The Sutton Academy

Knowledge Rich Curriculum Plan

SCIENCE- Chemistry Year 10

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	Assessment	Support
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***	Understand how scientific methods and theories develop over time.	*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*	*Cold call questions:* *1. How might we distinguish between an endothermic and exothermic reaction?* *"Exothermic reactions feel hotter, endothermic reactions will feel colder"* *2. Photosynthesis is and endothermic reaction, how might you explain this?* *"Photosynthesis absorbs light energy from the sun, endothermic reactions absorb energy"* *Cold call questions:* *1. How might catalysts influence the temperature change in an exothermic reaction?* *"The catalyst makes the reaction happen quicker therefor the temperature would increase faster"*	Tassomai BBC Bitesize Knowledge organiser Kay Science videos
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	• ***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***	Use a variety of models such as representational, spatial, descriptive, computational and mathematical to solve problems, make predictions and to develop scientific explanations and understanding of familiar and unfamiliar facts	*Reaction profiles: Diagrams that can be used to show the relative energies of the reactants and products, activation energy and overall energy change.*	How might a reaction profile change if a catalyst I added? - A catalyst lowers the activation energy therefor the energy difference between the reactants and	Tassomai BBC Bitesize Knowledge organiser Kay Science videos

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	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				top of the peak will be less. If the energy of the products is less than that of the reactants on a reaction profile, what type of reaction is represented? -Exothermic because energy has exited to the surroundings.	
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 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.	• ***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***	Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena.	Bond- a lasting attraction between atoms, ions or molecules that enables the formation of chemical compounds. Overall- taking everything into account.	Cold call questions: 1. How might the overall energy change value help to distinguish between an exo and endothermic reaction? "Positive energy changes represent an endothermic reaction because energy is entering the system" "Negative energy changes represent an exothermic reaction because energy is being lost from the system"	Tassomai BBC Bitesize Knowledge organiser Kay Science videos

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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 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.	• ***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***	Understand how scientific methods and theories develop over time.	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	How might a greater voltage be achieved? -Create a battery, which is 2 or more cells connected together in series. Why will a non-rechargable battery eventually stop producing electricity? -When one of the reactants have been completely used up. Explain why might a non-rechargeable batteries still be favoured over the use of rechargeable batteries? -Alkaline batteries are cheap to manufacture. Why might a re-chargeable battery be considered better for the environment? -They can be recharged and used over again because the chemical reactions can be reversed. This reduces the need for more natural resources to be used and fewer batteries will end up in landfill sites.	Making cells using tinfoil, cardboard, coins and salt water Tassomai BBC Bitesize Knowledge organiser Kay Science videos

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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 will know how to evaluate the use of hydrogen fuel cells	• ***Students need to already know that the cathode is the negative electrode*** • ***Students need to already know that the anode is the positive electrode.***	Understand how scientific methods and theories develop over time.	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	What is the balanced chemical equation for the reaction that takes place in a hydrogen fuel cell. Explain why might a company manufacturing electric cars consider using hydrogen fuel cells to power the vehicle? -Hydrogen fuel cells are easily maintained and small in size. They only produce water, therefore do not pollute the environment by releasing harmful greenhouse gases. Explain why a car manufacturer may choose to continue to make cars with petrol engines instead of hydrogen fuel cells? -Hydrogen fuel cells are expensive and it is difficult to store hydrogen gas because it is highly flammable.	Tassomai BBC Bitesize Knowledge organiser Kay Science videos