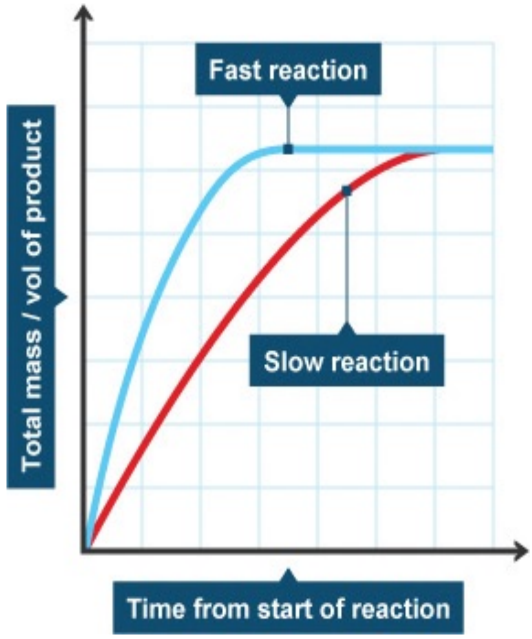
Rates of reaction:



How fast reactants are changed into products
Slow reactions: rusting of iron & chemical weathering
Fast reactions: explosions

Amount of product formed/ amount of reactant used up over time determines rate of reaction
Steep gradient & rapidly levels off on a graph = fast reaction rate

Collision theory:

Fast reaction rate:
High collision frequency & high energy transfer during the reaction

Increasing activation energy (to break bonds) = faster reaction rate

Factors effecting reaction rate:

Increasing temperature = particles collide quicker & more frequently as have higher kinetic energy

Increasing concentration/pressure = more particles in a given volume = more frequent collisions

Increasing surface area:volume by breaking up solids = have more area to work on = more frequent collisions

Catalysts reduce activation energy by finding alternative reaction pathways to speed up reactions

Measuring reaction rate:

Rate = amount of reactant used/product formed / time

Measuring reaction rate:

Precipitation & colour change:
Product becomes opaque from transparent
Mark fades during the reaction
Time loss/gain of colour
Subjectivity in results

Mass change:

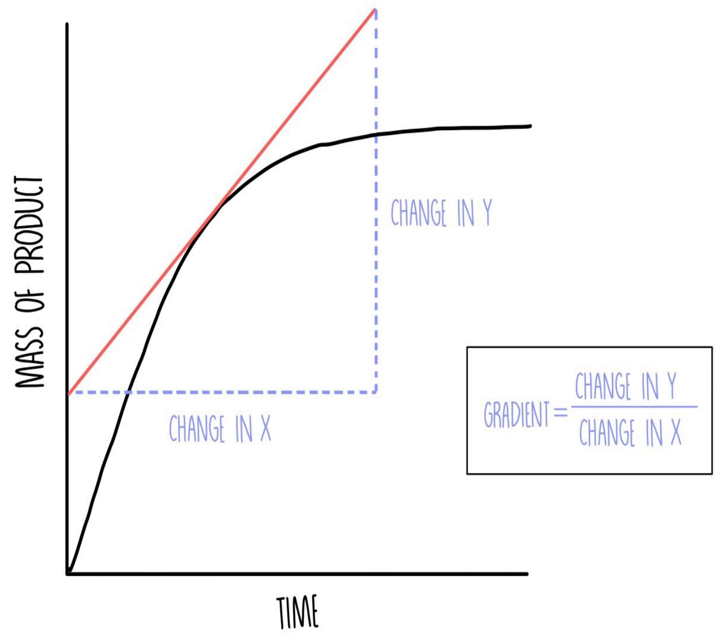
Gas dissipating observed on a balance
Quicker = faster reaction
Regular interval readings plotted on graphs for accuracy

Volume of gas released:

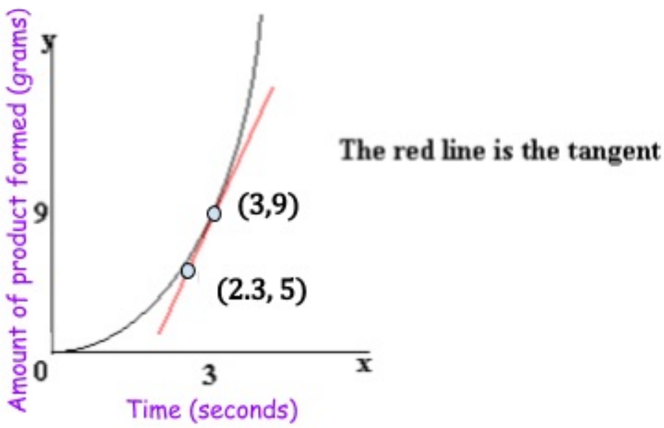
Use a gas syringe: faster reaction if more gas is given off rapid
Accurate if readings are taken at regular intervals
But if the reaction is too vigorous, the plunger can blow out of the end of the syringe

Reaction rates from graphs:

Mean reaction rate:
Product formed/reactant used up = y axis
Time = x axis
Mean rate = change in y value / total time taken



Tangent:
Find gradient of the slope at a particular time by drawing a tangent



Gradient of tangent = (change in y) / (change in x)
= (9 - 5) / (3 - 2.3)
= 5.71

Therefore rate of reaction = 5.71 g/s

Reversible reactions:

1. Concentrations fall so forward reaction slows but as more products are made, the backwards reaction speeds up
2. Forward reaction will equal the backwards reaction = dynamic equilibrium (no effect of any of the reactions as concentrations of reactants & products balance)

Equilibrium only reached in a CLOSED SYSTEM

Position of equilibrium:

Left leaning= higher concentration of products
Right leaning= higher concentration of reactants
Conditions:
Temperature, pressure & concentration of products & reactants

Reversible reactions:

Energy transferred from surroundings by endothermic reactions = energy transferred to the surroundings by the exothermic reaction

La Chatelier's principle:

Changing conditions of a reversible reaction at equilibrium = system will try to counteract the change
Predicts effects of changes in a system

Temperature changes:

Decrease temp = equilibrium moves in the exothermic direction to produce heat (more products formed for the exothermic reaction)

Increase temp = equilibrium moves in the endothermic direction to decrease it (more products formed for the endothermic reaction)

Pressure changes:

Increase= equilibrium moves to region with fewer gas particles (to decrease it)
Decrease= equilibrium moves to region with more gas particles (to increase it)

Concentration changes:

Increasing the concentration of the reactants/products = system increases the opposite (increasing the products/reactants) to counteract the change to reach equilibrium