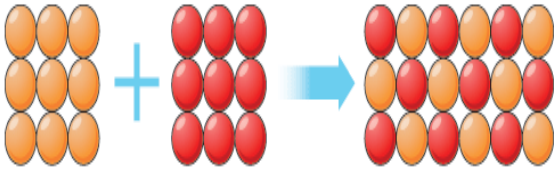
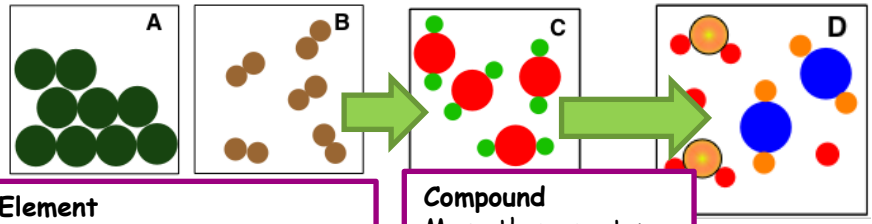
Y7 & 8 Compounds



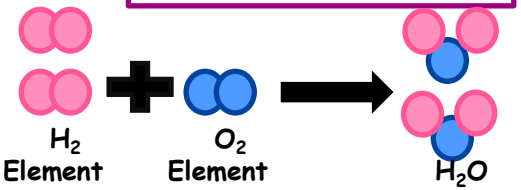
START



Element
All the same type of atom

Compound
More than one type of atom chemically bonded together

Mixture
More than one type of element or compound not chemically bound together



$2H_2 + O_2 \rightarrow 2H_2O$
Elements → Compound

To balance an equation there must be equal numbers of each type of atom before and after the reaction.
As there are 2 oxygen atoms before there must be 2 after. S we put a big 2 in front of the H_2O.
This then means there is now 4 hydrogen's so we put big 2 in front of the H_2 and they are now balanced.

Key words:

1. **Element:** All the same type of atom
2. **Compound:** More than one type of element chemically bound together
3. **Mixture:** More than one type of element or compound not chemically joined together
4. **Reactant:** Elements or compounds before a reaction has taken place
5. **Product:** Element or compound after a reaction has taken place
6. **Reaction:** When particles collide and new products are formed
7. **Molecule:** All the same type of atom chemically bonded together
8. **Fuel:** Chemical energy store
9. **Combustion:** When a fuel reacts with oxygen heat and light are given off
10. **Exothermic reaction:** A reaction that takes in heat from the surroundings so feels cold
11. **Endothermic reaction:** A reaction that gives out heat

Is this a chemical change or a physical change?

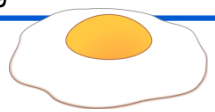
- Chemical as the products are different to the reactants
- It is chemically different from the start
- Bonds are made or broken to form the products

Physical change

- Reversible change (can be changed back)
- No new things are made
- E.g. melting, freezing, evaporating

Chemical change

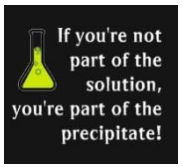
- Permanent change
- Can't be changed back
- New things are made
- Energy give of (heat/ light)
- Colour change
- Fizzing



How do you know a chemical reaction has taken place?

Bubbles / fizzing - A gas being released

A colour change

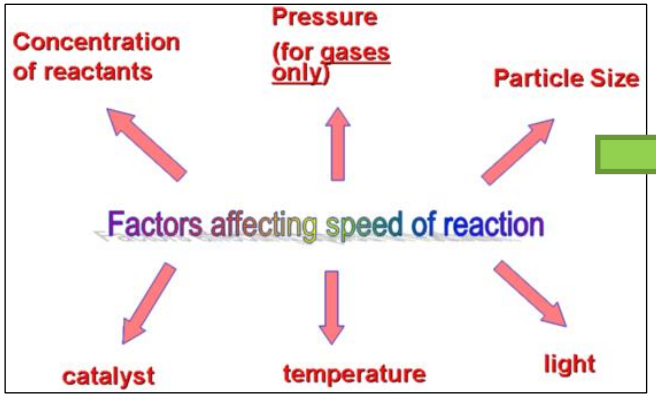


Bits / Precipitate

A temperature change

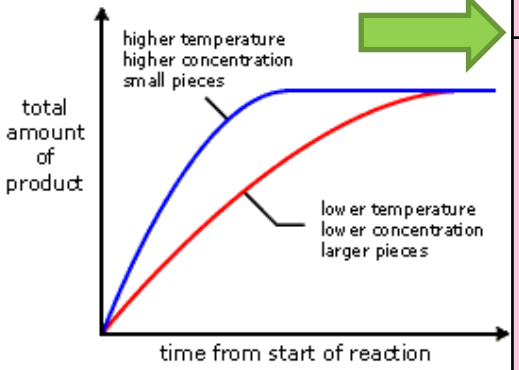
- Naming simple compounds
- Metal + oxygen = metal oxide
- E.g. magnesium + oxygen -> magnesium oxide
- $Mg + O_2 \rightarrow 2MgO$

- **Oxide** compounds contain **oxygen** atoms.
- **Chloride** compounds contain **chlorine** atoms.
- **Sulphide** compounds contain **sulphur** atoms.
- **Nitrate** compounds contain **nitrogen** and **oxygen**.
- **Sulphate** compounds contain **sulphur** and **oxygen**.



Temperature and rate of reaction

- The higher the temperature the more kinetic energy the particle have
- The more likely they will collide and react
- The quicker the rate of reaction

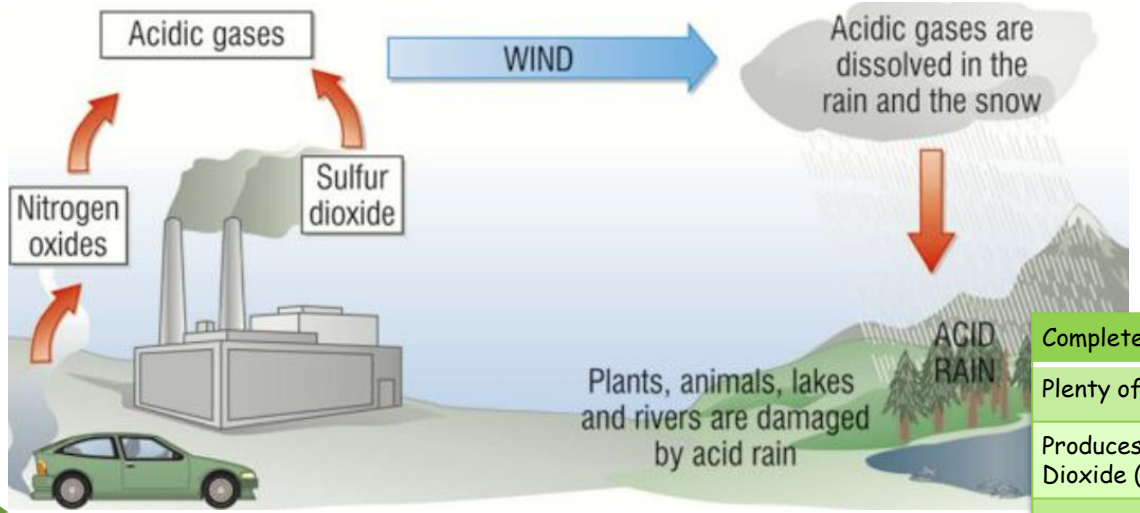


Small particles	Larger particles
Large surface area, therefore a higher **frequency of collisions** happen between reactants, **more successful collisions, meaning a faster rate of reaction**	Smaller surface area, therefore a **lower frequency of collisions** happen between reactants, there will be **fewer successful collisions, meaning a slower rate of reaction.**

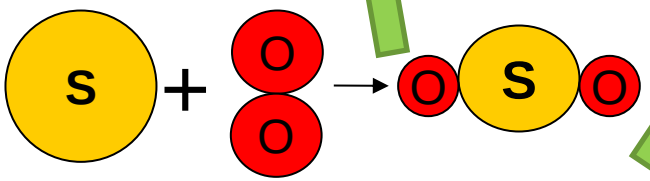
What is combustion?
Combustion is when a fuel is burnt in oxygen to release energy.

Acid Rain

- Factories and cars release nitrogen oxides and sulphur dioxide
- This reacts with the air to make acidic gases
- Wind causes the acidic gases to move
- Acidic gases are dissolved in the rain and the snow
- When it rains we get acid rain
- This damages plants, animals, lakes and rivers



Complete Combustion	Incomplete Combustion
Plenty of oxygen	Limited supply of oxygen
Produces Carbon Dioxide (CO_2)	Produces Carbon Monoxide (CO)
Produces water	
$C_4H_{12} + O_2 \rightarrow CO_2 + H_2O$	$C_3H_6 + O_2 \rightarrow CO + H_2O$

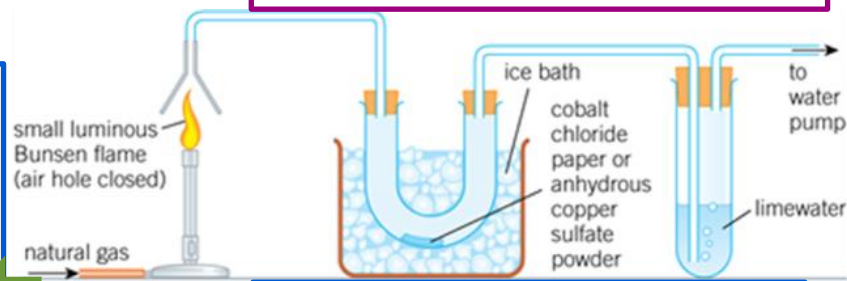


Impurities in fuels

- There are impurities in fuels such as sulphur and nitrogen
- When they are burn they react with oxygen
- Nitrogen + oxygen -> nitrogen oxide
- Sulphur + oxygen -> sulphur dioxide

- Black deposits form in the funnel, this is **unburnt carbon** (soot)
- The **water** bath condenses the water vapour and this turns the cobalt chloride paper from blue to pink.
- The limewater turns from colourless to cloudy when the **carbon dioxide** is bubbled through it.

Testing for the Products of Combustion



Carbon dioxide causes limewater to turn milky.

Conservation of Mass

The principle of conservation of mass states that in a chemical reaction, the total mass of the reactants must equal the total mass of the products.

Fe (Iron) + S (Sulfur) → FeS (Iron Sulfide)

When I burn a fuel the mass at the end has decreased from the start, why does this happen?

- As one of the products is carbon dioxide which is a gas it is lost into the atmosphere

- When we burn fuels or food we can measure the amount of energy transferred.
- This can be done by burning it and the energy that is released is transferred to water.
- We can measure how much the temperature increases by and calculate how much energy has been transferred to the water
- You must weigh the mass of water before the experiment

When we burn magnesium in air magnesium reacts with oxygen.

magnesium + oxygen -> magnesium oxide

$Mg + O_2 \rightarrow 2MgO$

Percentage of element = $\frac{\text{relative atomic mass of element}}{\text{relative formula mass of compound}} \times 100$

Exothermic reaction

- Gives off heat e.g. hand warmers
- More energy is used to make new bonds than break the old bonds = energy is given out so feels hot
- When the new bonds are made the energy is released as heat to the surroundings

Relative formula mass = M_r

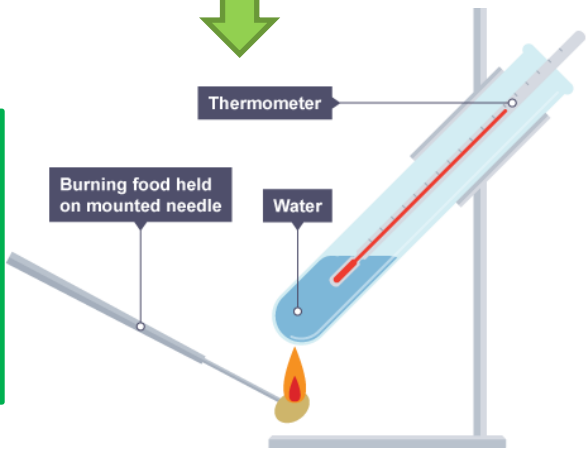
Is the mass of a compound so all of the individual A_r added together

What is the A_r of one oxygen atom

What is the M_r of an oxygen molecule O_2

Oxygen has an A_r of 16

O_2 has an M_r of 32 as 16 x 2 = 32



Endothermic reaction

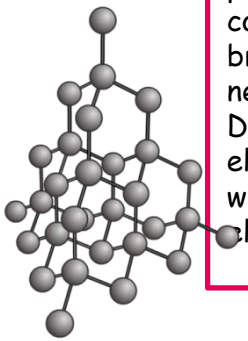
- Takes heat in so feel cold e.g. ice pack
- More energy is used to break the bonds than to make the new bods = energy is taken in so feels cold
- The energy is taken in from the surroundings to break the bonds so it feels cold

Why might this not be an accurate measure of energy released?

As not all energy will be transferred to the water, some will be lost to the surroundings

energy transferred (J) = mass of water (g) × 4.2 (J/g°C) × temperature increase (°C)

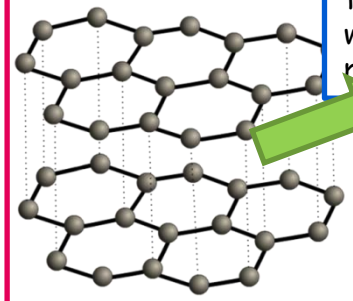
Diamond



Very hard and strong with a high melting point because each carbon has four strong covalent bonds to other carbon atoms. To break these a large amount of energy is needed.
Does not conduct electricity because all the electrons are used to form covalent bonds with other carbon atoms. Without free electrons diamond cannot conduct electricity.

Can you use the structure and bonding of diamond to explain why it would be used for tipping drills?

Graphite



It is much softer than diamond because the carb on atoms are only bonded to 3 others by strong covalent bonds in layers. The layers are held together by weak forces which are easily broken. This allows the layers to slide over one another.
Because each carbon atom only forms 3 covalent bonds with others there are free electrons. These electrons can flow through the structure allowing graphite to conduct electricity.

Can you use the structure and bonding of graphite to explain why it would be used for making pencils?

Atoms of different elements are held together in compounds by chemical bonds. Chemical bonds can hold atoms together in large networks or in small groups. Bonds help determine the properties of a compound. The properties of a compound depend not only on which atoms the compound contains but also on how the atoms are arranged.

Simple molecular substances consist of molecules in which the atoms are joined by strong covalent bonds. However, the molecules are held together by weak forces so these substances have low melting and boiling points. They do not conduct electricity.

Giant covalent structures contain many atoms joined together by covalent bonds to form a giant lattice. They have high melting and boiling points. Graphite and diamond have different properties because they have different structures. Graphite conducts heat and electricity well because it also has free electrons.

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Year 7 Compounds

1. Explain the difference between an element, compound and mixture
2. Write a method to balance an equation
3. Use your method to balance this equation Cu + O2 -> CuO
4. Write the word equation for number 3
5. How do you know a chemical reaction has taken place?
6. Explain the difference between a physical and a chemical change
7. What factors affect the speed of a reaction
8. Explain how temperature affect the rate of a reaction
9. Explain the difference between complete and incomplete combustion
10. Describe how you test for the products of combustion
11. Describe how acid rain forms
12. Explain how nitrogen oxide and sulphur dioxide are released when we burn fuels
13. In a chemical reaction explain what happens to the mass of the products and reactants
14. If a fuel is burnt in air explain why the mass might go down
15. Explain how the structure of diamond is different for graphite even though they are both made of carbon
16. Explain the difference between an exothermic and an endothermic reaction
17. Describe how we can measure the energy transferred when burning food or fuel
18. Explain why this may not be an accurate measurement of the energy transferred
19. Explain why the boiling point of different structures is different.
20. What is the relative formula mass of CO_2?
21. Find the percentage mass of oxygen in $Fe_2 O_3$