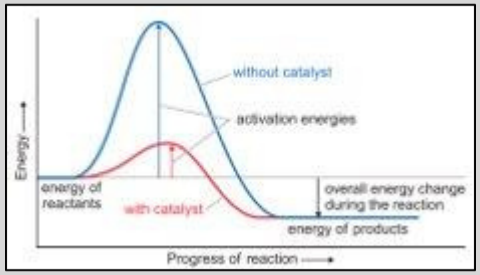
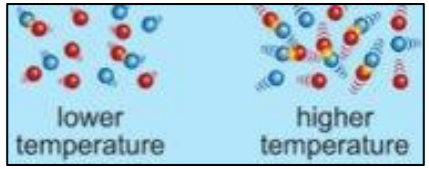
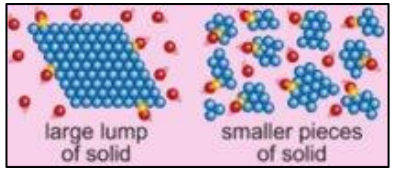
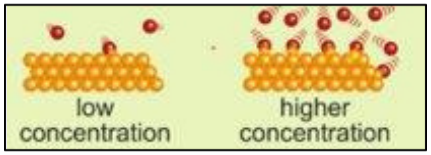
K nowledge Organiser: Chemistry, Rates of Reaction and Heat Changes Part A

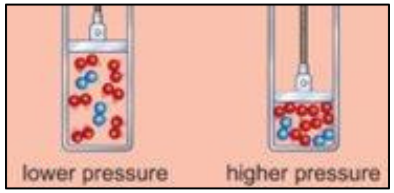
1	**Rate of reaction**is the speed at which**reactants**turn into**products**
2	Rate of reaction can be altered by changing**concentration**of solutions,**particlesize**of reactants
3	Reactions are typically faster at the start as concentration of reactants is highest
4	Rates of reaction can be monitored by**change in volume**e.g. gascollected in a gas syringe,**change in mass**using a mass balance or**changein colour**e.g. disappearing cross reaction.
5	**Activation energy**is the minimum energy reactants have to have whenthey collide for a new product to be made.It is shown as the 'hump' on**reaction profiles**.
6	**Exothermic**reactions -energy is transferred from stores of energy inchemical bonds to the surroundingswhen a new product is made. E.g. **combustion** reactions, **neutralisation** reactions
7	**Endothermic**reactions -energy is transferred from the surrounding tostores of energy in chemical bonds when a new product is made. E.g.photosynthesis, some precipitation reactions
8	**Increasing concentration**increases reaction rate As collisions between reactants is more likely
9	**Increasing surface area**increases reaction rate as more reactants can come into contact with each other.
10	**Increasing pressure**increases reaction rate as particles are closer together so more likely to collide.

11	**Increasing temperature**increases reaction rate as particle movefaster with more energy so more likely to collide with enough energy.
12	**Catalysts**speed up reactions but are**not used up**by them.Catalysts**lower**the**activation energy**needed in a reaction so have a lower**reaction profile**: 
13	**Catalysts**are used to**speed up**industrial processes e.g.**platinum**when making**nitric acid**from ammonia,**iron**in the manufacture ofammonia (**Haber process**).

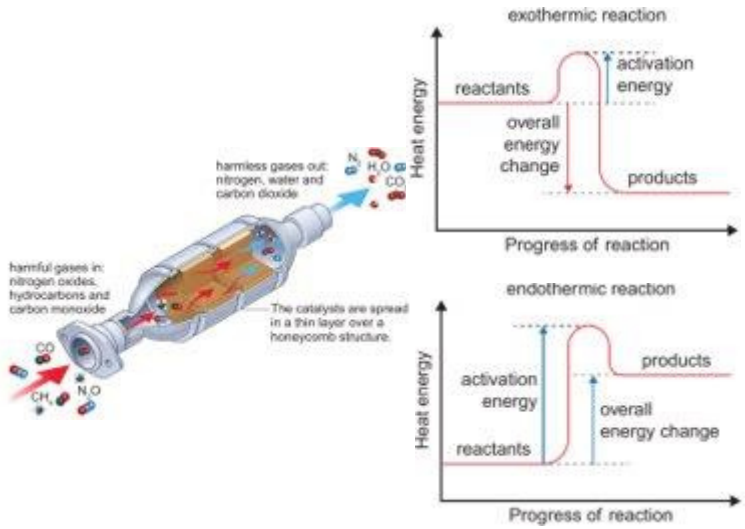








14	Cars are fitted with**catalyticconverters**,catalysts**platinum**and**palladium**are used to convert harmful gases into harmless ones.Thesemetals are expensive but not used up.
15	The human body relies on**enzymes**these are**biological catalysts**.Theseare complex proteins that have a specific shape called an**active site**where the reactant moleculesfit (**substrate**).Enzymes areshapespecificworking on one type of substrate (lock and key)
16	**Enzymes**are sensitive to**temperature**and**ph.**Large changes candenature (change shape) their molecules, meaning they stop working asthe substrate will no longer fit.
17	**Reaction profiles**model the energy change during a chemical reaction
18	**Exothermic**reaction profiles:heat energy of the reactants is greater thanthe products -**heat energy**is**given out**to the surroundings
19	**Endothermic**reaction profile: heat energy of The reactants is less than the products-**heat energy** is **taken in** from the surroundings



20	Displacement reactions (more reactive element replaces less reactiveone) are exothermic
21	Precipitation reactions (insoluble product from two solutions) can beendothermic or Exothermic.We can use a thermometer to tell as most of the energyis transferred as heat.
22	During a chemical reactions energyis taken in to break the bonds inthe reactants (**endo-thermic process**). Then energy is given out(**exothermic process**) when new bonds are formed by the product.**Overall**the reaction is**exothermic**if more energy is given out frommaking bonds in the product than taken out when breaking the bondsin the reactants.
23	**Bond energy**is measured in kilojoules per mole (**kJmol-1**). Scientistswork out the energy taken to break one mole ofparticular type ofbonde.g.C-H413 kJmol-1.Energytaken to break a bond is the sameas the energy releasing when making that bond.
24	Calculating energy changes in reaction: Step 1 calculate the**energy in**(bonds broken) Step 2 calculate**energy out**(bonds made Step 3**Energy change = energy in—energy out**
25	Displacement reactions (more reactive element replaces less reactiveone) are exothermic !Negative signshows the reactions isexothermic (endothermic has apositive sign)!