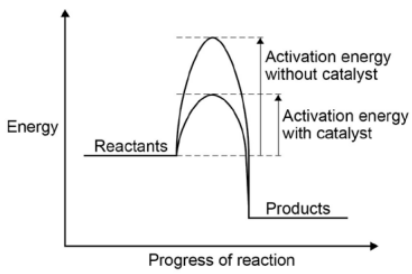
AQA Trilogy-Chemistry key terms – The rate and extent of chemical changes

Rate of reaction and collison theory	
Find rate of a chemical reaction from: Rate of reaction = amount of reactant used ÷ time Rate of reaction = amount of product formed ÷ time The quantity of reactant or product can be measured by the mass in grams or by a volume in cm3 . The units of rate of reaction may be given as g/s or cm3 /s Or mol/s for HT ONLY	We can follow the rate of reaction by timing many things – e.g. loss of mass, the volume of gas produced, appearance of a coloured product.
The slope of a graph drawn from experiments tells us the **rate of reaction** at that time. The steeper the slope, the faster the reaction. HT ONLY: To measure the rate of reaction at a specific time calculate the gradient of a tangent to the curve.	To react, particles must collide with enough energy -the minimum amount of energy particles must have to react is called the activation energy.
Increasing temperature increases the speed of the particles so that they collide more frequently and more energetically. This increases the rate of reaction.	Increasing the pressure of reacting gases makes particles closer together so increases the frequency of collisions and so increases the rate of reaction.
Increasing the concentration of reactants in solutions makes particles closer so increases the frequency of collisions and so increases the rate of reaction.	Increasing the surface area of solid reactants increases the frequency of collisions and so increases the rate of reaction.
Catalysts	
Catalysts increase the rate of chemical reactions but are not used up during the reaction. Different reactions need different catalysts. They are NOT included in the chemical equation for the reaction. E.g Enzymes	Catalysts are important in increasing the rates of chemical reactions used in industrial processes to reduce costs.
Catalysts increase the rate of reaction by providing a different pathway for the reaction that has a lower activation energy  	

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<u>Reversible reactions and equilibrium</u>	
In <u>reversible</u> reaction the products of the reaction can react to produce the original reactants. A + B $\rightleftharpoons$ C + D	For example: Hydrated copper $\xrightleftharpoons[\text{xothermic}]{\text{ndothermic}}$ Anhydrous copper sulphate + water
One direction is exothermic and the other is endothermic. The <u>same amount</u> of energy is transferred in each case.	Equilibrium is reached when the forward and reverse reactions occur at exactly the same rate.
HT ONLY: The relative amounts of all the reactants and products at equilibrium depend on the conditions of the reaction. If a system is at equilibrium and a change is made to any of the conditions, then the system responds to counteract the change.	HT ONLY: Le Chatelier's Principle (Concentration). 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.
HT ONLY: Le Chatelier's Principle (Temperature) 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. 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..	HT ONLY: Le Chatelier's Principle (Pressure) 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.