

# “Chemical Changes and Structure” – Traffic Lights

## Chemical Reactions

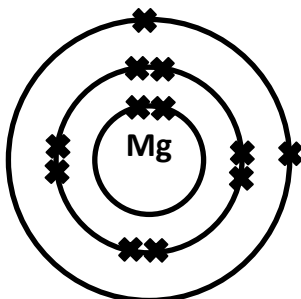
- Chemical reactions often **fizz (produce gas)**, **go cloudy (produce a solid)** or **change colour**.
- In a chemical reaction, a **new substance** is always formed.
- You can **increase the rate** (speed up) a chemical reaction by
  - **Reducing the particle size** of a solid
  - **Increasing the concentration** of a solution
  - Increasing the **temperature**
  - Adding a **catalyst**
- A **catalyst** is a substance that can **speed up a chemical reaction** but **remains unchanged** at the end of the reaction.
- Chemical reactions often produce **heat**, **light** and **sound** energy.

## Atoms

- An **atom** contains the following **particles**:

Particle	Mass (amu)	Charge	Where particle is found in atom
Proton	1	+1	In the nucleus
Electron	~0	-1	Orbiting the nucleus
Neutron	1	0	In the nucleus

- The **electrons** in atoms are arranged in **layers** or **“shells”** which can be drawn as shown below



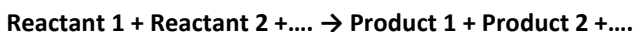
Magnesium, electron arrangement = 2,8,2

## Bonding

- Atoms form **bonds** to achieve a **stable electron arrangement**. This usually means that there will **be 8 electrons in the outer shell**.
- Covalent bonds are formed when atoms share electrons
- Compounds with **covalent bonds** are often **linear, bent, pyramidal or tetrahedral** molecules.
- An **ion** is an atom that has **lost or gained electrons**.
- **Ionic bonds** are formed when **positive and negative ions** are attracted to each other.
- **Ions** in a **solid** are often arranged in a **repeating structure** called a **lattice**.
- In a **metal**, **positive ions** are held together by a **“sea” of free electrons**
- The **free electrons** in a metal can **move** and allow **electricity to flow**.

## Equations and Formulae

- **“Reactants”** are the **ingredients** of a chemical reaction. **“Products”** are the **things made** in a chemical reaction.
- You can **write down a chemical reaction** as shown below:



- When a **chemical name** has a **prefix**, we can use the prefix to write down the formula.
  - *E.g. Sulphur difluoride = SF<sub>2</sub>*
- **Valency** is the **number of bonds** an atom can make.
- When a **chemical name** has no **prefix**, we need to use the valency/cross-over method to work out the formula.
  - *E.g. Sulphur fluoride: S – valency 2, F – valency 1 = SF<sub>2</sub>*
- The **relative atomic mass** of an element is the **average mass** of that element in atomic mass units (amu).
- The **formula mass** of a substance can be worked out by **combining all the relative atomic masses** of every atom in the substance
- The **total mass** of **all the reactants** in a chemical reaction is **always equal** to the **total mass** of **all the products**.