

# Edexcel IGCSE Chemistry

## Topic 3: Physical chemistry

### Rates of reaction

#### Notes





### 3.9 describe experiments to investigate the effects of changes in surface area of a solid, concentration of a solution, temperature and the use of a catalyst on the rate of a reaction

- Use equations below to find the rate of reaction to compare the effect of changes in surface area, concentration, temperature, use of a catalyst etc...
- Rates of reactions can be measured using the amount of product used, or amount of product formed over time:

$$\text{Rate of reaction} = \frac{\text{amount of reactant used}}{\text{Time}}$$

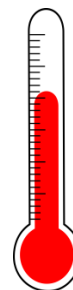
$$\text{Rate of reaction} = \frac{\text{amount of product formed}}{\text{Time}}$$

- o Quantity of reactant or product can be measured by the mass in grams or by a volume in  $\text{cm}^3$
- o Units of rate of reaction may be given as  $\text{g/s}$  or  $\text{cm}^3/\text{s}$
- o Use quantity of reactants in terms of moles and therefore, units for rate of reaction in  $\text{mol/s}$

### 3.10 describe the effects of changes in surface area of a solid, concentration of a solution, pressure of a gas, temperature and the use of a catalyst on the rate of a reaction



- Increasing the temperature increases the rate of reaction. As increasing temperature increases the speed of the moving particles, so they collide more frequently and energetically.



- Increasing pressure in reacting gases increases the rate of reaction, as it increases the frequency of collisions.
- Increasing concentration of reacting solutions increases the rate of reaction, as it increases the frequency of collisions.
- Increasing the surface area of solid reactants increases the rate of reaction, as it increases the frequency of collisions.
- Catalysts speed up chemical reactions

### 3.11 explain the effects of changes in surface area of a solid, concentration of a solution, pressure of a gas and temperature on the rate of a reaction in terms of particle collision theory

- see 3.10





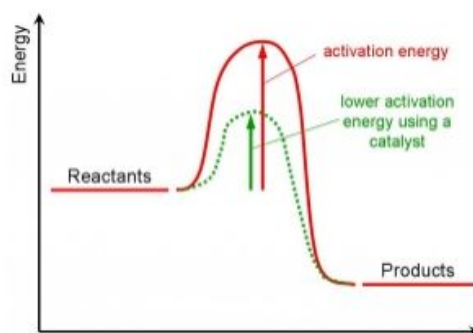
**3.12 know that a catalyst is a substance that increases the rate of a reaction, but is chemically unchanged at the end of the reaction**

- Catalysts are substances that speed up chemical reactions without being changed or used up during the reaction

**3.13 know that a catalyst works by providing an alternative pathway with lower activation energy**

- Catalysts provide an alternative pathway for a chemical reaction with a lower activation energy.
- this increases the proportion of particles with energy to react.

**3.14 (chemistry only) draw and explain reaction profile diagrams showing  $\Delta H$  and activation energy**



**3.15 practical: investigate the effect of changing the surface area of marble chips and of changing the concentration of hydrochloric acid on the rate of reaction between marble chips and dilute hydrochloric acid**

- using smaller marble chips (larger surface area), you should see an increase in reaction rate
- increasing the concentration of hydrochloric acid should increase the reaction rate

**3.16 practical: investigate the effect of different solids on the catalytic decomposition of hydrogen peroxide solution**

