



The Sutton Academy

Knowledge Rich Curriculum Plan

SCIENCE- Chemistry Year 10

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	Support
Lesson: Measuring Rates	- Students will know that the rate of a chemical reaction can be found by measuring the quantity of a reactant being used or by measuring the quantity of a product being formed - Students will know that the quantity of a product or reactant can be measured by the mass in grams or by a volume in cm³ - Students will know how to determine which method is best used for measuring the rate of a reaction	<i>Students need to already know that mass is measured using a digital balance</i> <i>Students need to already know that volume can be measured using a measuring cylinder or a gas syringe</i>	Recognise and use expressions in decimal form. Use ratios, fractions and percentages. Make estimates of the results of simple calculations. Translate information between graphical and numeric form. Drawing and interpreting appropriate graphs from data to determine rate of reaction. Plot two variables from experimental or other data. Determine the slope and intercept of a linear graph. Draw and use the slope of a tangent to a curve as a measure of rate of change.	Tier 2 Relative: in relation to something else Tier 3 Reactant: substance that reacts during a chemical reaction Product: substance that is produced during a chemical reaction	BBC Bitesize Knowledge organiser Kay Science videos Tassomai
Lesson: Calculating Rates of Reactions	- Students will know that the rate of a chemical reaction can be calculated using: mean rate of reaction = quantity of reactant used ÷ time taken OR mean rate of reaction = quantity of product formed ÷ time taken - Students will know that the units of rate of reaction may be given as g/ or cm³/s (or, for HT, as mol/s) - Students will know how to calculate mean rate of reaction from given information - HT only - Students will know how to draw tangents to curves on rates of reaction graphs, and calculate the gradient of the tangent	<i>Students need to already know how to draw axis for a graph accurately</i> <i>Students need to already know that gradients are calculated by using:</i> <i>gradient = change in y ÷ change in x</i>	Recognise and use expressions in decimal form. Use ratios, fractions and percentages. Make estimates of the results of simple calculations. Translate information between graphical and numeric form. Drawing and interpreting appropriate graphs from data to determine rate of reaction. Plot two variables from experimental or other data. Determine the slope and intercept of a linear graph.		BBC Bitesize Knowledge organiser Kay Science videos Tassomai

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	Students will know how to draw and interpret graphs, showing the quantity of product formed or quantity of reactants used up		Draw and use the slope of a tangent to a curve as a measure of rate of change.		
Lesson: Factors Affecting Rates	- Students will know that factors that affect the rates of reaction include: the concentration of reactants in solution, the pressure of reacting gases, the surface area of solid reactants, the temperature and the presence of catalysts - Students will know that collision theory explains how various factors affect rates of reaction. - Students will know that collision theory states that for chemical reactions to occur the reacting particles must collide with each other with sufficient energy - Students will know that the minimum amount of energy the particles must have to react is called the activation energy - Students will know that increasing the concentration of reactants in solution, the pressure of reacting gases and the surface area of solid reactants increases the frequency of collisions and so increases the rate of reaction - Students will know that increasing the temperature increases the frequency of collisions and makes the collisions more energetic, increasing the rate of reaction. - Students will know how to predict and explain, using collision theory, the effects of changing conditions	<i>Students need to already know that rate of reaction is a measure of how quickly a reaction takes place.</i>	Recognise and use expressions in decimal form. Use ratios, fractions and percentages. Make estimates of the results of simple calculations. Translate information between graphical and numeric form. Drawing and interpreting appropriate graphs from data to determine rate of reaction. Plot two variables from experimental or other data. Determine the slope and intercept of a linear graph. Draw and use the slope of a tangent to a curve as a measure of rate of change.	Tier 2 Frequency: the rate at which something occurs Tier 3 Catalyst: Substance that speeds up the rate of reaction without itself being used up Activation energy: minimum energy particles must have to react	BBC Bitesize Knowledge organiser Kay Science videos Tassomai

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	of concentration, pressure and temperature on the rate of reaction - Students will know how to predict and explain the effects of changes in the size of pieces of a reacting solid in terms of surface area to volume ratio. - Students will know how to use simple ideas about proportionality when using collision theory to explain the effect of a factor on the rate of a reaction				
Lesson: Factors Affecting Rates of Reaction - Required Practical	- Students will know that the independent variable when investigating rates of reaction is the concentration of the solution - Students will know that rate of reaction can be practically determined by measuring that volume of gas produced or by measuring a change in turbidity - Students will know that turbidity is a measure of how cloudy/ opaque a mixture is - Students will know how to describe a method used to determine how concentration affects the rate of reaction - Students will know how to develop a hypothesis	<i>Students need to already know that factors affecting rates of reaction are: concentration, pressure of gases, surface area, temperature and the presence of a catalyst.</i>	Recognise and use expressions in decimal form. Use ratios, fractions and percentages. Make estimates of the results of simple calculations. Translate information between graphical and numeric form. Drawing and interpreting appropriate graphs from data to determine rate of reaction. Plot two variables from experimental or other data. Determine the slope and intercept of a linear graph. Draw and use the slope of a tangent to a curve as a measure of rate of change.		BBC Bitesize Knowledge organiser Kay Science videos Tassomai
Lesson: Catalysts	- Students will know that catalysts change the rate of reaction without being used up. - Students will know that an example of a catalyst is enzymes - Students will know that catalysts increase the rate of reaction by providing a different pathway for	<i>Students need to already know how to draw reaction profiles.</i>	Recognise and use expressions in decimal form. Use ratios, fractions and percentages. Make estimates of the results of simple calculations.	Tier 2 Tier 3 Catalyst: substance that speeds up the rate of reaction	BBC Bitesize Knowledge organiser Kay Science videos Tassomai

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	the reaction that has a lower activation energy - Students will know how to represent a catalysed reaction using a reaction profile. - Students will know how to identify catalysts in reactions from their effect on the rate of reaction and because they are not included in the chemical equation for the reaction		Translate information between graphical and numeric form. Drawing and interpreting appropriate graphs from data to determine rate of reaction. Plot two variables from experimental or other data. Determine the slope and intercept of a linear graph. Draw and use the slope of a tangent to a curve as a measure of rate of change.	without itself being used up Enzyme: biological catalyst	
Lesson: Reversible Reactions	- Students will know that in some chemical reactions, the products of the reaction can react to produce the original reactants. These reactions are called reversible reactions - Students will know that if an equation contains a double arrow ($\rightleftharpoons$) that it is a reversible reaction - Students will know that the direction of a reversible reaction can be changed by changing the conditions - Students will know that if a reversible reaction is exothermic in one direction, it is endothermic in the opposite direction. - Students will know that the same amount of energy is transferred in both directions of a reversible reaction - Students need to know that when a reversible reaction occurs in a reaction vessel that prevents the escape of reactants and products equilibrium is reached. This means that the forward	<i>Students already need to know that exothermic reactions release heat energy to their surroundings</i> <i>Students already need to know that endothermic reactions release heat energy to their surroundings</i>	Recognise and use expressions in decimal form. Use ratios, fractions and percentages. Make estimates of the results of simple calculations. Translate information between graphical and numeric form. Drawing and interpreting appropriate graphs from data to determine rate of reaction. Plot two variables from experimental or other data. Determine the slope and intercept of a linear graph. Draw and use the slope of a tangent to a curve as a measure of rate of change.	Tier 2 Reversible: capable of going in both directions Tier 3 Dynamic Equilibrium: when, in a reversible reaction, the forwards reaction is going at the same rate as the backwards reaction	BBC Bitesize Knowledge organiser Kay Science videos Tassomai

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	and reverse reactions happen at exactly the same rate				
Lesson: The Effect of Changing Conditions on Equilibrium (HT only)	- Students will know that the relative amounts of reactants and products at equilibrium depends on the conditions of the reaction - Students will know that if there is a change in conditions of a system in equilibrium then the system responds to counteract the change - Students will know that the effects of changing conditions on a system at equilibrium can be predicted using Le Chatelier's Principle - Students will know that if the concentration of a reactant is increased, more products will be formed until equilibrium is reached again - Students will know that if the concentration of a product is decreased, more reactants will react until equilibrium is reached again - Students will know how to interpret appropriate data to predict the effect of a change in concentration of a reactant or product on given reactions at equilibrium. - Students will know that if the temperature of a system at equilibrium is increased: The relative amount of products at equilibrium increases for an endothermic reaction	<i>Students already need to know that exothermic reactions release heat energy to their surroundings</i> <i>Students already need to know that endothermic reactions release heat energy to their surroundings</i>	Recognise and use expressions in decimal form. Use ratios, fractions and percentages. Make estimates of the results of simple calculations. Translate information between graphical and numeric form. Drawing and interpreting appropriate graphs from data to determine rate of reaction. Plot two variables from experimental or other data. Determine the slope and intercept of a linear graph. Draw and use the slope of a tangent to a curve as a measure of rate of change.	Tier 2 Counteract: act against something to reduce it Tier 3 Gaseous: involving gases	BBC Bitesize Knowledge organiser Kay Science videos Tassomai

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	The relative amounts of products at equilibrium decreases for an exothermic reaction - Students will know that if the temperature of a system at equilibrium is decreased: The relative amount of products at equilibrium decreases for an endothermic reaction The relative amounts of products at equilibrium increases for an exothermic reaction - Students will know that for a gaseous reaction at equilibrium an increase in pressure causes the equilibrium position to shift towards the side with the smaller number of molecules as shown by the symbol equation for that reaction - Students will know that for a gaseous reaction at equilibrium a decrease in pressure causes the equilibrium position to shift towards the side with the larger number of molecules as shown by the symbol equation for that reaction				