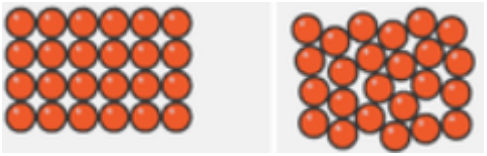
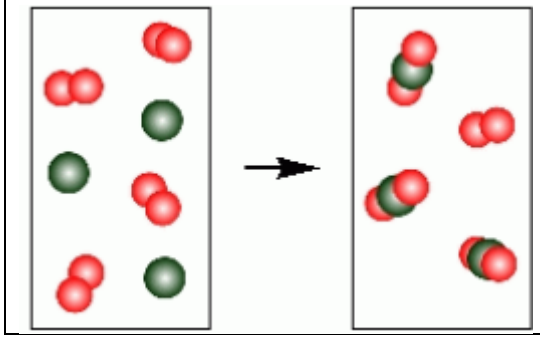
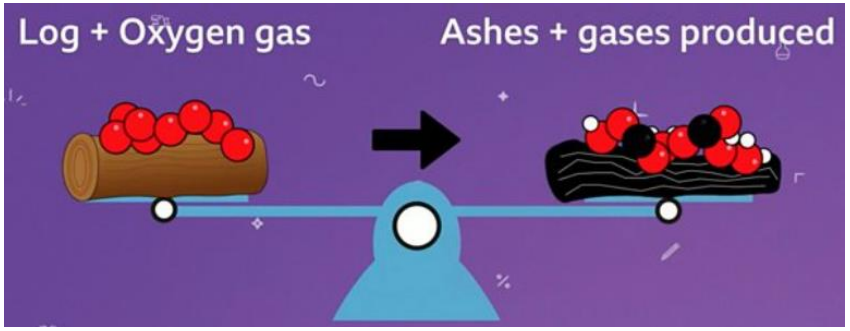
Year 7 Science: Chemical Reactions

Lesson 1 Chemical & Physical Changes	Lesson 2 Conservation of Mass	Lesson 3 Conservation of Mass (Thermal Decomposition)
Evidence for a **chemical reaction** can include any of the following: • Bubbles • A colour change • A large energy change **Physical changes**, such as melting, boiling and dissolving, do not make new chemicals. They are usually easy to reverse.  In a **chemical reaction**, chemical bonds between atoms are broken and made, so the atoms get rearranged into new substances. The simplest kind of chemical reactions involve two elements reacting together to make a compound. 	Whenever a physical change or chemical reaction happens, the mass of the chemicals before is the same as the mass of the chemicals after. This is called the Law of Conservation of Mass.  **The mass of a gas** It isn't easy to measure the mass of a gas, and it may seem as though gases don't weigh anything, but they do. If 100 grams of water is put into a pan and boiled. Eventually, all the water will boil away as steam. If you collected all the steam and measured its mass, it would be exactly 100 grams. **Mass loss** If it looks like a physical change or a chemical reaction has lost mass, that is probably because gas has been produced and has escaped into the surrounding air. **Mass Gain** If it looks like a physical change or a chemical reaction has gained mass, that is probably because a gas from the surroundings has reacted and has become part of the product.	

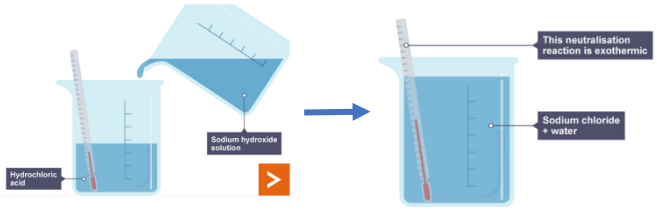
Lessons 4
Exothermic and Endothermic Reactions

When a chemical reaction happens, energy is transferred to or from the surroundings.

When energy is transferred **to the surroundings**, this is called an **exothermic** reaction and usually **feels hot**.

When energy is taken in **from the surroundings**, this is called an **endothermic** reaction and usually **feel cold**.

An example of an exothermic reaction. (Notice the reading on the thermometer has increased)



Exothermic and endothermic reactions that occur at room temperature in the science lab can be investigated using a thermometer.

Lesson 5
Acids & Alkalis

Acid:
Corrosive substance which has a pH lower than 7.
Acidity is caused by a high concentration of hydrogen ions.
Base:
A substance that reacts with an acid to neutralise it and produce a salt.
Alkali:
A base which is soluble in water.
Base:
Able to damage metal, stonework, clothes and skin.
Strong acids and alkalis are corrosive.
Neutralise:
To be made neutral by removing any acidic or alkaline nature.

Image	Source	Acid
	Vinegar	Ethanoic acid
	Fizzy drinks	Carbonic acid
	Tea	Tannic acid
	Vitamin C	Ascorbic acid
	Lemons	Citric acid

Lesson 6
Indicators

An indicator is a substance which will change colour depending on the pH of the solution it is mixed with.

The pH scale is a number scale from 0 to 14. It tells us how acidic or alkaline a solution is.

- Neutral solutions are exactly pH 7.
- Acidic solutions have pH values less than 7. The closer to pH 0, the more acidic a solution is.
- Alkaline solutions have pH values more than 7. The closer to pH 14, the more alkaline a solution is.

Litmus is an example of an indicator. It turns **red** in solutions that are **acidic** and it is **blue** in **alkaline** solutions.

Universal Indicator
Unlike litmus, universal indicator can show us how strongly acidic or alkaline a solution is, not just that the solution is acidic or alkaline. This is measured using the pH scale, which runs from pH 0 to pH 14.

<table>
<tr><th>Lesson 7
Neutralisation</th><th>Lesson 8
Naming Salts</th><th>Lesson 9
Making Salts</th></tr>
<tr><td>A chemical reaction happens if you mix together an acid and a base. The reaction is called neutralisation.

When an acid and alkali neutralise each other they produce salt and water.

A neutral solution can be made if you add just the right amount of acid and base together.

Neutralisation is an example of an exothermic reaction.</td><td colspan="2">Salts have scientific names.

For example, the scientific name of table salt is sodium chloride.

There are two parts to a salt name:
1. The first word is a metal, taken from the alkali.
2. The second word ends in ~ide or ~ate, taken from the acid.

These three acids use different words for the name of salts produced by them:
• A salt made from hydrochloric acid will end in chloride
• A salt made from nitric acid will end in nitrate
• A salt made from sulfuric acid will end in sulfate

hydrochloric acid + sodium hydroxide → sodium chloride

When an acid and alkali neutralise each other they produce salt and <u>water</u>.

hydrochloric acid + sodium hydroxide → sodium chloride + <u>water</u>

The general equation when an acid and alkali react together:

Acid + alkali → salt + water

Example:
nitric acid + sodium hydroxide → sodium nitrate + water

Your turn:
hydrochloric acid + potassium hydroxide →
lithium hydroxide + nitric acid →
sulfuric acid → sodium hydroxide →</td></tr>
</table>

Lesson 10
Reactivity Series

- Metals react differently. Some are very reactive and others are unreactive.
- Observations of reactions can be used to put metals into an order of reactivity.

Unreactive metals

- Some metals are very unreactive, meaning they don't easily take part in chemical reactions.
- For example, copper is unreactive so it can be used to make water pipes. This means that the water pipes will never react with the water passing through them.

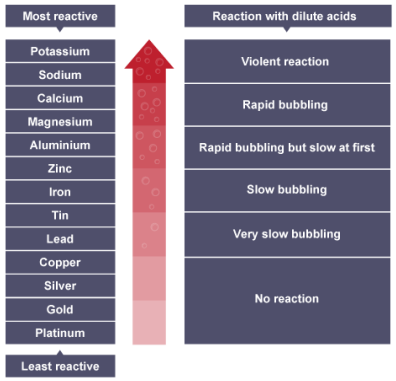
Reactive metals

- Other metals are very reactive, meaning they easily take part in chemical reactions.
- Example - lithium is a very reactive metal. It is so reactive it has to be kept under oil to prevent it coming in contact with oxygen and moisture in the air. If it did come into contact with the air, it would react very quickly.

A reactivity series of metals can be created using the observations of their reactions with oxygen, water and acid.

The metals which show the fastest and most violent reactions are the most reactive.

Those which show no visible change are the least reactive.



In the reactivity series, the metals are in order of reactivity, with the most reactive metals at the top.

Lesson 11
Displacement Reactions

Displace:

When an element is displaced, it is pushed out of a compound by a more reactive element.

- In **displacement** reactions a more reactive metal will **displace** a less reactive metal from its compound.
- The reactivity series is a list of metals from the most reactive at the top to the least reactive at the bottom. It can be used to predict displacement reactions.
- Carefully planned **displacement** experiments can be used to put metals into a reactivity series.

- There is no reaction between a metal and a salt of the same metal.
- For example, iron cannot displace iron from iron chloride (a salt).

iron oxide + aluminium → iron + aluminium oxide

- Aluminium is more reactive than iron.
- This means the aluminium takes the oxygen from the iron oxide to produce aluminium oxide.
- The iron has been displaced from its compound so it is not bonded to anything after the reaction.

During this displacement reaction:

- the more reactive metal becomes less visible as it dissolves into the solution
- the less reactive metal from the salt coats the surface of the more reactive metal as it is displaced from its compound