AQA Chemistry Unit 6 The Rate and Extent of Chemical Change
Student Progress Sheet

Name: **Target:**

Unit 5.6 – The Rate and Extent of Chemical Change

5.6.1. Rate of Reaction

5.6.1.1. Calculating Rates of Reactions

a	I know that the rate of a chemical reaction can be found by measuring the quantity of a reactant used or the quantity of product formed over time: mean rate of reaction = quantity of reactant used / time taken mean rate of reaction = quantity of product formed / time taken			
b	I know that the quantity of reactant or product can be measured by the mass in grams or by a volume in cm3.			
c	I know that the units of rate of reaction may be given as g/s or cm3/s.			
d	I can describe the quantity of reactants in terms of moles and units for rate of reaction in mol/s (HT only).			
e	I can calculate the mean rate of a reaction from given information about the quantity of a reactant used or the quantity of a product formed and the time taken.			
f	I can draw, and interpret, graphs showing the quantity of product formed or quantity of reactant used up against time.			
g	I can draw tangents to the curves on these graphs and use the slope of the tangent as a measure of the rate of reaction.			
h	I can 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).			

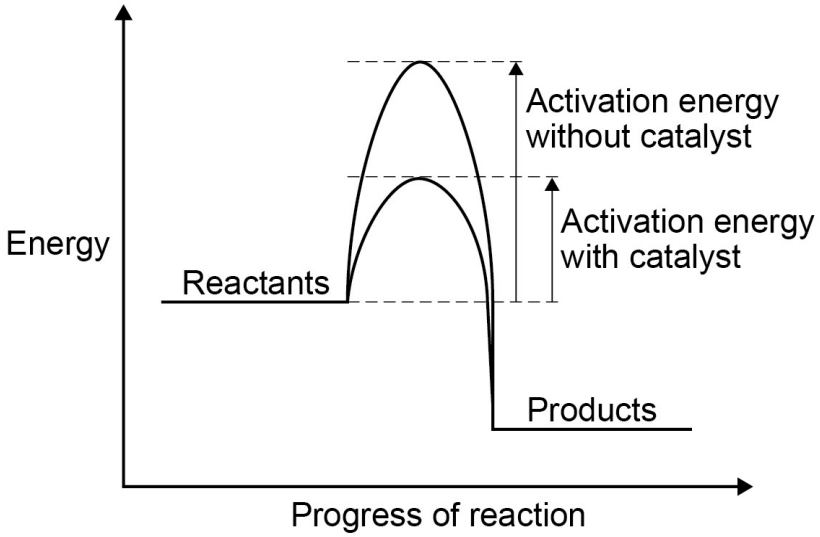
5.6.1.2. Factors which Affect the Rates of Chemical Reactions

a	I can state the factors which affect the rates of chemical reactions including: the concentrations of reactants in solution, the pressure of reacting gases, the surface area of solid reactants, the temperature and the presence of catalysts.			
b	I can describe how changing these factors affects the rate of chemical reactions.			

5.6.1.3. Collision Theory and Activation Energy

a	I can state the various factors that affect rates of reactions (concentration, surface area, pressure, temperature).			
b	I can describe how 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.			
c	I know that chemical reactions can occur only when reacting particles collide with each other and with sufficient energy and that the minimum amount of energy that particles must have to react is called the activation energy.			
d	I can describe how increasing the temperature increases the frequency of collisions and makes the collisions more energetic, and so increases the rate of reaction.			
e	I can predict and explain (using collision theory) the effects of changing conditions of concentration, pressure and temperature on the rate of a reaction.			
f	I can predict and explain the effects of changes in the size of pieces of a reacting solid in terms of surface area to volume ratio.			
g	I can use simple ideas about proportionality when using collision theory to explain the effect of a factor on the rate of a reaction.			

5.6.1.4. Catalysts

a	I know that catalysts change the rate of chemical reactions but are not used up during the reaction and that different reactions need different catalysts.			
b	I know that catalysts increase the rate of reaction by providing a different pathway for the reaction that has a lower activation energy.			
c	I know that a reaction profile for a catalysed reaction can be drawn in the following form:  			
d	I can 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.			
e	I can explain catalytic action in terms of activation energy.			
f	I know that enzymes act as catalysts in biological systems.			

5.6.2. Reversible Reactions and Dynamic Equilibrium

5.6.2.1. Reversible Reactions

a	I know that in some chemical reactions, the products of the reaction can react to produce the original reactants. Such reactions are called reversible reactions and are represented: $A + B \rightleftharpoons C + D$			
b	I know that the direction of reversible reactions can be changed by changing the conditions. For example: $\text{ammonium chloride} \underset{\text{cool}}{\overset{\text{heat}}{\rightleftharpoons}} \text{ammonia + hydrogen chloride}$			

5.6.2.2. Energy Changes and Reversible Reactions

a	If a reversible reaction is exothermic in one direction, it is endothermic in the opposite direction. The same amount of energy is transferred in each case. For example: $\text{hydrated copper sulfate (blue)} \underset{\text{exothermic}}{\overset{\text{endothermic}}{\rightleftharpoons}} \text{anhydrous copper sulfate (white)} + \text{water}$			

5.6.2.3. Equilibrium

a	I know that when a reversible reaction occurs in apparatus which prevents the escape of reactants and products, equilibrium is reached when the forward and reverse reactions occur at exactly the same rate.			

5.6.2.4. The Effect of Changing Conditions on Equilibrium (HT Only)

a	I know that the relative amounts of all the reactants and products at equilibrium depend on the conditions of the reaction.			
b	I know that if a system is at equilibrium and a change is made to any of the conditions, then the system responds to counteract the change.			
c	I know the effects of changing conditions on a system at equilibrium can be predicted using Le Chatelier's Principle.			
d	I can make qualitative predictions about the effect of changes on systems at equilibrium when given appropriate information.			

5.6.2.5. The Effect of Changing Concentration (HT Only)

a	I know that if the concentration of one of the reactants or products is changed, the system is no longer at equilibrium and the concentrations of all the substances will change until equilibrium is reached again: If the concentration of a reactant is increased, more products will be formed until equilibrium is reached again. If the concentration of a product is decreased, more reactants will react until equilibrium is reached again.			
b	I can interpret data to predict the effect of a change in concentration of a reactant or product on given reactions at equilibrium.			

5.6.2.6. The Effect of Temperature Changes on Equilibrium (HT Only)

a	I know that if the temperature of a system at equilibrium is increased: The relative amount of products at equilibrium increases for an endothermic reaction. The relative amount of products at equilibrium decreases for an exothermic reaction.			
b	I 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 amount of products at equilibrium increases for an exothermic reaction.			
c	I can interpret data to predict the effect of a change in temperature on given reactions at equilibrium.			

5.6.2.7. The Effect of Pressure Changes on Equilibrium (HT Only)

a	I know that for gaseous reactions 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. 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.			
b	I can interpret data to predict the effect of pressure changes on given reactions at equilibrium.			