The Sutton Academy

Knowledge Rich Curriculum Plan

SCIENCE- Chemistry Year 10

Topic: Energy Changes

Lesson/Learning Sequence	Intended Knowledge: *Students will know that…*	Prior Knowledge: *In order to know this, students need to already know that…*	Working Scientifically	Tiered Vocabulary and Reading Activity
Lesson: Exothermic and Endothermic Reactions	• Students will know that energy is conserved in chemical reactions • Students will know that if a reaction transfers energy to the surroundings the product molecules must have less energy than the reactants • Students will know that an exothermic reaction is one that transfers energy to the surroundings so the temperature of the surroundings increases • Students will know that examples of exothermic reactions include combustion, many oxidation reactions and neutralisation • Students will know every day uses of exothermic reactions include self-heating cans and hand warmers • Students will know that an endothermic reaction is one that takes in energy from the surroundings so the temperature of the surroundings decreases • Students will know that examples of endothermic reactions include thermal decompositions and the reaction of citric acid and sodium hydrogen carbonate • Students will know that everyday uses of endothermic reactions include some sports injury packs • Students will know how to distinguish between exothermic and endothermic reactions on the basis of the temperature change of the surroundings • Students will know how to evaluate uses of exothermic and endothermic reactions Students will know how to practically determine whether a reaction is exothermic or endothermic.	***Students need to already know that heat change is a sign of a chemical reaction***		*Exothermic reaction is one that transfers energy to the surroundings so the temperature of the surroundings increases* *Endothermic reaction is one that takes in energy from the surroundings so the temperature of the surroundings decreases* *Activation energy- The minimum energy required to start a reaction*

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Lesson: Reaction Profiles	• Students will know that chemical reactions can only occur when reacting particles collide with each other with sufficient energy • Students will know that the minimum amount of energy that particles must have to react is called the activation energy • Students will know that reaction profiles are diagrams that can be used to show the relative energies of reactants and products, the activation energy and the overall energy change of a reaction. • Students will know that in an exothermic reaction the products have less energy than the reactants • Students will know that in an endothermic reaction the products have more energy than the reactants • Students will know how to draw simple reaction profiles for exothermic and endothermic reactions Students will know how to use reaction profiles to identify reactions as exothermic or endothermic	• *Students need to already know that exothermic reactions transfer energy to the surroundings* *Students need to already know that endothermic reactions take in energy from the surroundings*		*Reaction profiles: Diagrams that can be used to show the relative energies of the reactants and products, activation energy and overall energy change.*
Lesson: Energy change of reactions (Higher tier)	• Students will know that during a chemical reaction energy must be supplied to break bonds in the reactants • Students will know that during a chemical reaction energy is released when bonds in the products are formed • Students will know that the energy needed to break the bonds and the energy released when bonds are formed can be calculated from bond energies • Students will know that the difference between the sum of the energy needed to break bonds in the reactants and the sum of the energy released when bonds in the products are formed is the overall energy change of the reaction	• *Students need to already know that exothermic reactions transfer energy to the surroundings* • *Students need to already know that endothermic reactions take in energy from the surroundings* *Students need to already know how to perform addition and subtraction using brackets*		Bond- a lasting attraction between atoms, ions or molecules that enables the formation of chemical compounds. Overall- taking everything into account.

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	• Students will know that in an exothermic reaction the energy released from forming new bonds is greater than the energy needed to break existing bonds. This means that the calculated energy change will be negative • Students will know that in an endothermic reaction the energy needed to break existing bonds is greater than the energy released from forming new bonds. This means that the calculated energy change will be positive Students will know how to calculate the energy transferred in chemical reactions using bond energies supplied.			
Lesson: Cells and Batteries (triple only)	• Students will know that cells contain chemicals which react to produce electricity • Students will know that the voltage produced by a cell is dependent upon a number of factors, including type of electrode and electrolyte • Students will know that a simple cell can be made by connecting two different metals in contact with an electrolyte • Students will know that batteries consist of two or more cells connected together in series to provide a greater voltage • Students will know that in non-rechargeable cells and batteries the chemical reactions stop when one of the reactants has been used up. An example of non-rechargeable batteries includes alkaline batteries. • Students will know that rechargeable batteries can be recharged because the chemical reactions are reversed when an external electrical current is supplied • Students will know that advantage of alkaline batteries is that they are cheap to manufacture. Disadvantages are that	• *Students need to already know that an electrolyte is a liquid (either molten or solution) that is capable of conducting electricity.* *Students need to already know that metals can conduct electricity*		Cell,: unit structure used to generate an electrical current by some means Battery: a container consisting of one or more cells Electrode: an electrical conductor that makes contact with the non-metallic circuit parts of a circuit electrolyte: a substance that conducts electricity when molten or dissolved in water

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	they can end up in landfill when discharged and that it is expensive to recycle them Students will know that advantage of rechargeable cells are that they can be recharged many times which reduces the use of resources. The disadvantage is that they are more expensive to manufacture than alkaline cells.			
Lesson: Fuel Cells (Triple only)	• Students will know that fuel cells are supplied by an external source of fuel (e.g. hydrogen) and oxygen or air. • Students will know that the fuel is oxidised electrochemically within the fuel cell to produce a potential difference. • Students will know that the overall reaction in a hydrogen fuel cell involves the oxidation of hydrogen to produce water. • Students will know that hydrogen fuel cells offer a potential alternative to rechargeable cells and batteries. • Students will know that the half equation at the cathode in a hydrogen fuel cell is: • $2H_2 + 4OH^- \rightarrow 4H_2O + 4e^-$ • Students will know that the half equation at the anode in a hydrogen fuel cell is: • $O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$ • Students will know advantages of hydrogen fuel cells include that they're easy to maintain, they are small in size and water is the only product. The disadvantages of hydrogen fuel cells is that they're very expensive to manufacture and they need a constant supply of hydrogen, which is a flammable gas	• *Students need to already know that the cathode is the negative electrode* • *Students need to already know that the anode is the positive electrode.*		External-the outward features of something. Channelled- a path along which information (such as data or music) in the form of an electrical signal passes. Oxidation- Loss of electrons Reduction- Gain of electrons

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	• Students will know how to evaluate the use of hydrogen fuel cells			