ul style="list-style-type: none"> Explain how to produce an electric current by the relative movement of a magnet and a conductor a on a small scale in the laboratory b in the large-scale generation of electrical energy <p>Explain how electromagnetic induction is used in alternators to generate current which alternates in direction (a.c.) and in dynamos to generate direct current (d.c.)</p>		
6 TS only	<p>Applications in microphones and speakers</p> <p>Explain the action of the microphone in converting the pressure variations in sound waves into variations in current in electrical circuits, and the reverse effect as used in loudspeakers and headphones</p>		
7	<p>How can you calculate the power in a transformer?</p> <p>How do transformers follow the law of conservation of energy?</p> <p>How can you calculate the current and voltage produced by a transformer?</p>	Transformer, potential difference, electromagnetic induction, induces, primary coil, secondary coil, electric power	MUM: poster
8	<p>How is electricity transmitted around the country?</p> <p>How do transmitters work?</p> <p>What are the factors that affect the size and direction of an induced potential difference?</p>	National grid, transmission lines, step up transformer, step down transformer, alternative current	
9 TS only	<p>Transformer Equation & Efficiency of National Grid</p> <ul style="list-style-type: none"> Use the turns ratio equation for transformers to calculate either the missing voltage or the missing number of turns Explain the advantages of power transmission in highvoltage cables (using equations) 	$V_p/V_s = N_p/N_s$	
10	<p>Revision</p> <p>End of Unit Test</p> <p>Test Feedback</p>		Class assessment sheet EUT Test feedback sheet

Lacon Childe School Science Department – Physics Scheme of Work – Year 11 TS Topic 14&15

The Particle Model & Forces and Matter

Opportunities for Breadth and Challenge: Gradient of force/extension graph			
Links to Sequencing for Learning: This unit links to previous work on Y8 P1 Electricity and magnetism, Y10 Electric circuits This unit prepares pupils for work in GCSE paper			
Section	What we are learning (key knowledge)	Key words	Assessment

1	<p>Particles and density</p> <ul style="list-style-type: none"> • How do the particle arrangements in solids, liquids and gases explain their properties? • What happens to particles when a substance changes state? • How can you calculate the density of a substance? 	Sublimation, states of matter, kinetic theory, compressed, change of state, conserved, physical change, chemical change, density	Prior knowledge
2	Core practical – Investigating densities of solids and liquids	Displacement can	Retrieval Qs of keywords
3	<p>Energy and change of state.</p> <ul style="list-style-type: none"> • What effect does heating a substance have on the substance? • How can we reduce unwanted energy transfers? • What do specific heat capacity and specific latent heat mean? 	Thermal energy, temperature, specific latent heat	Homework: independent research for poster
4	Core practical - investigating water. <i>Investigate the properties of water by determining the specific heat capacity of water and obtaining a temperature-time graph for melting ice.</i>		MUM: poster
5	<p>Gas temperature and pressure</p> <ul style="list-style-type: none"> • What causes gas pressure? • How does the temperature of a gas affect its pressure? • What is the difference between the kelvin and Celsius temperature scales? 	Kinetic energy, pascals, absolute zero, kelvin temperature scale, kelvin	
6 TS only	<p>Pressure & Collision Theory</p> <ul style="list-style-type: none"> • Explain that gases can be compressed or expanded by pressure changes • Explain that the pressure of a gas produces a net force at right angles to any surface- • Explain the effect of changing the volume of a gas on the rate at which its particles collide with the walls of its container and hence on the pressure produced by a fixed mass of gas at constant temperature 		
7 TS only	<p>Boyle's Law</p> <ul style="list-style-type: none"> • Use the equation: $P_1V_1 = P_2V_2$ to calculate pressure or volume for gases of fixed mass at constant temperature • Explain why doing work on a gas can increase its temperature, including a bicycle pump 		
8	<p>Bending and stretching.</p> <ul style="list-style-type: none"> • How do forces cause objects to change shape? • What is the difference between elastic and inelastic distortion? <p>What is the relationship between force and extension when an object is deformed?</p>	Elastic, linear relationship, directly proportional, non-linear	
9	Core practical – Investigating springs. <i>Investigate the extension and work done when applying forces to a spring.</i>		

10	<p>Extension and energy transfers.</p> <ul style="list-style-type: none"> • What is the spring constant of a spring? • What is the equation that relates a force and extension of a spring? • How do we calculate the work done in stretching a spring? 	Spring constant, work done	
11a TS only	<p>Pressure in fluids</p> <ul style="list-style-type: none"> • Explain why atmospheric pressure varies with height above the Earth's surface with reference to a simple model of the Earth's atmosphere • Describe the pressure in a fluid as being due to the fluid and atmospheric pressure • Recall that the pressure in fluids causes a force normal to any surface • Describe and explain how pressure in fluids increases with depth and density 		
11b TS only	<p>Calculating Pressure</p> <ul style="list-style-type: none"> • Use $P = F/A$ • Use $P = h \times \rho \times g$ 	Density, rho, gravitational field strength	
12 TS only	<p>Upthrust</p> <ul style="list-style-type: none"> • Explain why an object in a fluid is subject to an upwards force (upthrust) and relate this to examples including objects that are fully immersed in a fluid (liquid or gas) or partially immersed in a liquid • Recall that the upthrust is equal to the weight of fluid displaced • Explain how the factors (upthrust, weight, density of fluid) influence whether an object will float or sink 	Archimedes	
13	<p>Revision End of Unit Test Test Feedback</p>		<p>Class assessment sheet EUT Test feedback sheet</p>