Holy Family Catholic School – Faculty of Science and Physiology Science Autumn Term 1 Year 11

Learning Intention	Vocab	Concept	Retrieval	Success Criteria	Hinge Questions for this lesson	Red Zone
Week 1 Lesson 1						
Week 1 Lesson 2						
Week 1 Lesson 3 What are the properties of group 1 elements? Why do they have different properties?	Properties, Elements, Alkali metals, periodic table, groups, periods, chemical properties, physical properties	Chemical Reactions	Elements, compounds and the periodic table. What happens during chemical reactions. Properties of metals.	1. Recall the location of the 'alkali metals', 'halogens', and 'noble gases'. 2. Recall the properties of the alkali metals. 3. Explain this pattern in reactivity in terms of electronic configurations.	Which statement best explains why Group 1 metals react more vigorously with water as you go down the group? A. The atoms get bigger, so they collide with water more often. B. The metals have more protons, which makes them more reactive. C. The outer electron is further from the nucleus and is lost more easily. ☑ D. The metals become harder, so they react more strongly.	Explain why the alkali metals become more reactive as you descend group 1 (6 Marks) Lithium, Sodium and Potassium are reactive metals in group 1 of the periodic table. Explain in terms of electronic configuration, the increase in reactivity from Lithium, Sodium to Potassium (6 Marks)
Week 1 Lesson 4	metal hydroxide, positive ions, electrons,	Chemical Reactions	Structure of the atom, electrons protons and	1. Describe the reactions of lithium, sodium and potassium with water. 2. Describe the pattern in	When sodium reacts with water, what are the products of the reaction? A. Sodium oxide and	Two elements in group 1 of the periodic table are lithium and sodium.

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How do alkali metals react with water?	electron shells, shelding, reactivity		neutrons, Charges of the subatomic particles. Reactivity series.	reactivity of the alkali metals, lithium, sodium and potassium, with water; and use this pattern to predict the reactivity of other alkali metals.	hydrogen B. Sodium hydroxide and oxygen C. Sodium hydroxide and hydrogen ☑ D. Sodium chloride and hydrogen	Very small pieces of lithium and sodium were reacted separately with water. Describe the similarities and differences in what is seen and in the products of the reactions. [6 marks]
Week 2 Lesson 1 How do the properties of group 7 elements change as you go down the group?	Halogens, groups, periods, boiling points, physical properties, reactants, products,	Chemical Reactions	Structure of the atom and physical properties of non metals	1. Recall the colours and physical states of chlorine, bromine and iodine at room temperature. 2. Describe the pattern in the physical properties of the halogens, chlorine, bromine and iodine, and use this pattern to predict the physical properties of other halogens. 3. Describe the chemical test for chlorine. 4. Describe the reactions of the halogens, chlorine, bromine and iodine, with metals to form metal halides, and use this pattern to predict the reactions of other halogens. 5. Recall that the halogens,	Which change occurs as you go down Group 7 from chlorine to iodine? A. Reactivity increases and colour becomes lighter B. Reactivity decreases and melting point increases ☑ C. Reactivity increases and melting point decreases D. Reactivity stays the same and atoms get smaller	Explain the trend in reactivity of the group 7 Halogens.

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				chlorine, bromine and iodine, form hydrogen halides which dissolve in water to form acidic solutions, and use this pattern to predict the reactions of other halogens.		
Week 2 Lesson 2 How can displacement reactions be used to work out the reactivity of halogens? How can we explain the reactivity?	Trends, displacement, reactivity, halogens, ions, reactants, products,	Chemical Reactions	electronic configuration, words equation, reactants and products. balancing equations	1. Describe the relative reactivity of the halogens chlorine, bromine and iodine, as shown by their displacement reactions with halide ions in aqueous solution, and use this pattern to predict the reactions of astatine. 2. Explain why these displacement reactions are redox reactions in terms of gain and loss of electrons, identifying which of these are oxidised and which are reduced. (HT) 3. Explain the relative reactivity of the halogens in terms of electronic configurations.	Chlorine is added to a solution of potassium bromide. Bromine is produced. What does this tell us about the reactivity of chlorine and bromine? A. Bromine is more reactive than chlorine. B. Chlorine and bromine are equally reactive. C. Chlorine is more reactive than bromine. ☑ D. Reactivity cannot be compared using displacement reactions.	The elements chlorine, bromine and iodine are part of group 7 in the periodic table. The order of reactivity of chlorine, bromine and iodine can be determined by carrying out displacement reactions. Explain how displacement reactions can be used to show the reactivity of these three elements. [6 marks]

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				4. Write balanced ionic equations (HT)		
Week 2 Lesson 3 How can displacement reactions be used to work out the reactivity of halogens? How can we explain the reactivity?	Trends, displacement, reactivity, halogens, ions, reactants, products,	Chemical Reactions	electronic configuration, words equation, reactants and products. balancing equations	1. Describe the relative reactivity of the halogens chlorine, bromine and iodine, as shown by their displacement reactions with halide ions in aqueous solution, and use this pattern to predict the reactions of astatine. 2. Explain why these displacement reactions are redox reactions in terms of gain and loss of electrons, identifying which of these are oxidised and which are reduced. (HT) 3. Explain the relative reactivity of the halogens in terms of electronic configurations. 4. Write balanced ionic equations (HT)		The elements chlorine, bromine and iodine are part of group 7 in the periodic table. The order of reactivity of chlorine, bromine and iodine can be determined by carrying out displacement reactions. Explain how displacement reactions can be used to show the reactivity of these three elements. [6 marks]
Week 2 Lesson 4 Why are group 0 elements	Inert, sheliding, noble gases, low density, non	Chemical Reactions	electron shells and numbers of electrons in each shell.	1. Explain why the noble gases are chemically inert, compared with the other elements, in terms of their electronic configurations.	Why are Group 0 elements very unreactive? A. They have very large atoms that cannot form bonds.	Compare the halogens and noble gases. Discuss:

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unreactive? What properties do they have that allow us to use them?	flammable, unreactive			2. Explain how the uses of noble gases depend on their inertness, low density and/or non-flammability. 3. Describe the pattern in the physical properties of some noble gases and use this pattern to predict the physical properties of other noble gases.	B. They have a full outer shell of electrons. ☑ C. They have no outer shell electrons.	Trends in melting and boiling points. Reactivity of groups How reactivity changes down the group What they look like Uses How they are structured (electrons) (6 marks)
Week 3 Lesson 1 What has to happen for two particles to react? How do we determine the rate of a chemical reaction?	chemical reaction, rate of reactions, reactants, products.	Energy and Rates	signs of a chemical reaction,	1. Explain how reactions occur when particles collide and that rates of reaction are increased when the frequency and/or energy of collisions is increased. 2. Suggest practical methods for determining the rate of a given reaction. 3. Interpret graphs of mass, volume or concentration of reactant or product against time	How can the rate of a chemical reaction be determined? A. By measuring how hot the reaction mixture becomes. B. By measuring the total amount of product made at the end. C. By measuring how fast a reactant is used up or a product is formed. ☑ D. By counting the number	Marble chips react with dilute hydrochloric acid to produce carbon dioxide gas. The rate of this reaction can be changed by changing the size of the marble chips. Describe how you could investigate what effect using smaller marble chips has on the rate of this reaction. Predict and explain the effect of using smaller

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					of collisions between particles.	marble chips on the reaction rate. [6 marks]
Week 3 Lesson 2 What are the factors that affect the rate of reaction?	Collision theory, surface area, temperature, catalyst, concentration, pressure	Energy and Rates	reactants and products, particle theory	Explain the effects on rates of reaction of changes in temperature, concentration, surface area to volume ratio of a solid, and pressure (on reactions involving gases) in terms of frequency and/or energy of collisions between particles.	Which of the following will increase the rate of a chemical reaction? A. Increasing the temperature of the reaction ☑ B. Using larger pieces of a solid reactant C. Decreasing the concentration of a solution D. Removing a catalyst	Describe the factors that affect the rate of a reaction, use the collision theory in your answer. (6 Marks)
Week 3 Lesson 3 Core Practical: Investigating reaction rates – gases. Lesson 1 of 2	Dependent variable, independent variable, control variable, temperature surface area, pressure, rates of reaction, collision theory	Energy and Rates	How particles in a gas behave, Arrangement of particles gas.	To investigate the effect on the rate of reaction of changing the surface area of solids and the concentration of solutions, by measuring the production of a gas.	In an experiment where a gas is produced, how can the rate of reaction best be measured? A. By measuring the total volume of gas produced at the end B. By measuring how quickly the volume of gas increases over time ☑ C. By measuring the temperature of the reaction mixture D. By observing the colour of the reactants	Hydrochloric acid reacts with magnesium metal to produce hydrogen gas: Magnesium + hydrochloric acid → magnesium chloride + hydrogen Describe how you could use magnesium ribbon, and a solution of hydrochloric acid, to show that decreasing the concentration of the hydrochloric acid changes the rate of this reaction. [6 marks]

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Week 3 Lesson 4 Core Practical: Investigating reaction rates – gases. Lesson 2 of 2	temperature surface area, pressure, rates of reaction, collision theory	Energy and Rates	How particles in a gas behave, Arrangement of particles gas.	To investigate the effect on the rate of reaction of changing the surface area of solids and the concentration of solutions, by measuring the production of a gas.	In an experiment where a gas is produced, how can the rate of reaction best be measured? A. By measuring the total volume of gas produced at the end B. By measuring how quickly the volume of gas increases over time ☑ C. By measuring the temperature of the reaction mixture D. By observing the colour of the reactants	Hydrochloric acid reacts with magnesium metal to produce hydrogen gas: Magnesium + hydrochloric acid → magnesium chloride + hydrogen Describe how you could use magnesium ribbon, and a solution of hydrochloric acid, to show that decreasing the concentration of the hydrochloric acid changes the rate of this reaction. [6 marks]
Week 4 Lesson 1 Core Practical: Investigating reaction rates – colour changes. Lesson 1 of 2		Energy and Rates		To investigate the effect of changing the temperature on the rate of reaction between sodium thiosulfate and hydrochloric acid, by observing a colour change in the solutions.	In a reaction that changes colour, what is the best way to investigate the rate of reaction? A. Measure how dark the final colour is. B. Measure the time taken for the colour to change. ☑ C. Measure the temperature of the solution after the reaction. D. Measure the total volume of reactants used.	

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Week 4 Lesson 2 Core Practical: Investigating reaction rates – colour changes. Lesson 2 of 2		Energy and Rates		To investigate the effect of changing the temperature on the rate of reaction between sodium thiosulfate and hydrochloric acid, by observing a colour change in the solutions.	In a reaction that changes colour, what is the best way to investigate the rate of reaction? A. Measure how dark the final colour is. B. Measure the time taken for the colour to change. ☑ C. Measure the temperature of the solution after the reaction. D. Measure the total volume of reactants used.	
Week 4 Lesson 3 What is a catalyst and how do they work?	Catalyst, activation energy, Reaction profiles, successful collisions,	Energy and Rates	Enzymes, chemical reactions	1. Define catalyst. 2. Explain how the addition of a catalyst increases the rate of a reaction in terms of activation energy. 3. Recall that enzymes are biological catalysts and that enzymes are used in the production of alcoholic drinks	Which statement best describes how a catalyst works in a chemical reaction? A. It increases the temperature of the reaction mixture. B. It is used up during the reaction. C. It speeds up the reaction by lowering the activation energy and is not used up. ☑ D. It increases the amount of product formed.	A catalyst is added to increase the rate of the reaction. Explain how adding a catalyst increases the rate of a chemical reaction. Explain how catalysts and enzymes work and why they are useful in industrial reactions.
Week 4 Lesson 4	Endothermic reaction,	Energy and Rates	Law of conservation	1. Recall that changes in heat energy accompany:	Which statement correctly describes the difference	You are provided with four solids which are soluble in water. Some

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What are exothermic and endothermic reactions?	Exothermic reactions, energy profiles		of energy. How we can measure a change in energy.	salts dissolving in water, neutralisation reactions, displacement reactions, and precipitation reactions. 2. Recall that when these reactions take place in solution, temperature changes can be measured to reflect the heat changes. 3. Describe an exothermic and endothermic changes.	between exothermic and endothermic reactions? A. Exothermic reactions take in energy, and endothermic reactions release energy. B. Exothermic reactions increase temperature, and endothermic reactions always make reactions stop. C. Exothermic reactions release energy to the surroundings, and endothermic reactions take in energy from the surroundings. ☑	of them dissolve during an exothermic reaction, and some dissolve during an endothermic reaction. Describe how you would identify which dissolving process absorbs and releases the most energy. Your description should include a list of apparatus or a labelled diagram, how you will make the investigation a fair test, and how you would interpret the results. [6 marks]
Week 5 Lesson 1 How can exothermic and endothermic reactions be modelled and explained?	Activation energy Endothermic reaction, Exothermic reactions, energy profiles	Energy and Rates	Law of conservation of energy. How we can measure a change in energy.	1. Recall that the breaking of bonds is endothermic and the making of bonds is exothermic/ 2. Recall that the overall heat energy change for a reaction is: a) exothermic if more heat energy is released in forming bonds in the products than is required in breaking bonds in the reactants b) endothermic if less heat	How do reaction profile diagrams help explain the difference between exothermic and endothermic reactions? A. They show that exothermic reactions have a higher activation energy than endothermic reactions. B. They show that exothermic reactions release energy overall, while endothermic reactions absorb energy overall. ☑	Compare exothermic and endothermic reactions. In your answer, explain the differences between exothermic and endothermic reactions and give examples of each type of reaction. [6 marks]

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				energy is released in forming bonds in the products than is required in breaking bonds in the reactants 3. Explain the term activation energy 4. Draw and label reaction profiles for endothermic and exothermic reactions, identifying activation energy	C. They show that all reactions release energy once started. D. They show that energy is only needed to break bonds, not to form them.	
Week 5 Lesson 2 **How are energy changes in reactions calculated? (HT)**	**Bond energy, reactants, products, energy released, energy taken in, endothermic, exothermic**	**Energy and Rates**	**Chemical reactions, examples of endothermic and exothermic reactions**	**Calculate the energy change in a reaction given the energies of bonds (in kJ mol–1)**	**How is the overall energy change for a chemical reaction calculated using bond energies?** **A. Energy change = energy released − energy absorbed** **B. Energy change = energy absorbed − energy released ☑** **C. Energy change = total energy of products only** **D. Energy change = activation energy × number of bonds**	**Calculate the energy released when making 5 mol of HCL?** **Calculate the total energy required to break all the bonds in 1 mol of CO_2**
Week 5 Lesson 3						

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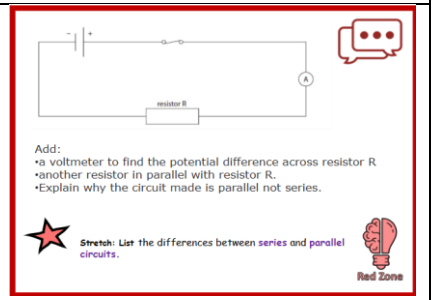
Review and practice of Groups and Rates – lesson 1 of 2						
Week 5 Lesson 4 Review and practice of Groups and Rates – lesson 2 of 2						
Week 6 Lesson 1 What are circuits, how do we draw them?	Circuit, Component, Symbol, Diagram	Electricity and Electromagnetism	Electricity flows through a complete (closed) circuit. Circuit diagrams use standard symbols to represent components.	1. Identify components from their symbols 2. State what a series circuit is. 3. Explain what a parallel circuit is. 4. Explain why your house is on a parallel circuit.	Which of these will make a bulb light? A. A circuit with a gap in the wire B. A circuit with only a battery and no wires C. A closed circuit with a battery, wires and bulb	

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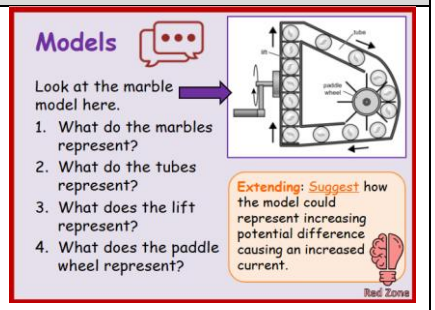
Week 6 Lesson 2 What are circuits, how do we draw them?	Current, Ammeter, Flow, Series	Electricity and Electromagnetism	Electric current is the flow of charge through a conductor. An ammeter is used to measure current and is placed in series.	1. State that current is measured in amps using an ammeter. 2. Show how an ammeter is placed in a circuit. 3. Describe how to find the potential difference across two points. 4. Explain how voltage and current changes in a series and parallel circuit.	In a simple series circuit with one battery and two identical bulbs, where would the current be the highest? A) The current is exactly the same at all points in the circuit. B) It is highest right after the battery, before it hits the first bulb. C) It is highest between the two bulbs because they "push" the charge	
Week 6 Lesson 3 What is the connection between current and charge?	Charge, Electron, Time, Coulomb	Electricity and Electromagnetism	Charge is carried by electrons moving through a wire. Current is the rate of flow of charge ($I = Q \div t$).	1. Define a coulomb and state the link between charge and current. 2. Explain how increasing the current effects the charge flowing through the circuit. 3. Apply the electrical charge equation. 4. Rearrange the electrical charge equation.	If a circuit has a constant current of flowing through a bulb for 10s , which statement is true? A) The total charge that passed through the bulb is 5 columbs B) The total charge that passed through the bulb is 20 columbs C) The charge stays at 2 columbs because the current does not change	Figure 23 shows an electric car connected to a battery charger. The car has a rechargeable battery to drive its motor. The rechargeable battery provides a potential difference of 330 V and can store up to 64 MJ. It takes 8 hours for the battery to receive a full charge. Assume that the charging process is 100% efficient. Calculate the total charge that flows while the battery is being charged. (3)

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						Calculate the average charging current. (3)
Week 6 Lesson 4 What is resistance?	Resistance, Ohm, Opposition, Conductor	Electricity and Electromagnetism	Resistance slows down the flow of electric current. It is measured in ohms (Ω) and varies between materials.	1. Define electrical resistance. 2. Explain the relationship between voltage, current and resistance as V = I x R 3. Apply the resistance equation. 4. Describe how adding resistors affects the resistance in a series and parallel circuit.	A student replaces a short, thick copper wire in a circuit with a very long, thin wire. What will happen to the current in the circuit? A) The current will increase because the long wire provides more room for the charge to build up. B) The current will decrease because the long, thin wire has more resistance. C) The current will stay the same because the battery voltage hasn't changed.	You are part of a team designing a new electronic device. The device must operate safely and efficiently using a 12V power supply. You are given a selection of resistors and must design two different circuits: - A series circuit with three resistors: 4Ω, 6Ω, and 10Ω. - A parallel circuit using the same resistors. a) Calculate the total resistance for both circuits. b) Determine the current flowing through each circuit. c) Explain how the arrangement of resistors affects the total resistance and current. d) Justify which circuit would be more suitable for a device that requires higher current flow, and explain why.
Week 7 Lesson 1	Potential Difference, Variable,	Electricity and Electromagnetism	Potential difference (voltage) is the energy	1. Sketch a resistance graph for an LDR and a thermistor. 2. Describe the I-V graph for filament lamp, diode and a	A student adds a second battery to a simple circuit. This doubles the Potential Difference (the push). What	Evaluation of practical

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Working Scientifically: How does PD affect current and resistance in different components? Lesson 1 of 2	Graph, Component		transferred per unit charge. Ohm's Law links voltage, current, and resistance (V = I × R).	fixed resistor. 3. Explain the shape of the resistance curve for an LDR and a thermistor. 4. Explain the shape of different I-V graphs.	happens to the current? A) The current will increase because there is a stronger push. B) The current will decrease because the circuit is now too crowded. C) The current will stay the same because the bulb is still the same.	
Week 7 Lesson 2 Working Scientifically: How does PD affect current and resistance in different components? Lesson 2 of 2	Potential Difference, Variable, Graph, Component	Electricity and Electromagnetism	Potential difference (voltage) is the energy transferred per unit charge. Ohm's Law links voltage, current, and resistance (V = I × R).	1. Sketch a resistance graph for an LDR and a thermistor. 2. Describe the I-V graph for filament lamp, diode and a fixed resistor. 3. Explain the shape of the resistance curve for an LDR and a thermistor. 4. Explain the shape of different I-V graphs.	A student adds a second battery to a simple circuit. This doubles the Potential Difference (the push). What happens to the current? A) The current will increase because there is a stronger push. B) The current will decrease because the circuit is now too crowded. C) The current will stay the same because the bulb is still the same.	Evaluation of practical
Week 7 Lesson 3 What is power and what units are	Power, Energy, Watt, Rate	Electricity and Electromagnetism	Power is the rate at which energy is transferred or used. It is measured in	1. Describe power as energy transferred per second. 2. Recall the equation "Power = Energy ÷ Time". 3. Explain how the power transfer in any circuit device	Two different lightbulbs are connected to the same battery. Bulb A is labelled 60W and Bulb B is labelled 10W. Which statement is scientifically correct?	Plan an investigation to calculate the power of a motor within a circuit, you must include a circuit diagram.

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used to measure it?			watts (W), and calculated using P = V × I.	is related to the potential difference across it and the current in it. 4. Recall and use the equations P = I x V and P = I2 x R. Explain why if current doubles, the power quadruples	A) Bulb A is more powerful because it transfers more energy every second. B) Bulb B is more powerful because it uses less energy to stay bright. C) Power is measured in Volts, so both bulbs have the same power	
Week 7 Lesson 4 What is the difference between DC and AC, for both current and voltage?	Direct, Alternating, Frequency, Supply	Electricity and Electromagnetism	DC (direct current) flows in one direction; AC (alternating current) changes direction. Mains electricity is AC; batteries provide DC.	1. Remember that a.c. mains is 50Hz frequency and a voltage of 230V. 2. Describe how energy is transferred from the stores in batteries and a.c. mains to motors and heating devices. 3. Describe the difference between a.c. and d.c. 4. Explain the relationship between alternating and direct voltages and currents.	A student is comparing a battery and a mains plug in the wall. Which of these correctly describes how the electricity moves? A) In both the battery and the plug, the electricity flows in one direction only. B) In the battery, electricity flows in one direction; in the plug, it constantly swaps direction. C) In the battery, electricity swaps direction; in the plug, it flows in one direction.	Describe the differences between AC and DC current. (6 Marks)
Week 8 Lesson 1 How do we stay safe with electricity?	Insulation, Fuse, Earth Wire, Hazard	Electricity and Electromagnetism	Water and metal conduct electricity and can cause electric shocks. Safety	1. Explain the difference in function between the live and the neutral mains input wires. 2. Explain the function of an earth wire and of fuses or	What does a fuse do? A. stores charge B. Increase voltage C. Breaks circuit when current is too high	Compare and contrast circuit breakers and fuses as safety devices. (4 marks)

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			devices like fuses and circuit breakers prevent damage and injury.	circuit breakers in ensuring safety. 3. Explain why switches and fuses should be connected in the live wire of a domestic circuit. 4. Recall the potential differences between the live, neutral and earth mains wires. 5. Explain the dangers of providing any connection between the live wire and earth		
Week 8 Lesson 2 What are magnets and what do their forces look like?	Poles, Field lines, Attraction, Repulsion	Electricity and Electromagnetism	Understanding that some materials (like iron) are magnetic. Knowing that forces can act at a distance (e.g., gravity, electrostatic)	1. Recall when magnets attract and repel. 2. Explain the difference between permanent and induced magnets 3. Describe the uses of permanent and temporary magnets. 4. Describe the shape and direction and strength of the magnetic field around bar magnets and for a uniform field. 5. Use plotting compasses to show the shape and direction of the field of a	If you put two magnets near each other and they immediately push away from one another, what does this tell you about the poles and the force? A) The poles facing each other are different (North and South) and the force is attractive. B) The poles facing each other are the same (e.g., North and North) and the force is repulsive. C) The magnets have run	Describe how a student could show that the paper clips are induced magnets. A student wants to determine the shape of the magnetic field for a large area around a magnet. Describe how the student should carry out an investigation using just one plotting compass.

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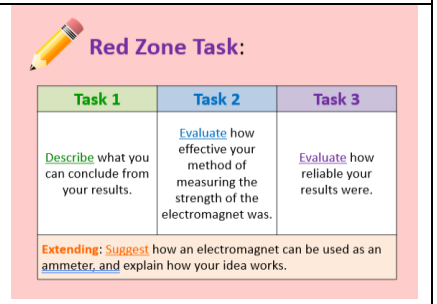
				magnet and the Earth's magnetic field 6. Explain how the behaviour of a magnetic compass is related to evidence that the core of the Earth must be magnetic	out of energy and can no longer pull together.	
Week 8 Lesson 3 What are electromagnets and how do we change their strength?	Current, Coil, Iron core, Turns	Electricity and Electromagnetism	Basic idea of electric current and circuits, Familiarity with the concept of coils and how they carry current	1. Describe how current can be used to make an electromagnet. 2. Describe the effect of altering the size and direction of the current. 3. Recall the effect of the size of the current and the distance from the conductor. 4. Explain how the fields interact in a solenoid and the effect of this on the field.	Which of these will make an electromagnet stronger? A) Using a shorter piece of wire. B) Adding more turns to the coil of wire. C) Turning off the electricity.	
Week 8 Lesson 4 **How do magnetic forces work? (H)**	**Interaction, Field strength, Direction, Force**	**Electricity and Electromagnetism**	**Knowledge of vector quantities (direction and magnitude), Understanding of magnetic field diagrams**	**1. Describe how currents and magnetic fields interact.** **2. Explain how magnetic forces occur.** **3. Use Flemming's left hand rule.** **4. Use the equation:** **$F = B \times I \times l$**	**A wire carrying a current is placed between two magnetic poles. If the wire is placed exactly parallel to the magnetic field lines, what happens to the magnetic force acting on the wire?** **A) The force is at its**	**The apparatus shown here is placed on a balance. The wire is held so that it cannot move. Explain how the reading on the balance changes when the current is switched on.**

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			and how field lines behave		maximum because the wire is aligned with the field. B) The force is zero because the wire must be at an angle to the field lines to experience a force. C) The force is reversed because parallel wires cause the magnetic poles to swap.	