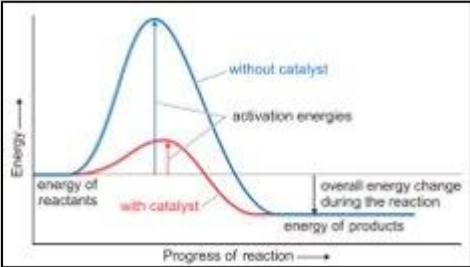
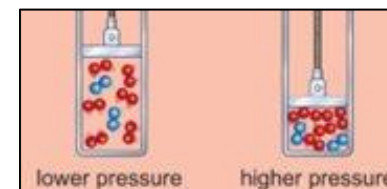
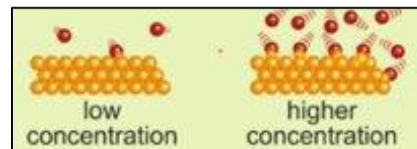
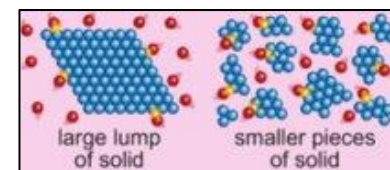
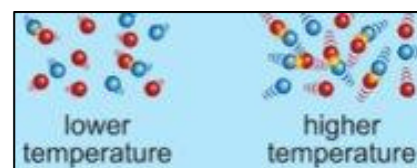
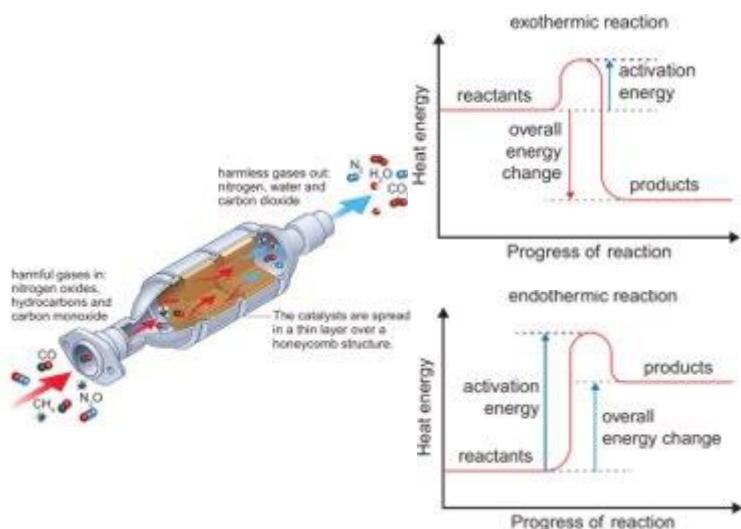


1	Rate of reaction is the speed at which reactants turn into products
2	Rate of reaction can be altered by changing concentration of solutions, particle size of reactants
3	Reactions are typically faster at the start as concentration of reactants is highest
4	Rates of reaction can be monitored by change in volume e.g. gas collected in a gas syringe, change in mass using a mass balance or change in colour e.g. disappearing cross reaction.
5	Activation energy is the minimum energy reactants have to have when they 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 in chemical bonds to the surroundings when a new product is made. E.g. combustion reactions, neutralisation reactions
7	Endothermic reactions - energy is transferred from the surrounding to stores 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 particles move faster 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 of ammonia (Haber process).



14	Cars are fitted with catalytic converters , catalysts platinum and palladium are used to convert harmful gases into harmless ones. These metals are expensive but not used up.
15	The human body relies on enzymes these are biological catalysts . These are complex proteins that have a specific shape called an active site where the reactant molecules fit (substrate). Enzymes are shaped specific working on one type of substrate (lock and key)
16	Enzymes are sensitive to temperature and pH . Large changes can denature (change shape) their molecules, meaning they stop working as the 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 than the 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 reactive one) are exothermic
21	Precipitation reactions (insoluble product from two solutions) can be endothermic or exothermic. We can use a thermometer to tell as most of the energy is transferred as heat.
22	During a chemical reaction, energy is taken in to break the bonds in the 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 from making bonds in the product than taken out when breaking the bonds in the reactants.
23	Bond energy is measured in kilojoules per mole (kJmol⁻¹). Scientists work out the energy taken to break one mole of a particular type of bond, e.g. C-H 413 kJmol ⁻¹ . Energy taken to break a bond is the same as 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 reactive one) are exothermic

!Negative sign shows the reaction is exothermic (endothermic has a positive sign)!