Changing Materials

Earth Structure

The Earth has a layered structure made up of the core, mantle and crust. The lithosphere (crust and upper part of the mantle) is broken into large pieces called tectonic plates. These move slowly over the mantle.

Weathering

Rocks gradually wear away. This is called weathering. There are three types of weathering:

Physical Weathering

If water gets into a crack in a rock and then freezes, it expands and pushes the crack further apart. When the ice melts later, water can get further into the crack. When the rock freezes again, it expands and makes the crack even bigger. This process of freezing and thawing can continue until the crack becomes so big that a piece of rock falls off.

Chemical Weathering

Animals and plants can also wear away rocks. For example, burrowing animals such as rabbits can burrow into a crack in a rock, making it bigger and splitting the rock. Plants can also weather rocks as their roots can push open any cracks and make them wider and deeper. Eventually pieces of rock may fall away.

Biological Weathering

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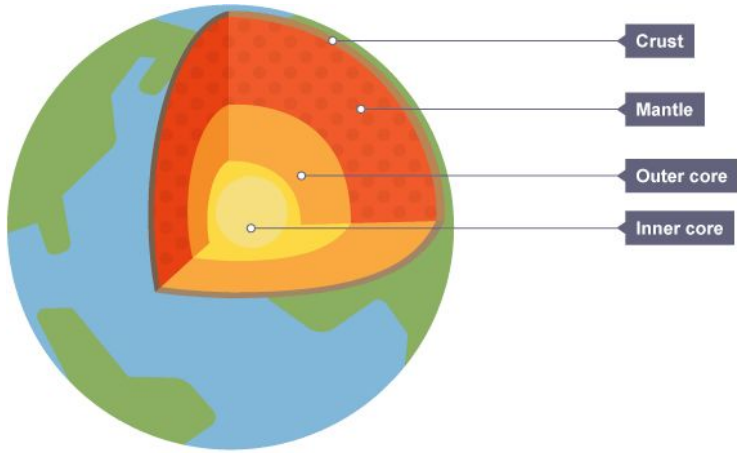


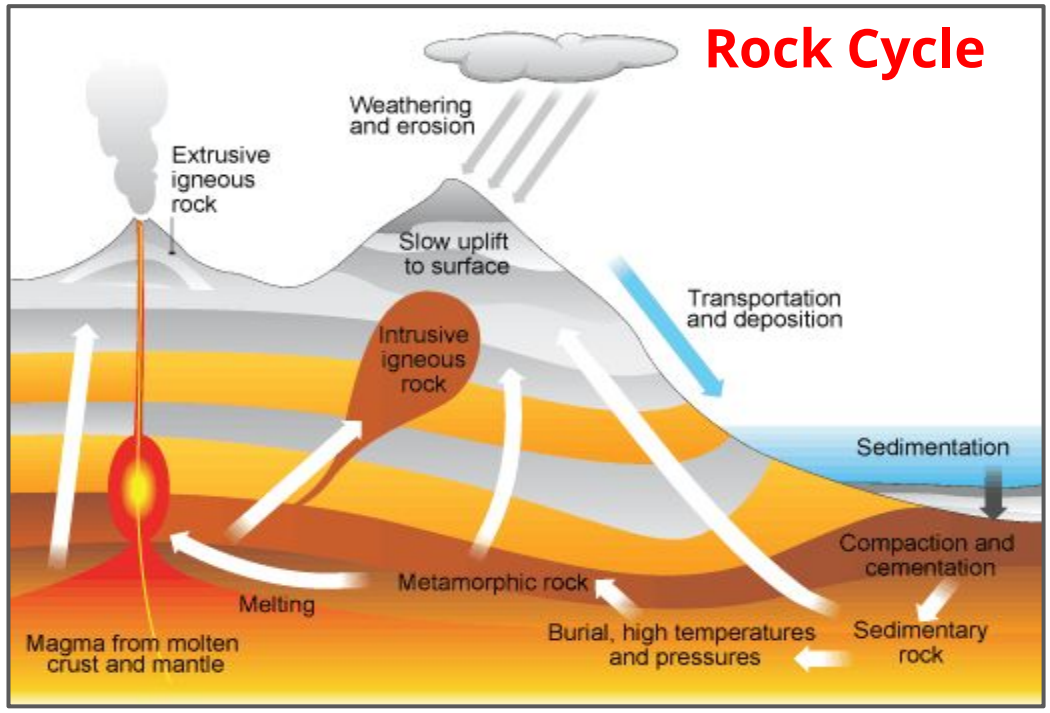
Greenhouse Effect

Some heat energy from the Earth's surface escapes into space. If too much heat energy escaped, the planet would be very cold. However some gases in the atmosphere can trap escaping heat energy, causing some of it to pass back to the surface.

These are called greenhouse gases, and they keep our planet warm, **which is a good thing**. **Carbon dioxide** is an important greenhouse gas.

Keywords

Igneous	Rocks that formed under very hot conditions within the Earth.
Metamorphic	A type of rock formed under intense heat or pressure
Sedimentary	Rocks that are formed through the deposition of sediments, eg limestone and sandstone.
Tectonic Plate	The Earth's crust and upper part of the mantle are broken into large pieces called tectonic plates.
Weathering	The breaking down of rocks in situ by the action of weather, plants, animals and chemical processes.



Increasing carbon dioxide levels

Humans burn **fossil fuels** such as oil, coal and natural gas. The energy released is used to power cars and generate electricity. However, burning fuel releases carbon dioxide. As the human population increases, more fuel is used, and more carbon dioxide is released.

Global warming

This extra carbon dioxide increases the greenhouse effect. **More** heat is trapped by the atmosphere, causing the planet to become **warmer** than it would be naturally. This increase in global temperature is called **global warming**.

Classifying Materials

Atoms

Everything is made from atoms, including you. Atoms are tiny particles that are far too small to see, even with a microscope. If people were the same size as atoms, the entire population of the world would fit into a box about a thousandth of a millimetre across!

Elements

There are over a hundred different types of atom, and these are called elements. Each element has a special name. For example carbon, oxygen and hydrogen are all elements.

Lead and gold are elements too. A piece of pure gold contains only gold atoms. A piece of pure lead contains only lead atoms.

Chemical reactions join or split atoms to rearrange them. But they cannot change one element into another element, or anything simpler. A chemical reaction cannot turn lead into gold, because it can't change the atoms into different elements.

Compounds

A compound is a substance that contains atoms of two or more different elements, and these atoms are chemically joined together. For example, water is a compound of hydrogen and oxygen. Each of its molecules contains two hydrogen atoms and one oxygen atom. There are very many different compounds.

Relative atomic mass

The relative atomic mass is a measure of the mass of one atom of the element.

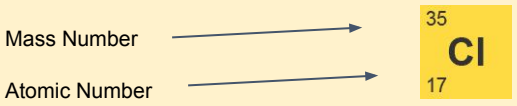
For example: Hydrogen = 1, Carbon = 12 and Oxygen = 16

Atomic number and mass number

The number of protons in the nucleus of an atom is called its atomic number:

- the atoms of a particular element all have the same number of protons
- the atoms of different elements have different numbers of protons

The total number of protons and neutrons in an atom is called its mass number.



Solids

Steel, plastic and wood are solids at room temperature. Ice is solid water. The **particles** in a solid are:

- close together
- arranged in a regular way

Strong forces, called **bonds**, attract the particles towards each other. This means that the particles in a solid:

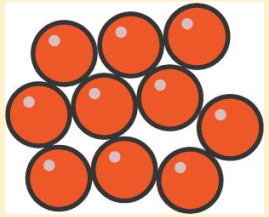
- can vibrate in a fixed position
- cannot move from place to place

Solids such as concrete are useful for buildings and their foundations because they cannot be compressed.

Liquids

Mercury, petrol and water are liquids at room temperature. The **particles** in a liquid are:

- close together
- arranged in a random way



The particles in a liquid can:

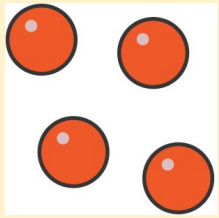
- move around each other

The bonds in a liquid are strong enough to keep the particles close together, but weak enough to let them move around each other.

Gases

Air, helium and chlorine are gases at room temperature. Water vapour is water as a gas. The **particles** in a gas are:

- far apart
- arranged in a random way



The particles in a gas can:

- move quickly in all directions

There are no bonds between the particles in a gas, so they are free to move in any direction.

Knowledge Organiser

Property of Solid	Reason
They have a fixed shape and cannot flow	The particles cannot move from place to place
They cannot be compressed	The particles are close together and have no place to move into

Property of Liquid	Reason
They flow and take the shape of the bottom of their container	The particles can move around each other
They cannot be compressed	The particles are close together and have no place to move into

Property of Gas	Reason
They flow and completely fill their container	The particles can move quickly in all directions
They can be compressed	The particles are far apart and have space to move into

Keywords

Atom - The smallest part of an element that can exist.
Compound - A substance formed by the chemical union of two or more elements.
Element - A substance made of one type of atom only.
Molecule - A collection of two or more atoms held together by chemical bonds.
Bond - The chemical link that holds molecules together.
Compressed - Made smaller by squeezing together.
Conservation of mass - The total mass of reactants before a reaction is equal to the total mass of products after a reaction because no atoms can be created or destroyed so the mass must remain unchanged.
Particle - A general term for a small piece of matter. It can mean protons, neutrons, electrons, atoms, ions or molecules for example.
Balanced chemical equation - A chemical equation written using the symbols and formulae of the reactants and products, so that the number of units of each element present is the same on both sides of the arrow.
Word equation - An equation in which only the names of the reactants and products are used to model a reaction.