Learning Journey – C6 The Rate and Extent of Chemical Change

What have I done previously in my learning journey?	
Previously….	**You have learnt previously about chemical reactions. This has involved:** • Knowing that chemical reactions involve the rearrangement of atoms • Representing chemical reactions using formulae and using equations • Learning about different chemical reactions including combustion, thermal decomposition, oxidation and displacement reactions
In this topic…	Chemical reactions can occur at vastly different rates. Whilst the reactivity of chemicals is a significant factor in how fast chemical reactions proceed, there are many variables that can be manipulated to speed them up or slow them down. Chemical reactions may also be reversible and therefore the effect of different variables needs to be established to identify how to maximise the yield of desired product. Understanding energy changes that accompany chemical reactions is important for this process.

We will develop our learning by studying the following each lesson:	**RAG**	**Skills in Science checklist**
C6.01 Rates of Reaction • Describe how we can show the rate of reaction on a graph. • Explain what is meant by collision theory and how it affects the rate of reaction.		☐ Scientific Methods ☐ Practical ☐ Number skills ☐ Application ☐ Communication
C6.02 Calculating Rates of Reaction • Describe methods of measuring the rate of reaction using gas syringes, collection over water or balances • Calculate the rate of reaction from measuring products or reactants • Draw tangents to the curves on rates of reaction graphs and use the slope of the tangent as a measure of the rate of reaction • Calculate the gradient of a tangent to the curve on these graphs as a measure of rate of reaction at a specific time (**HT only**)		☐ Scientific Methods ☐ Practical ☐ Number skills ☐ Application ☐ Communication
C6.03 Factors Affecting the Rate of Reaction • Describe how changing certain factors (temperature, concentration, pressure, surface area and catalysts) affects the rate of chemical reactions.		☐ Scientific Methods ☐ Practical ☐ Number skills ☐ Application ☐ Communication
C6.04 Measuring the Rate of Reaction (RP) Part 1 • Investigate how changes in concentration affect the rates of reactions using two methods: i. A method involving measuring the volume of a gas produced ii. A method involving a change in colour or turbidity.		☐ Scientific Methods ☐ Practical ☐ Number skills ☐ Application ☐ Communication
C6.05 Measuring the Rate of Reaction (RP) Part 2 • Investigate how changes in concentration affect the rates of reactions using two methods: i. A method involving measuring the volume of a gas produced ii. A method involving a change in colour or turbidity.		☐ Scientific Methods ☐ Practical ☐ Number skills ☐ Application ☐ Communication
C6.06 Reversible Reactions • Explain what is meant by a reversible reaction. • Recall the definitions of exothermic and endothermic. • Describe the effects of temperature on the reversible reaction.		☐ Scientific Methods ☐ Practical ☐ Number skills ☐ Application ☐ Communication
C6.07 Equilibrium • Explain the term equilibrium and given suitable examples of when it can occur. • Explain that the position of equilibrium depends on the conditions of the reaction and the equilibrium will change to counteract any changes to conditions (**HT only**) • Explain and predict the effect of a change in concentration of reactants or products, temperature, or pressure of gases on the equilibrium position of a reaction (**HT only**)		☐ Scientific Methods ☐ Practical ☐ Number skills ☐ Application ☐ Communication

Key Vocabulary

rate	**tangent**	**gradient**	**concentration**	**pressure**	**Surface area**	**temperature**	**catalyst**	**collision theory**
activation energy	**reaction profile**	**reversible reaction**	**endothermic**	**exothermic**	**equilibrium**	**forward reaction**	**reverse reaction**	

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Future Learning	In AS Level Chemistry there is a building on the content from GCSE in a topic called 'Kinetics'. The study of kinetics enables chemists to determine how a change in conditions affects the speed of a chemical reaction. Whilst the reactivity of chemicals is a significant factor in how fast chemical reactions proceed, there are variables that can be manipulated to speed them up or slow them down. In contrast with kinetics, which is a study of how quickly reactions occur, a study of 'Equilibria' indicates how far reactions will go. Le Chatelier's principle can be used to predict the effects of changes in temperature, pressure and concentration on the yield of a reversible reaction. This has important consequences for many industrial processes. The further study of the equilibrium constant, K_c, considers how the mathematical expression for the equilibrium constant enables us to calculate how an equilibrium yield will be influenced by the concentration of reactants and products.
In careers	In industry, chemists and chemical engineers determine the effect of different variables on reaction rate and yield of product. Whilst there may be compromises to be made, they carry out optimisation processes to ensure that enough product is produced within a sufficient time, and in an energy-efficient way.