



The Sutton Academy

Knowledge Rich Curriculum Plan

SCIENCE- Physics Year 11

Lesson/Learning Sequence	Intended Knowledge: <i>Students will know that...</i>	Prior Knowledge: <i>In order to know this, students need to already know that...</i>	Working Scientifically	Tiered Vocabulary and Reading Activity
Lesson: Poles of a magnet	- Students will know that the poles of a magnet (north and south) are where the magnetic forces are the strongest. - Students will know that a permanent magnet produces its own magnetic field. - Students will know that an induced magnet is a material that becomes a magnet when it is placed in a magnetic field. - Students will know that induced magnets can only produce a force of attraction. Students will know that an induced magnet will lose most/all of its magnetism quickly when it is removed from a magnetic field.	<i>Students need to already know that when two magnets are brought together they exert a force on each other</i> <i>Students need to already know two like poles repel each other.</i> <i>Students need to already know two unlike poles attract each other.</i> <i>Students need to already know attraction and repulsion between two magnetic poles are examples of non contact forces.</i>		Tier 2 Repel: force away Induce: make happen Tier 3 Pole: area on a magnet where the magnetic forces are strongest
Lesson: Magnetic Fields	- Students will know that the region around a magnet where a force acts is called the magnetic field. - Students will know that the force between a magnet and a magnetic material is always attraction. - Students will know that the strength of the magnetic field depends on the distance from the magnet. - Students will need to know the magnetic materials are iron, cobalt, nickel and alloys such as steel. - Students will know that the direction of the magnetic field at any point is given by the direction of the force that would act on another north pole placed at that point. - Students will know that the direction of a magnetic field line is from the north pole of a magnet to the south pole of the magnet - an arrow is used to represent the direction of the force. - Students will know a magnetic compass contains a small bar magnet. - Students will know that the Earth has a magnetic force.	<i>Students need to already know that the magnetic field is strongest at the poles of a magnet.</i> <i>Students need to already know that a permanent magnet produces its own magnetic field</i>		Tier 2 Tier 3 Field diagrams: diagrams that show the force that an object will feel around a magnetic object

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	- Students need to know that a compass needle point in the direction of the Earth's magnetic field. - Students will explain how the behaviour of a magnetic compass is related to evidence that the core of the Earth must be magnetic. - Students will know how to plot a magnetic field pattern using a compass. Students will know how to draw the magnetic field pattern of a bar magnet showing how strength and direction change from one point to another.			
Lesson: Electromagnetism	- Students will know that when a current flows through a conducting wire a magnetic field is produced around the wire. - Students will know that the strength of the magnetic field depends on the current through the wire and the distance from the wire. - Students will know that shaping a wire to form a solenoid increases the strength of the magnetic wire. The magnetic field inside a solenoid is strong and uniform. - Students will know that a magnetic field around a solenoid has a similar shape to that of a bar magnet. - Students will know that adding an iron core increases the strength of the magnetic field for a solenoid. - Students will know how to draw the field pattern for a straight wire carrying a current and for a solenoid. Students will know how to use the thumb rule to demonstrate the direction of the magnetic field in relation to the direction of current.	<i>Students need to already know the shape of the magnetic field around a bar magnet.</i> <i>Students need to already know that iron is a magnetic material.</i> <i>Students need to already know circuit symbols.</i> <i>Students need to already know how to draw a magnetic field using a compass.</i> <i>Students need to already know how to build electrical circuits</i>	Interpreting data	Tier 2 Tier 3 Solenoid: coil of wire
Lesson: TRIPLE ONLY Uses of Electromagnetism	- Students will know how to interpret diagrams for electromagnetic devices in order to explain how they work. - Students will know that examples of devices that use electromagnetism are relay switches and bell	<i>Students need to already know that current carrying wires produce their own magnetic field</i>		Tier 3 Relay Switch: an electrically operated switch that is used to control a higher-power circuit

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Lesson: Flemings left hand rule	- Students will know that when a conductor carrying a current is placed in a magnetic field the magnet producing the field and the conductor exert a force on each other - the motor effect. - Students will recall the factors that affect the size of the force on the conductor - Students will know how to use the equation Force (F) (Newton, N) = magnetic flux density (B) (Tesla, T) x current (I) (Amp, A) x length (l) (metre, m) Students will know how to use their left hand to show the direction of the force, current and magnetic field.	<i>Students need to already know that a conductor allows a flow of charge (electrical current) in one or more directions.</i> <i>Students need to already know how to build electrical circuits.</i> <i>Students need to already know how to use a calculator</i>	Making predictions Using formula from the equation sheet	Tier 2 Tier 3 Magnetic flux density: measure of the strength of the magnetic field
Lesson: Electric motors	- Students will explain how the force on a conductor in a magnetic field cause the rotation of the coil in an electric motor. - Students will know that a split ring commutator reverse the current to allow a continuous rotation in one direction.	<i>Students need to already know that a coil of wire carrying a current in a magnetic field tends to rotate - the motor effect.</i> <i>Students need to already know how to build electrical circuits.</i>		Tier 2 Tier 3 Split ring commutator: device that reverses the current in a motor to allow continuous rotation in one direction
Lesson: Loudspeakers (PHYSICS ONLY)	- Students will know that loudspeakers and headphones use the motor effect to convert variations in current in electrical circuits to the pressure variations in sound waves. - Students will be able to explain how a moving-coil loudspeaker and headphones work.	<i>Students need to already know that a coil of wire carrying a current in a magnetic field tends to rotate - the motor effect.</i> <i>Students need to already know that sound waves are longitudinal waves and require a medium.</i>		Tier 2 Variation: a change Tier 3
Lesson: Induced potential (PHYSICS ONLY)	Students will know that if an electrical conductor moves relative to a magnetic field or if there is a change in the magnetic field around a conductor, a potential difference is induced across the ends of the conductor. If the conductor is part of a complete circuit, a current is induced in the conductor - the generator effect	<i>Students need to already know that an electrical conductor will move when placed in an electrical field.</i>		Tier 2 Tier 3

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	- Students will know an induced current generates a magnetic field that opposes the original change, either the movement of the conductor or the change in magnetic field. - Students will recall the factors that affect the size of the induced potential difference/induced current. (changing the speed of movement, changing the magnetic field strength and turn the wire into a coil or increase the number of coils) - Students will be able to recall the factors that affect the direction of the induced potential difference/induced current. (magnet moved in opposite direction, the other pole of the magnet is inserted first). - Students will know how to apply the principles of the generator effect in a given context.			
Lesson: Generators (PHYSICS ONLY)	- Students will explain how the generator effect in an alternator to generate ac and in a dynamo to generate dc. - Students will know how to draw/interpret graphs of potential difference generated in the coil against time.	<i>Students need to already know how to apply the principles of the generator effect in a given context.</i> <i>Students need to already know the factors that affect the size of the induced potential difference/induced current. (changing the speed of movement, changing the magnetic field strength and turn the wire into a coil or increase the number of coils)</i> <i>Students need to already know the factors that affect the direction of the induced potential difference/induced current. (magnet moved in opposite direction, the other pole of the magnet is inserted first.</i>		Tier 2 Tier 3 Dynamo: device that generates dc Alternator: a device that generates ac

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Lesson: Microphones (PHYSICS ONLY)	- Students will know that microphones use the generator effect to convert pressure variations in sound waves into variations in current in electrical circuits. - Students will know be able to explain how a moving coil microphone works.	<i>Students need to already know how to apply the principles of the generator effect in a given context.</i> <i>Students need to already know the factors that affect the size of the induced potential difference/induced current. (changing the speed of movement, changing the magnetic field strength and turn the wire into a coil or increase the number of coils)</i> <i>Students need to already know the factors that affect the direction of the induced potential difference/induced current. (magnet moved in opposite direction, the other pole of the magnet is inserted first.</i>		
Lesson: Transformers (PHYSICS ONLY)	- Students will know that a basic transformer consists of a primary coil and a secondary coil wound on an iron core. - Students will know how to use the equation $V_p/V_s = N_p/N_s$. - Students will know that if transformers were 100% efficient, the electrical power output would equal the electrical power input. $V_s \times I_s = V_p \times I_p$. $V_s \times I_s$ is the power output (secondary coil) and $V_p \times I_p$ is the power input (primary coil). - Students will be able to explain how the effect of an alternating current in one coil in inducing a current in another is used in transformers. - Students will explain how the ratio of the PDs across the two coils depends on the ratio of the number of turns on each. - Students will know how to calculate the current drawn from the input supply to provide a particular power output.	<i>Students need to already know that iron is easily magnetised.</i> <i>Students need to already know that power is measured in watts.</i> <i>Students need to already know that the more coils will induce a larger current.</i> <i>Students need to know how to use a scientific calculator</i>	Ratio skills Using formula from the equation sheet	Tier 2 Transmission: The movement of something from one point to another Tier 3 Transformer: device that increases potential difference

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	- Students will know how to apply the equation linking the pds and number of turns in the coils of a transformer to the currents and the power transfer involved, and relate these to the advantages of power transmission at high potential differences. - Students know that a step-down transformer $V_s < V_p$. - Students know that a step-up transformer is $V_s > V_p$.			