S2 Earth's Materials Topic

- Pupils should work through the activities in this presentation.
- If you have any questions please contact Miss Ayton on gw11aytonalyson@glow.ea.glasgow.sch.uk

Lesson 1 The Structure of the Earth

1. Watch the following clip

https://www.youtube.com/watch?v=Cn8Rdujngws

2. After watching the clip write down everything you can remember for the clip.

3. Copy or print the diagram of the structure of the earth (slide 3) and stick into jotter or notepad.

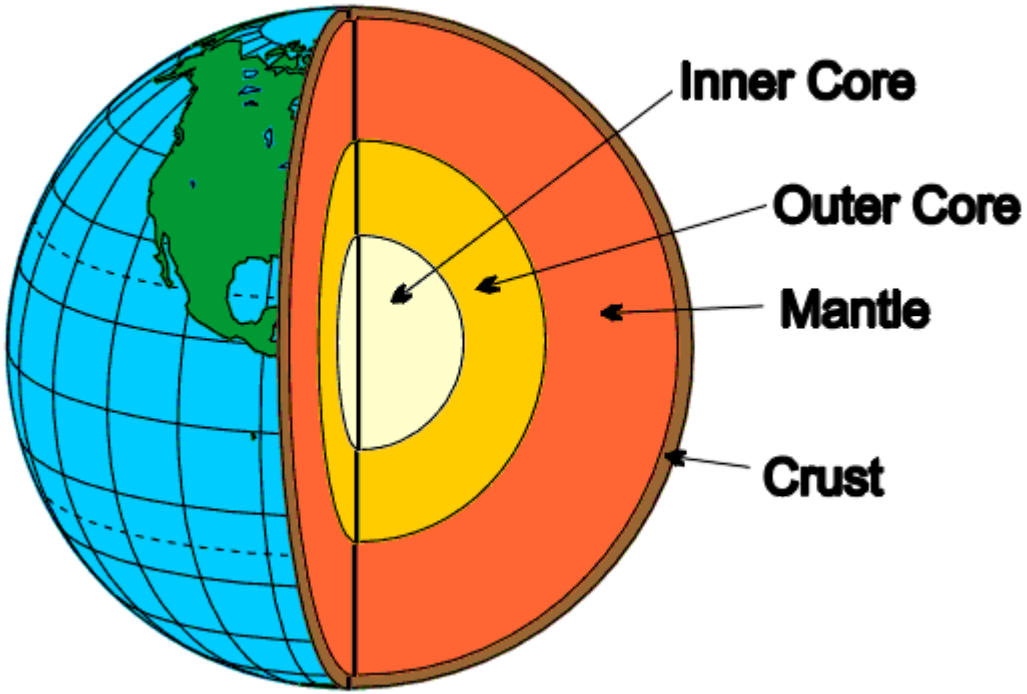
4. Print or copy out the table on slide 4. You could even cut them out to create a card sort and get your parents/guardians/siblings to test you at home!

5. Read slides 5-6 showing different models of the structure of the earth.

6. Create a model structure of the earth at home. Check out these videos on you tube for some inspiration. Share your models with us via Glow and through our Twitter @HillheadScience

https://www.youtube.com/watch?v=Cn8Rdujngws

The structure of the earth

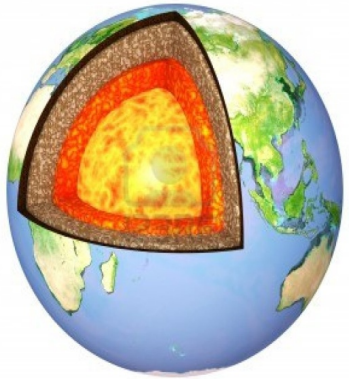


The structure of the earth

	What is it?	Why is it important?
Atmosphere	A thin layer of gases surrounding earth	Contains the gases plants and animals need to live
Crust	A thin solid layer on top of the mantle, covered by land or ocean	Contains all the minerals and resources we need to live on
Mantle	A thick layer below the crust. It behaves like a solid but can flow slowly.	Movements in the mantle cause volcanoes, mountains and earthquakes
Inner core	The hot, dense core at the centre of the earth. The outer core is liquid, the inner core solid.	Makes the earth magnetic as made of magnetic metals
Outer core		

Which is the best model for the structure of the earth? Why?

Label how a Cadbury Creme egg is like the structure of the Earth?



Outer Core
Made from liquid nickel and iron (magnetic)

Crust
Relatively thin and rocky

Mantle
Has the properties of a solid, but can flow very slowly

Inner Core
Made from solid nickel and iron

Lesson 2 Types of Rocks

1. Watch the following video clips

https://www.youtube.com/watch?v=CeuYx-AbZdo

https://www.youtube.com/watch?v=TbHB7xUjMIk

2. Read through the slides 8-10.

3. In your jotter/ notepad write down definitions for igneous, sedimentary and metamorphic rocks.

4. In your jotter create a table to characterise different rock types (like the table on slide 11)

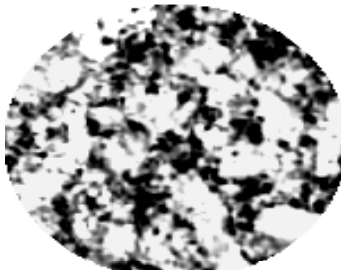
5. Go into your garden (if you have one) and photograph the different rocks you can find. Can you try and identify whether you think they are igneous, metamorphic or sedimentary?

Igneous rocks

- Properties of igneous rocks:
  - Consist of lots of irregular **interlocking crystals**.
  - Hard, because the crystals are strongly held together
  - The crystals can be large or small, but will always be irregular
  - Some are porous – this means they let water through – but most are not
  - Some contain trapped air bubbles so are less dense than water
  - Never have **fossils** trapped within them.
  - Most do not react strongly with acids to release carbon dioxide

- How they form
  - Magma is liquid rock
  - When it cools it solidifies and forms igneous rocks
  - If the magma cools quickly, crystals will be small
  - If it cools slowly the crystals will be large

Igneous rocks consist of randomly arranged interlocking crystals.



Examples

Obsidian

Black, glassy rock

Forms when magma cools quickly on the surface of the earth

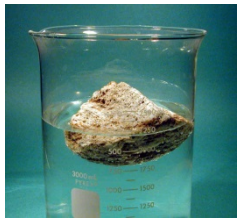
Crystals are so small they are not visible

Pumice

Brown rock.

Gas was released when it formed so it contains thousands of air bubbles.

It has very low density and floats on water.



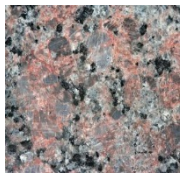
Basalt

Dull, black rock

Forms when magma cools quickly on the surface of the earth

Contains small interlocking crystals

Granite



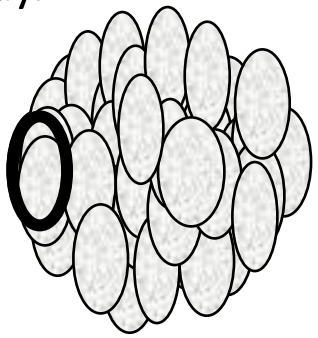
Can have a range of colours, from grey to pink

Cooled slowly beneath the earth's surface so containsl large, interlocking crystals

Sedimentary rocks

- Properties of sedimentary rocks:
  - Consist of lots of **small grains**.
  - Often soft or crumbly as the grains are only weakly stuck together
  - Often porous – this means they let water through
  - Often have **layers** showing the deposition of sediment at different time periods.
  - Often have **fossils** trapped within them.
  - Some will react with acids to release carbon dioxide
- How they form
  - Some sedimentary rocks form when small particles of rock are deposited then buried,
  - Others form when minerals in water are left behind when water in seas or lakes evaporates away.

Sedimentary rocks consist of layers of lots of small particles called grains.



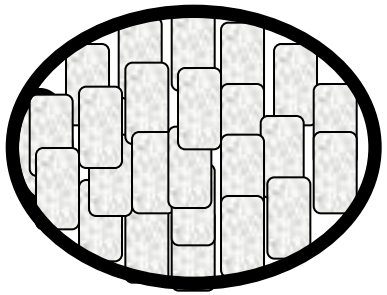
Examples	
Sandstone orangey coloured rock looks like lots of sand grains stuck together quite soft	
Limestone grey/white coloured rock mostly made from crushed sea-shells may contain fossilised shells Reacts with acids	
Mudstone Brown coloured rock mostly made from mud deposits stuck together may contain fossilised shells	
Chalk 	grey/white coloured rock. mostly made from crushed sea-shells may contain fossilised shells Reacts with acids

Metamorphic rocks

- Properties of metamorphic rocks:
  - Contain regular crystals in layers
  - Sometimes the crystal pattern is wavy or zig-zags because the structure has been distorted by pressure
  - Usually hard, because the crystals are strongly bonded together
  - Usually dense – will not float on water
  - May contain fossil remnants but they will not look like the original fossils
  - Some will react with acid to release carbon dioxide

- How they form
  - Heat from the core of the earth and pressure from rocks above change the structure of sedimentary or igneous rocks to make metamorphic rock

Metamorphic rocks contain regular layers of crystals that sometimes have a wavy or zig-zag arrangement.



Examples	
Slate Grey black rock Hard but splits easily into sheets Formed from shale under low temperature and pressure	
Marble Grey/white coloured rock Formed from limestone under high heat and low pressure Reacts with acids to release CO_2	
Quartzite Grey/white coloured rock Formed from sandstone under heat and pressure Layers may still be evident	

Rock Table

Create a similar table to characterise different types of rocks. Try and discover at least five of each type of rock.

Igneous	Sedimentary	Metamorphic
obsidian	sandstone	slate

Lesson 3 The Rock Cycle

1. Watch the video clip below

https://www.youtube.com/watch?v=pm6cCg_Do6k

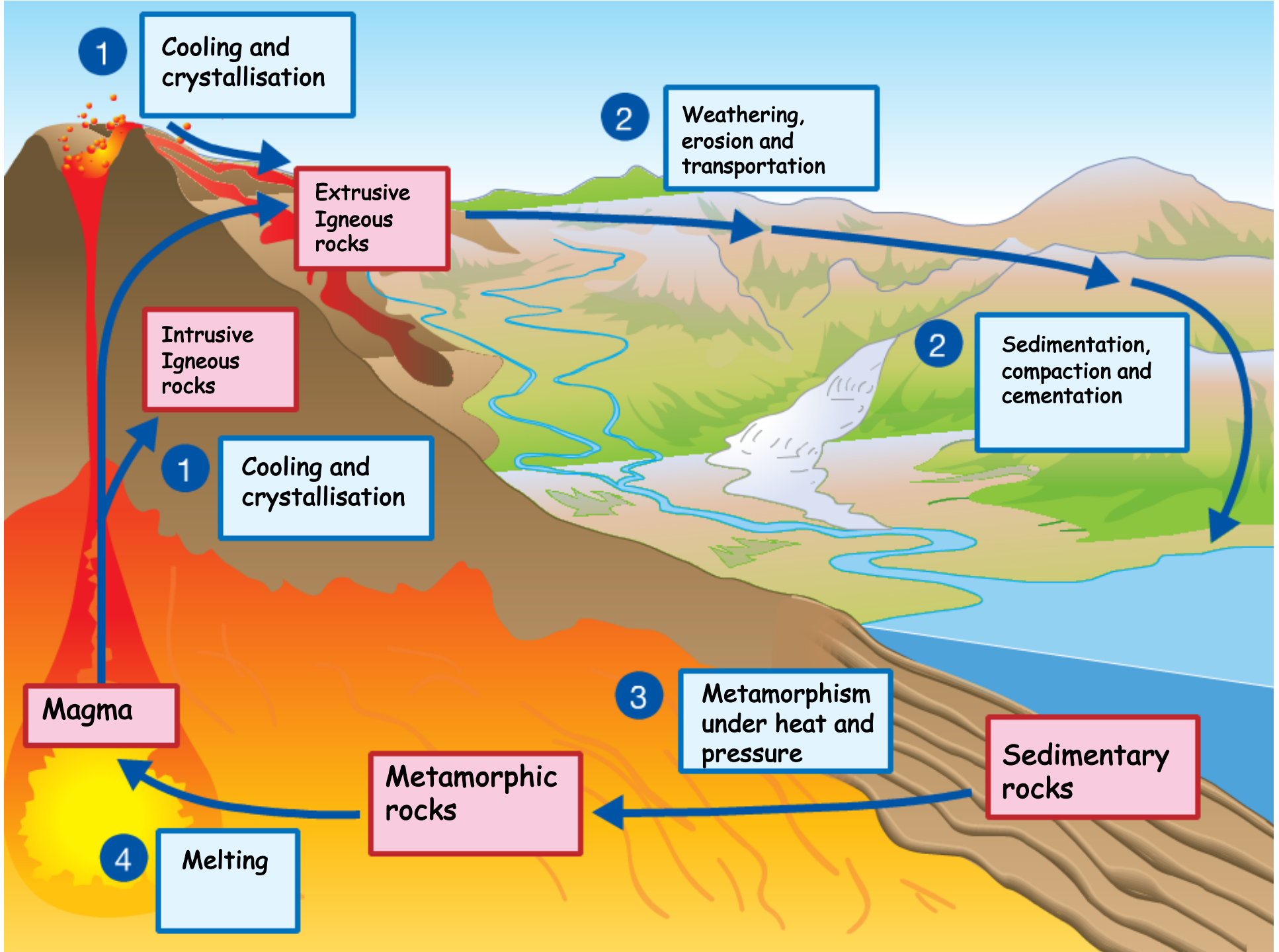
2. Study the rock cycle diagram on slid 13.

3. Create a model rock cycle at home using starbust sweeties, chocolate or playdough. You tube has lots of inspiration for how to model the rockcycle. Don't forget to share your models with us through Glow or twitter @HillheadScience

https://www.youtube.com/watch?v=g93jXTUv_RQ

https://www.youtube.com/watch?v=6Tl31CF5STg

4. Write a mini essay explaining the rock cycle process. Try to use some of the terms used in the diagram on slide 13.


1
Cooling and crystallisation
Extrusive Igneous rocks
2
Weathering, erosion and transportation
Intrusive Igneous rocks
2
Sedimentation, compaction and cementation
1
Cooling and crystallisation
Magma
3
Metamorphism under heat and pressure
Sedimentary rocks
Metamorphic rocks
4
Melting

Lesson 4 Soil

1. Think about the question on the next slide. Click to reveal the answer.
2. Watch the following BBC clip

https://www.bbc.co.uk/programmes/p01190tx

3. Use the internet to research the three different types of soil:

- Sandy
- Clay
- Loam

What are the features of each and where are they commonly found?

Think

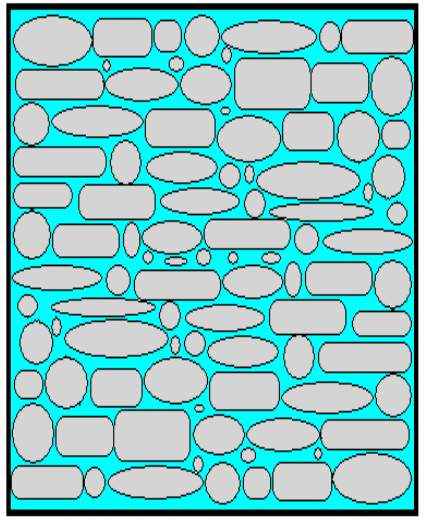
What is soil made of?

Soil is a combination of materials, both living and non-living. One part of soil is **broken down rock**. Another is **organic matter** made up of decaying plants and animals. **Water and air** are also a part of soil.

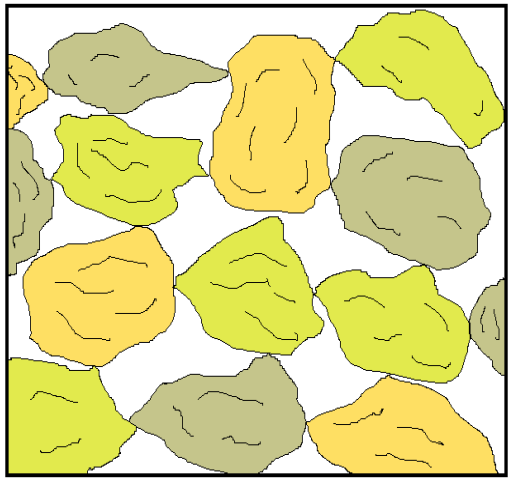
What's in Soil?

Type of Soil	Typical Particle Size
Clay	Small
Sandy	Large
Loam	Mixture

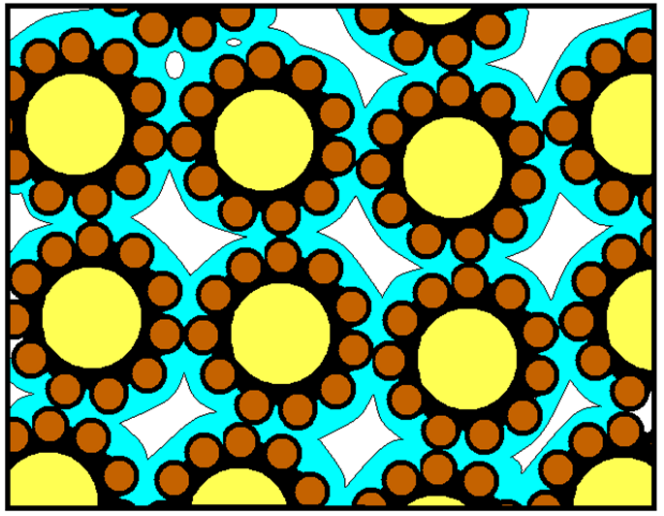
Clay



Sandy



Loam



Lesson 5 Solutions

1. Use the internet to research the meaning of the terms on the following slide.
2. Read through the examples of slides 19-22.
3. Answer the questions relating to the graph on slide 23.

What do any these words mean?

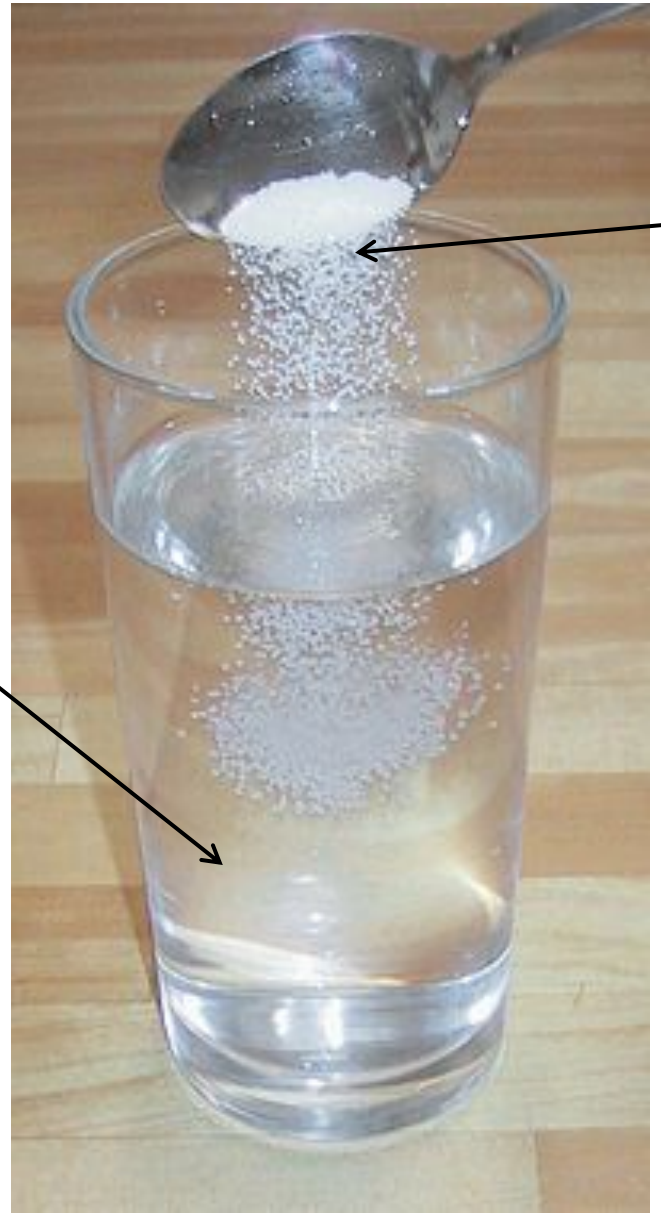
Soluble

Solute

Solution

Saturated

Solvent



Solute

Solvent

Solution
(But is a mixture)

Does not dissolve

Insoluble

Mixture

Words in to pictures

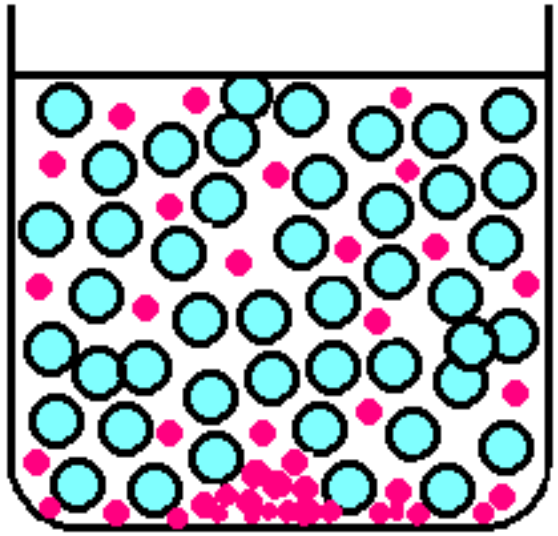
Saturated Solutions

A saturated solution is a solution in which no more solid/solute can be dissolved.

The particles in a liquid are constantly moving in a random motion.

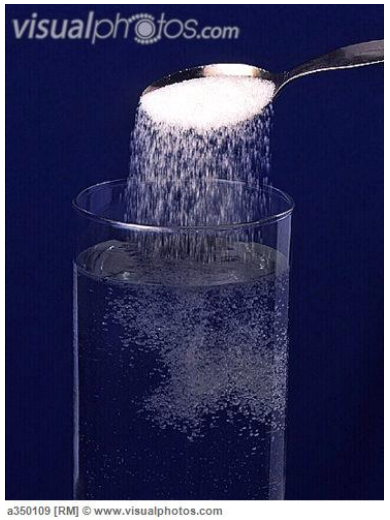
The particles of the solute nestle between those of the solvent.

When there is no more room, the excess solute settles on the bottom.



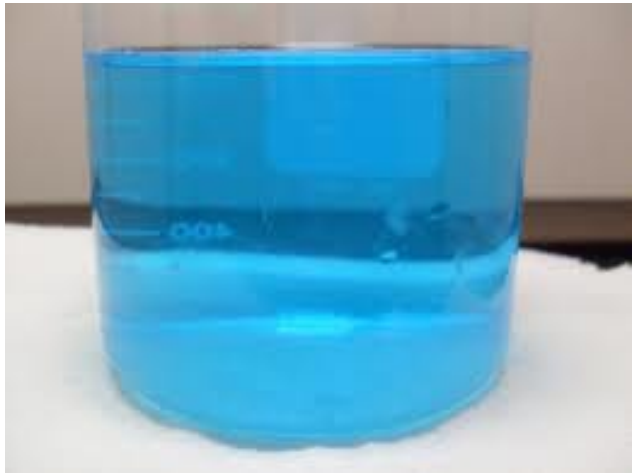
1. Salt in water

2. Sand in water



3. Sugar in water

4. Mud in water

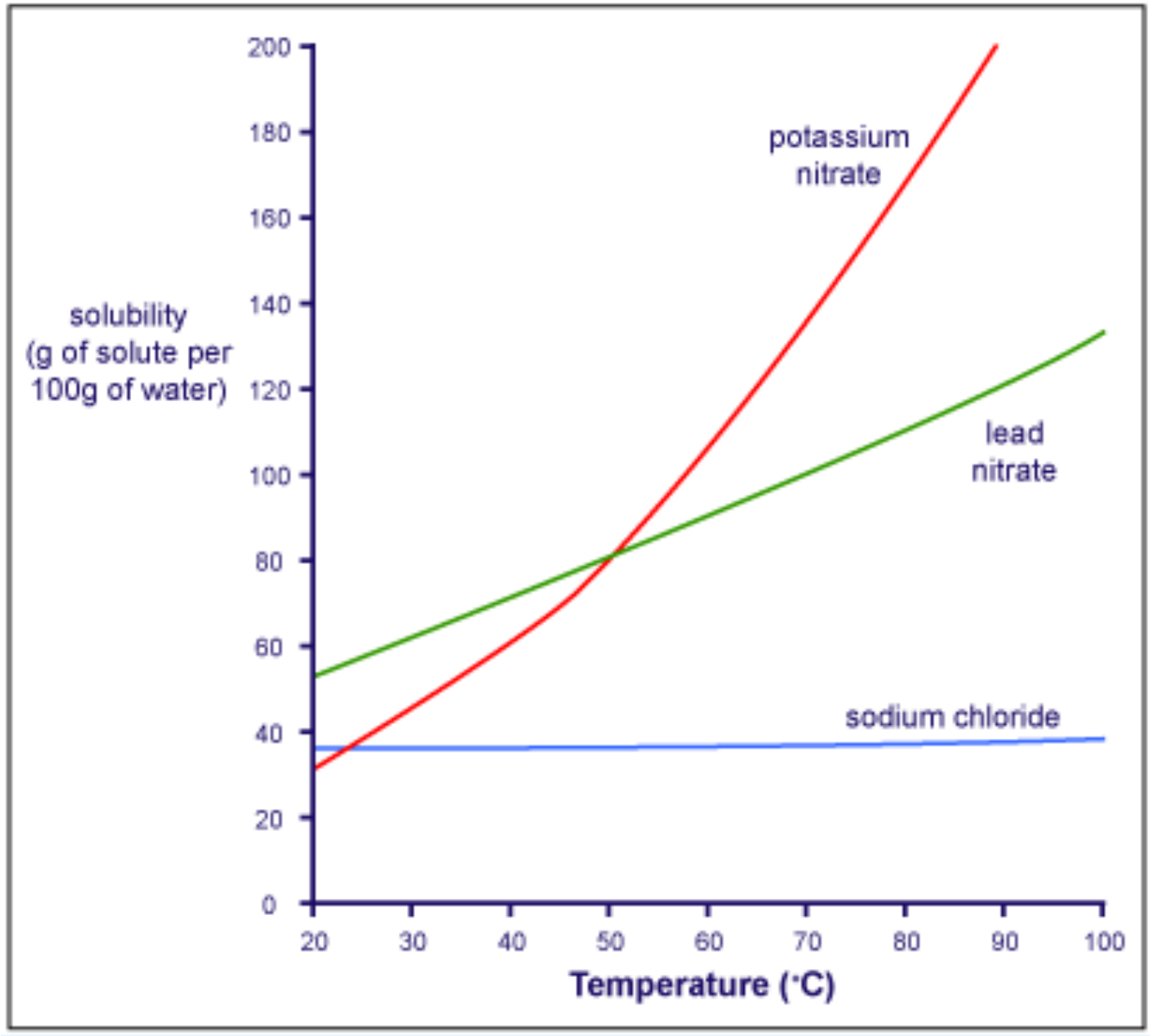


5. Copper Sulphate in water

6. Coffee in water

7. Gravel in water

1. Which of the solutes on the graph would you describe as the most soluble?
2. Which solute is the most soluble at 30°C?
3. What happens to the solubility of potassium nitrate and lead nitrate as the temperature increases?



Lesson 6 The pH Scale

1. Watch the following video on Twig – “Acids and alkalis part 1”. Twig can be access through glow. Add the twig tile to your launch pad.
2. Using slide 25 create your own pH scale at home using paper and colouring in pens/pencils.
3. Research some common acids and alkalis and complete the table on slide 26. Try to find examples of 5 acids and 5 alkalis.
4. Read slide 27 and watch the following videos on how to test for acids and alkalis https://www.youtube.com/watch?v=8udgWbrJsYo
5. You can make your own pH indicator at home by boiling up strips of red cabbage in water and testing the indictor on acids and alkalis in your home, including: vinegar, lemon/lime juice, toothpaste, shampoo and bicarbonate of soda. Remember to share your experiment with us through Twitter @HillheadhighScience

Instructions can be found here

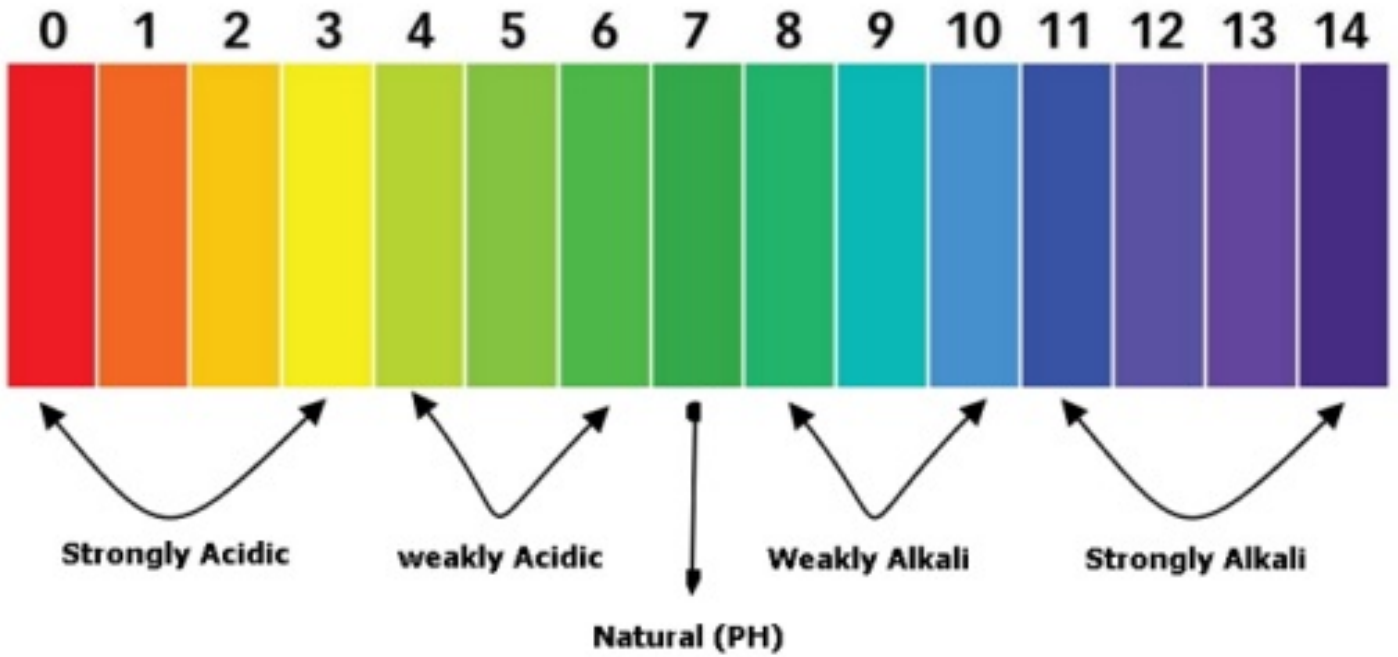
https://www.carolina.com/teacher-resources/Interactive/red-cabbage-guice-homemade-ph-indicator/tr10851.tr

A video of the experiment can be found here

https://www.youtube.com/watch?v=I18K2upEHLc

The pH Scale

The pH scale is a continuous scale from 0-14.



Everyday Acids and Bases

Acids	Alkalis
vinegar	toothpaste

Testing the pH

We use an indicator called universal indicator or pH paper.

Lesson 7 Neutralisation

1. Watch the following Twig clip “Acids and Alkalis part 2”.
2. Copy the following slide into your jotter.
3. Watch the following clip on neutralisation

https://www.youtube.com/watch?v=vVOZe3fnoX0

4. Write a small passage about indigestion and how it relates to neutralisation.

5. Research some other examples of neutralisation reactions and create a poster of leaflet. Share this with us through Glow or Twitter @HillheadhighScience

Neutralisation

When alkali is added to an acid the pH **increases**.

During a neutralisation reaction there are two new products made – a salt and water.

This can be represented as a word equation, which is shown below:

Acid + Alkali ⟶ Salt + Water

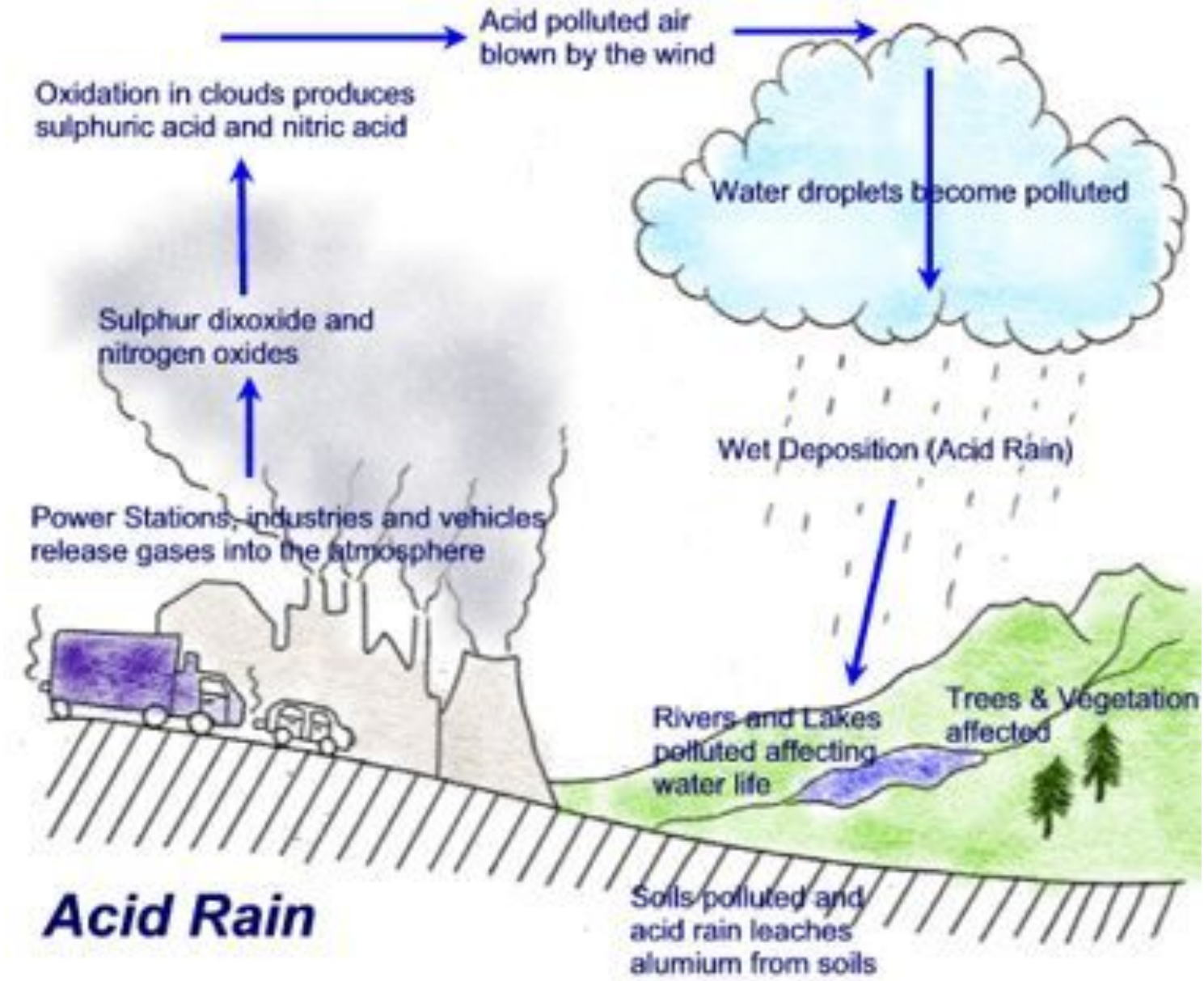
Lesson 8 Acid Rain

1. Use the internet and information from the diagram on the following slide to create a poster or presentation on acid rain. In your presentation you should cover the following points:

- What is acid rain?
- What causes acid rain?
- What are the main pollutant gases responsible for acid rain?
- What impact can acid rain have on the environment and buildings?
- What can be done to prevent acid rain?

2. Watch the following experiment video

https://www.youtube.com/watch?v=MIkBqUqAJVw


Acid polluted air
blown by the wind
Oxidation in clouds produces
sulphuric acid and nitric acid
Water droplets become polluted
Sulphur dixoxide and
nitrogen oxides
Wet Deposition (Acid Rain)
Power Stations, industries and vehicles
release gases into the atmosphere
Rivers and Lakes
polluted affecting
water life
Trees & Vegetation
affected
Soils polluted and
acid rain leaches
alumium from soils
Acid Rain

Lesson 9 The Periodic Table

1. If you are able to print out a copy of the periodic table then please do so by following this link and selecting the 2020 periodic table

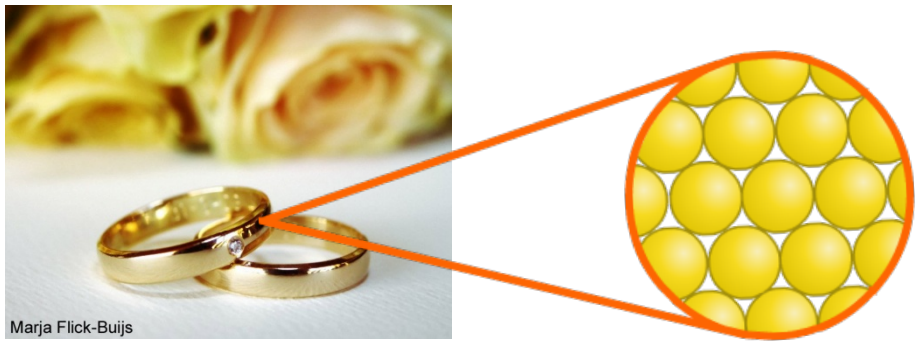
https://sciencenotes.org/printable-periodic-table/

2. Write down the definition of an element from the next slide.
3. Use the information on slide 35 to label groups 1, 2, 7 and 8 on your periodic table with the labels “alkali metals”, “alkali earth metals”, ”halogens” and “noble gases” respectively.
4. Answer the true or false questions on slide 36. Click to reveal the answers.
5. Try and use the element symbols to create your name. You can use this website to help you. https://www.lmntology.com/nameAsElementsWhite.php
6. Watch the video below to see the activity of the alkali metals in water. As you are watching the video complete the table on slide 38.

https://www.bbc.co.uk/bitesize/clips/z28kjxs

Elements

There are many different types of atoms. When a substance contains only one type of atom it is called an **element**.



The element gold is made up of only gold atoms.

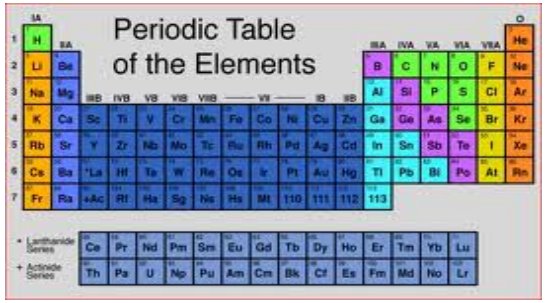
The Periodic Table

The Periodic Table displays all the known elements – there are over 100. Every element has its own chemical symbol.

The Periodic Table is arranged into Groups and Periods. A Group is a vertical column. A period is a horizontal row.

Library of Congress

Dmetri Mendeleev



The big block in the middle is called the Transition Metals- colour in purple.

Metals to the left of the step ladder and non-metals to the right.

Group 1: Alkali Metals (except H!!)

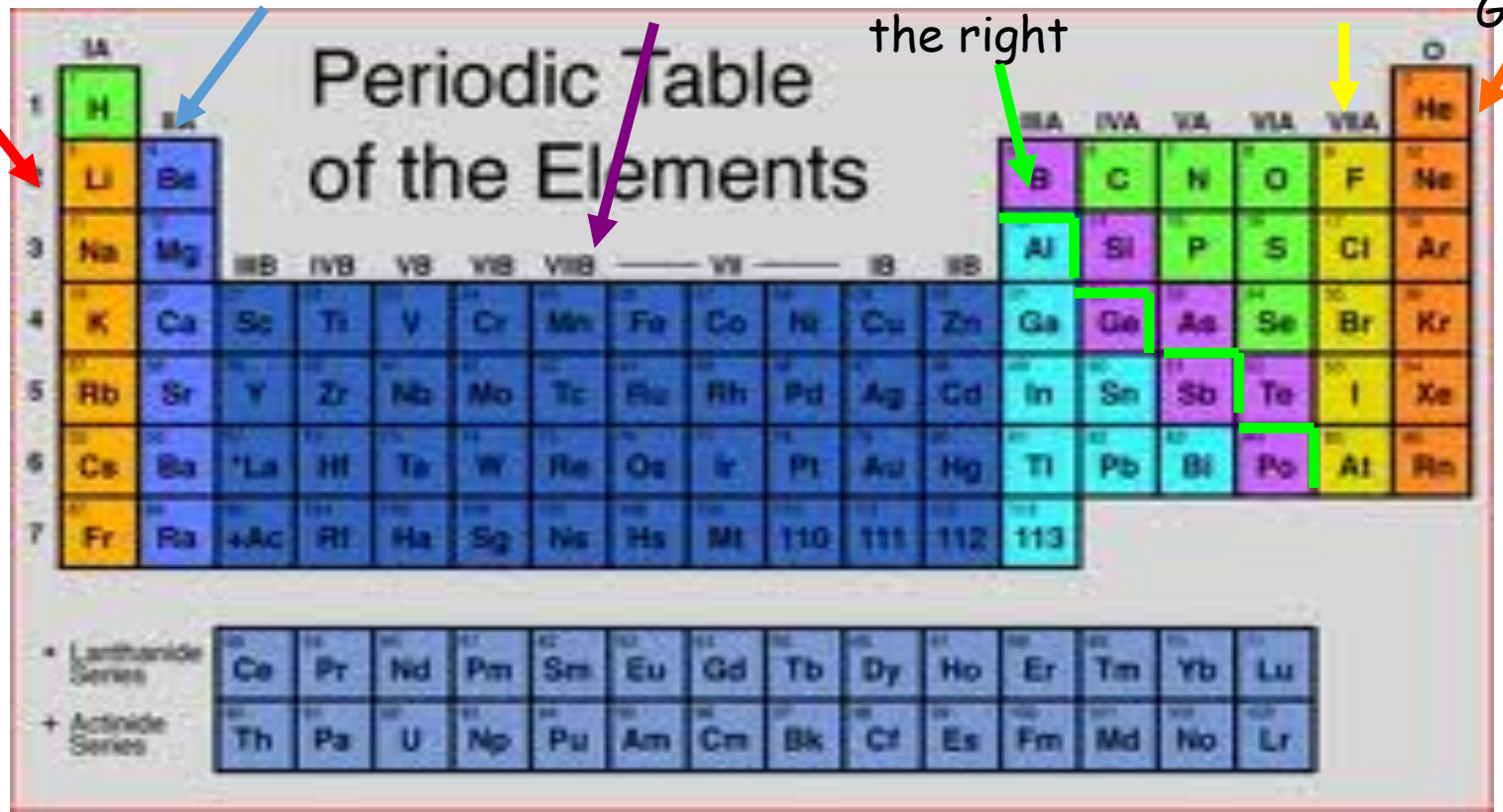
Group 2: Alkali Earth Metals

The Transition Metals

The step ladder metals on the left and non-metals on the right

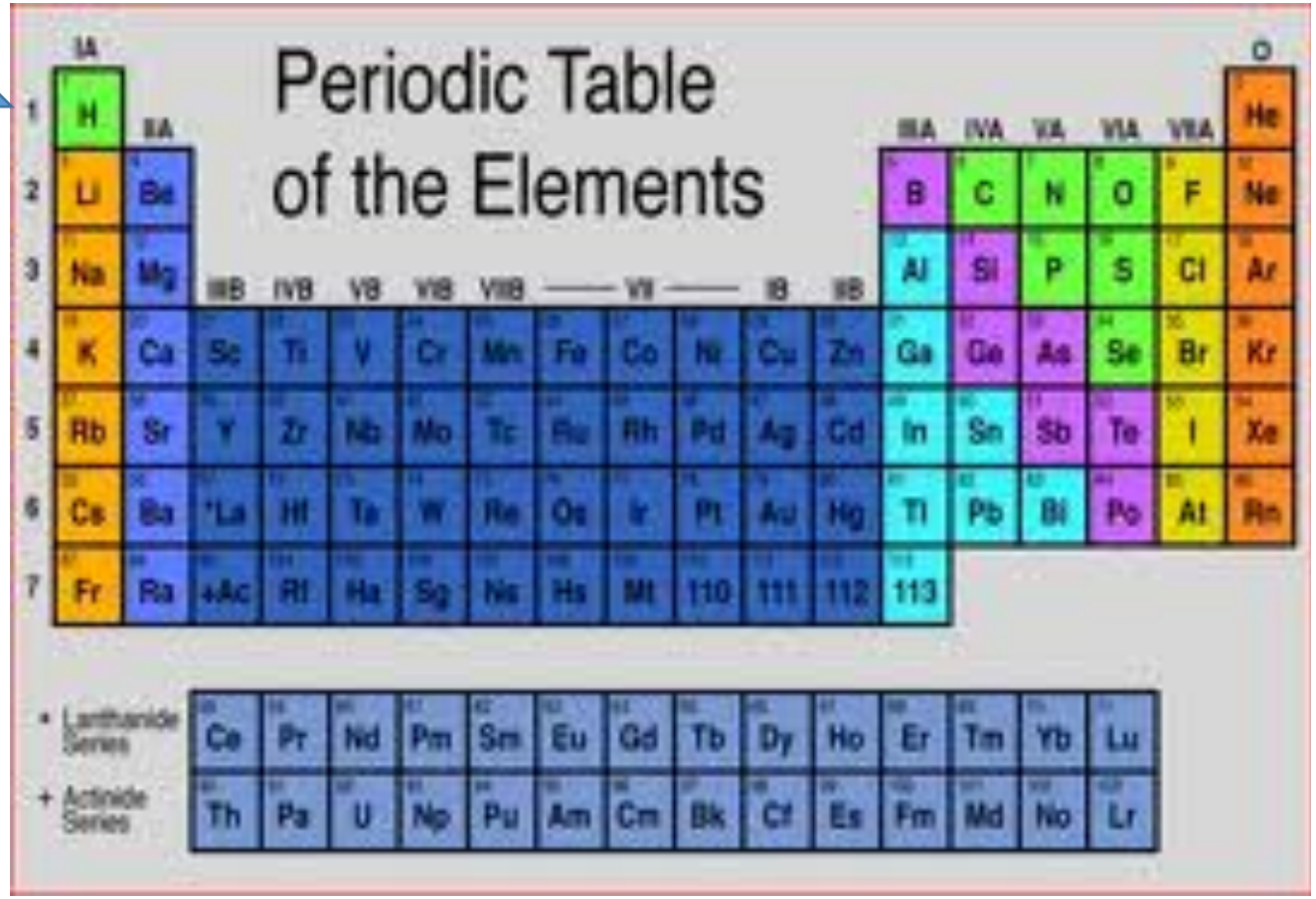
Group 7: The Halogens

Group 0: The Noble Gases



The Periodic Table

- The periodic table is organised into groups and periods.
- A group goes vertically up and down the periodic table, e.g. group 7 goes from F to At.
- Elements in the same group react in similar ways.



- A period goes horizontally left to right across the periodic table e.g. from Li to Ne is the 2nd period

True or False

1. Calcium is a non-metal element. **False**
2. The chemical symbol for calcium is C. **False**
3. Beryllium is in the same group as calcium. **True**
4. Group 7 in the periodic table is known as the Halogens. **True**
5. Group 0 in the periodic table is known as the Alkali Metals. **False**
6. Chlorine is in the same group as iodine. **True**
7. Nitrogen is in the same group as oxygen. **False**
8. Iodine is a liquid at room temperature. **True**
10. Iron is an Alkali Metal. **False**

Alkali Metals in Water

Elements in the same group react in similar ways. Watch the video below and copy and complete the table with your observations.

https://www.bbc.co.uk/bitesize/clips/z28kjxs

Alkali Metal	Element's symbol	Observation when added to water
Lithium	Li	The metal floated around the surface of the water and fizzed giving off hydrogen gas.
Sodium		
Potassium		
Rubidium		
Caesium		

Do the alkali metals get more or less reactive moving down the group?

Lesson 10 Compounds and Mixtures

1. Watch the iron and sulfur demo via the link below

https://www.youtube.com/watch?v=UdQ3GkIDRo4

2. Read slides 40-42.

3. Complete the card sort on slide 43 – you can either do this on your computer or print and cut out the squares at match them up to the labels.

4. Read the information on slide 44 and answer the questions on slide 45 – click to reveal the answers.

5. Create a mixture at home by creating your own lava lamp. Istructions can be found on slide 47 or look at the video here if you don't have the equipment at home

https://www.youtube.com/watch?v=aaEpq-1sq0E

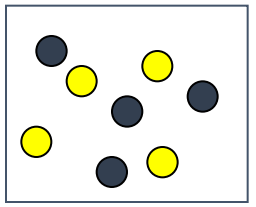
Remember to share your creations with us through Glow and Twitter @HillheadhighScience

Mixtures

How could we separate a mixture of sulfur and iron?

Iron is a metal

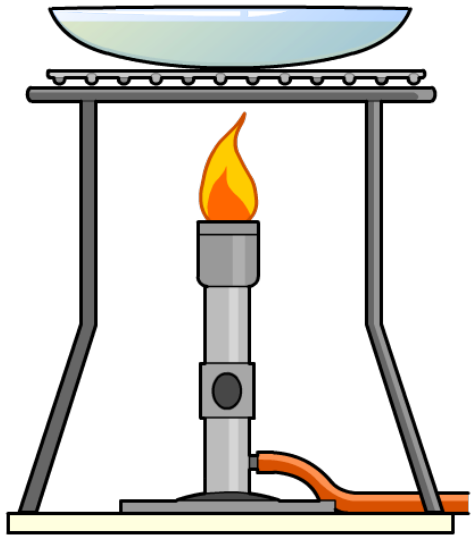
Sulfur is a non-metal.



We can represent the atoms in a mixture.

We can use a magnet to separate the iron from the sulfur.

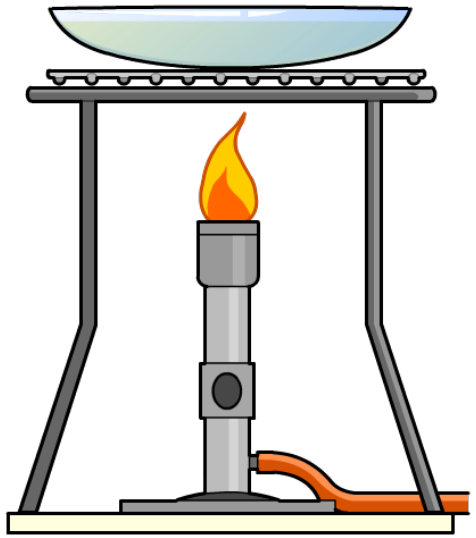
What happens when I heat the mixture?

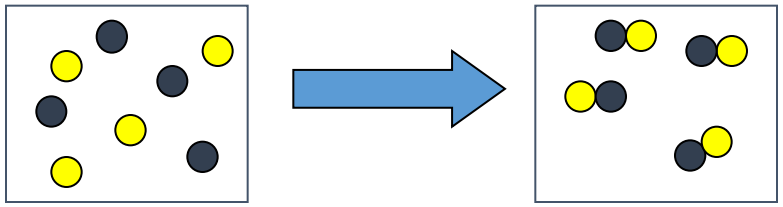


Will I still be able to separate the iron from the sulfur using the magnet?

No I can't! The sulfur and the iron have reacted together to form something new- a compound.

What happens when I heat the mixture?





A mixture

Iron + sulfur

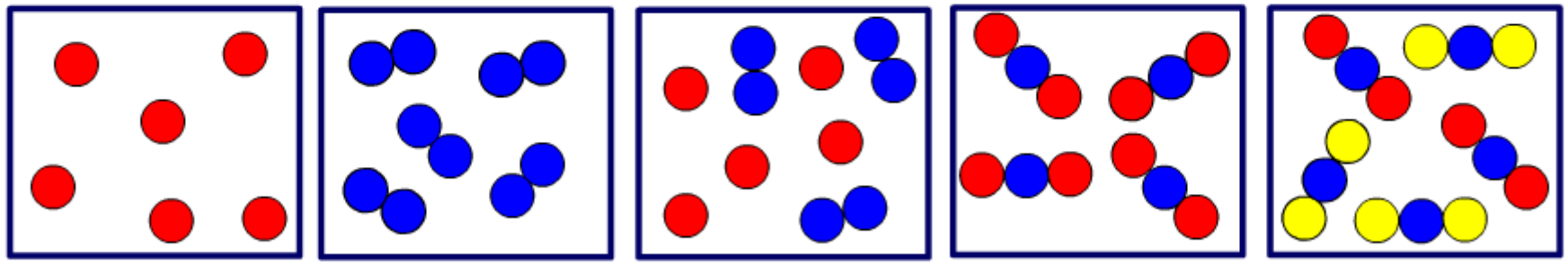
A compound

Iron sulfide

When the mixture is heated the iron and sulphur atoms join together and make a new compound. This is a chemical reaction.

What type of substance does each picture show?

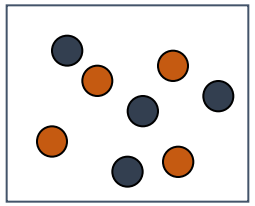
element	element	compound	mixture of elements	mixture of compounds



?

C

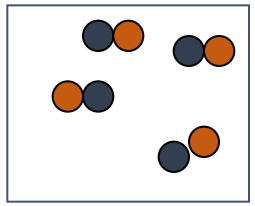
solve



1. This represents atoms in a mixture. The iron and the sulfur are not joined together.

2. The mixture can be easily separated as the sulphur and the iron atoms are not joined together.

3. After heating, the sulfur atoms and the iron atoms joined together to make a compound so could not be easily separated.

4. 

This represents the atoms in a compound, they are joined together.

Can we now answer:

1. What is a mixture?

   When two (or more) substances are mixed together but do not react.

2. What is a compound?

   When two (or more) substances join together to form something new.

Lava lamp

The lava lamp is a mixture of oil and water.

A mixture contains two or more substances that are mixed together but have not reacted together. i.e we can separate them easily.

Making a lava lamp

1. You will need: an empty water or drinks bottle, some oil (vegetable, sunflower, olive or whatever is available), water from the tap, food colouring (any colour you like), an effervescent tablet for example a vitamin c tablet or alka seltzer tablet
2. $\frac{1}{4}$ fill your bottle with water.
3. Add 5 drops of food colouring.
4. Top up the lava lamp with food colour until $\frac{3}{4}$ full.
5. Add in a vitamin C tablet (or any other effervescent tablet e.g. an alka seltzer tablet.

Lesson 11 Making Compounds

1. Watch the you tube clip showing the formation of the compound magnesium oxide.

https://www.youtube.com/watch?v=Otx0jiwHFrw

Did you witness any signs of a chemical reaction in the video?

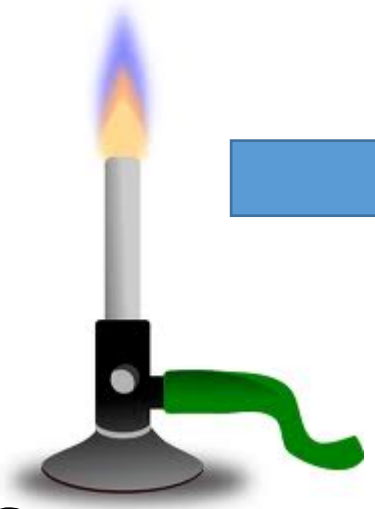
2. Read slide 49 and copy the word equation into your jotter.

3. Read slide 50 “naming compounds” and copy down into your jotter or print out and stick in.

4. Name the compounds formed from the element combinations on slide 51. Click to reveal the answer.

5. Predict which elements would have made the compounds on slide 52. Click to reveal the answer.

Compounds



Magnesium + Oxygen ⟶ Magnesium Oxide

Naming Compounds

- Compounds are named after the elements that make them.
- If only two elements are present in the compound the compound's name ends in **–ide.**

For example:

Copper and chlorine join together to make copper chlor**ide.**

Lithium and oxygen react together to make lithium ox**ide.**

Naming Compounds

Name the compounds made from the following elements.

1. Sodium and chlorine.
2. Calcium and oxygen.
3. Potassium and sulphur.
4. Boron and hydrogen.
5. Phosphorus and oxygen.

1. Sodium chlor**ide**.
2. Calcium ox**ide**.
3. Potassium sulph**ide**.
4. Boron hydr**ide**.
5. Phosphorus ox**ide**.

Identify what elements are present in these compounds.

1. Potassium nitride.
2. Calcium phosphide.
3. Lithium nitride.
4. Copper sulfide.
5. Iron oxide.
6. Magnesium hydride.

1. Potassium and nitrogen.
2. Calcium and phosphorus.
3. Lithium and nitrogen.
4. Copper and sulphur.
5. Iron and oxygen.
6. Magnesium and hydrogen.

Lesson 12 Breaking up Compounds

1. Read slide 54 “Ore” and copy the definition of an ore.
2. Read slide 55 “Extracting metals” and watch the following video on the extraction of iron in the blast furnace.

https://www.youtube.com/watch?v=fxBIgbRT8fw

3. Draw a diagram of the blast furnace (slide 56) and copy the key reactions into your jotter.

4. Plan the animation on slide 57 “Extracting Iron in Industry” oruse the animation on the BBC website

http://www.bbc.co.uk/history/interactive/animations/blast_furnace/index_embed.shtml

5. Use the animation to annotate the storyboard on slide 58. If you have a printer print out the storyboard. If not just write a sentence for each box explaining what is happening in each stage of the blast furnace.

Ores

Reactive metals are found combined with other elements. These naturally occurring metal compounds are known as metal ores.

Pyrite
Iron and sulphur
'Fools gold'

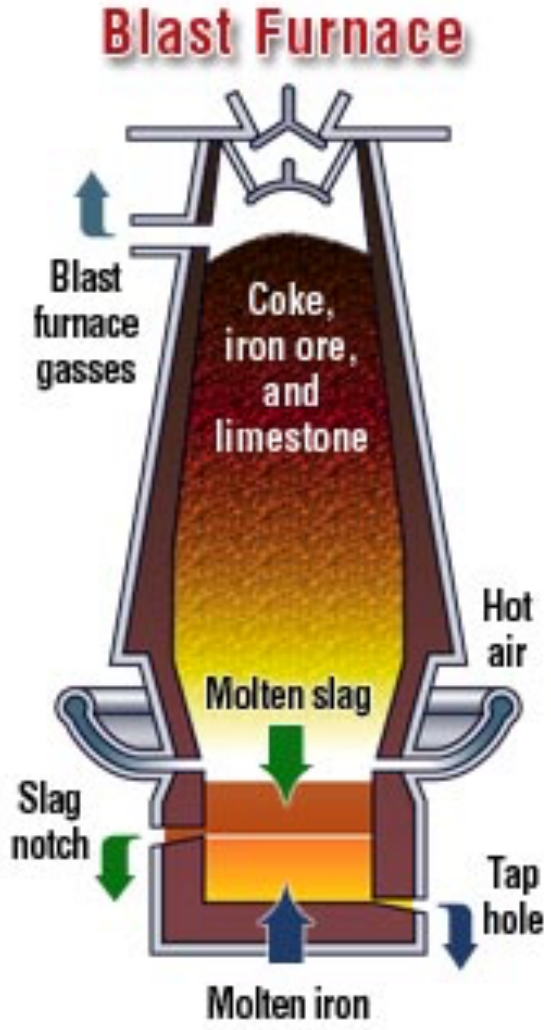
Haematite
Iron and oxygen

Extracting Metals

Extraction is when we try and separate the metal from its ore.

The extraction of iron is carried out in a **blast furnace**.

Extracting Iron – The Blast Furnace

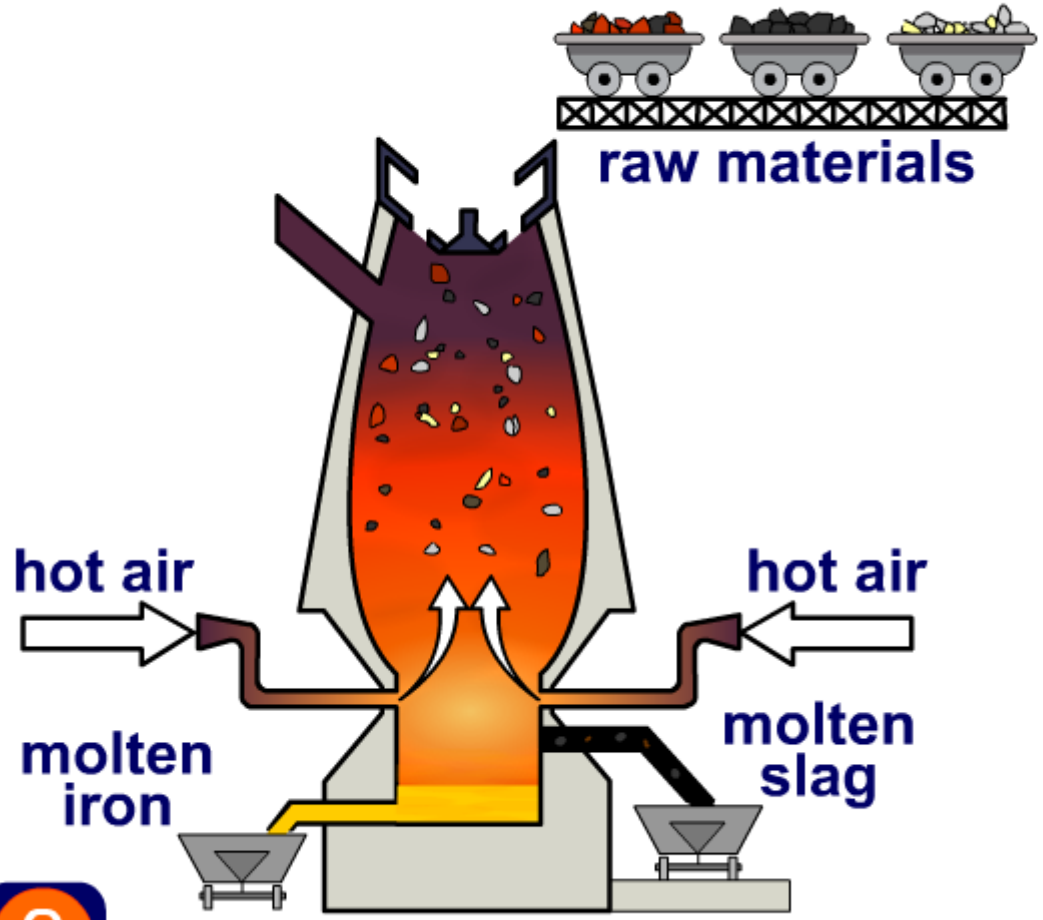


The main chemical reaction taking place in a blast furnace is:

Iron (III) oxide + carbon → iron + carbon dioxide

Extracting iron in industry

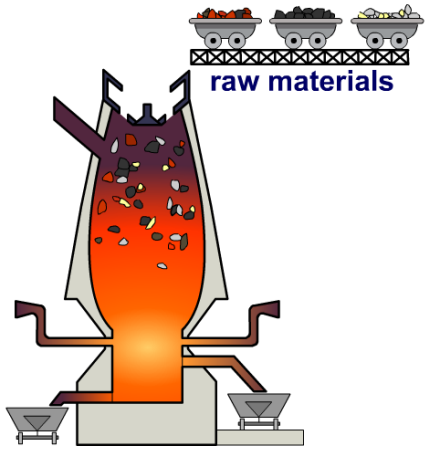
How does a blast furnace work?

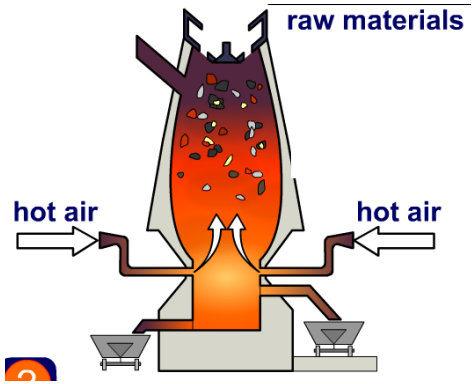


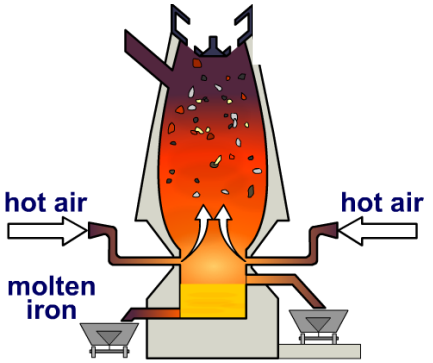
Stage 5

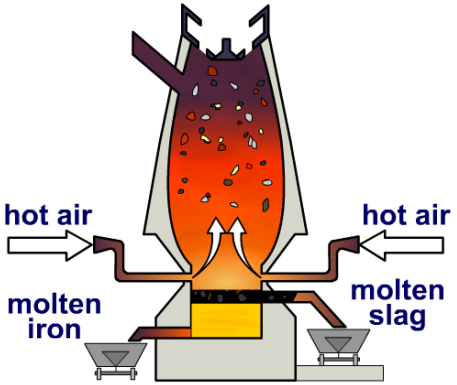
Limestone reacts with sand and other impurities in the iron ore to form **slag**. This floats on top of the iron.

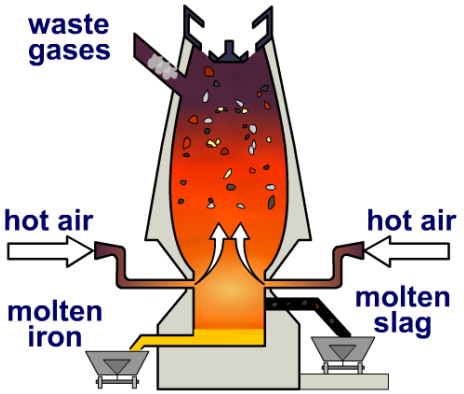
It is drained off and can be used to build roads.











Comments and equations:

Copy and complete the sentences below.

iron ore, coke, hot air, limestone, slag, molten iron,

Use the words in the list to complete the description of how iron is extracted.

Iron is extracted from ____(1)_____.

_____(2)_____ and _____(3)_____ are also needed.

Blasts of _____(4)_____ are forced into the Blast Furnace.

_____(5)_____ is collected at the bottom of the furnace. A waste product is called _____(6)_____.

Lesson 12 Breaking up Compounds - Electrolysis

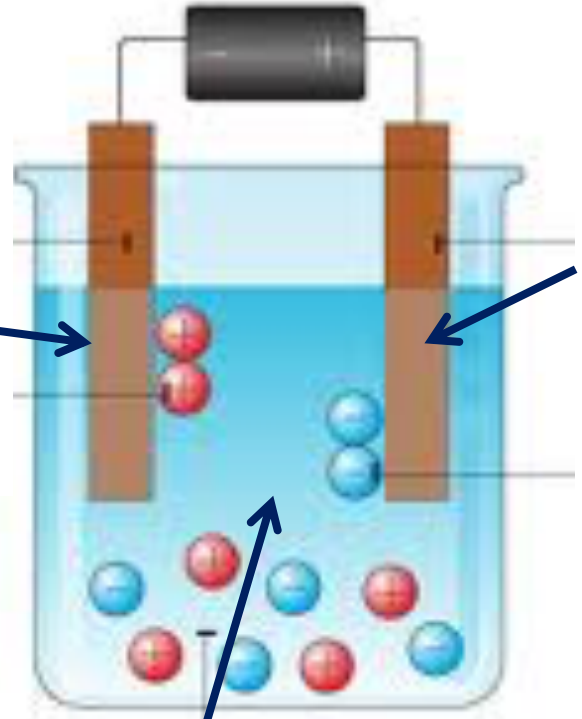
1. Watch the Twig clip “electrolysis”. Record the key points at the back of your jotter or on a piece of paper/notepad.
2. Copy the electrolysis of copper (II) chloride diagram on slide 61 and watch the video on you tube of the experiment via the link below.

https://www.youtube.com/watch?v=E6npZEyaASk

3. Use your observations from the video to complete the table on slide 62. Click to reveal the answers.

4. Copy the definition for electrolysis on slide 64 and 65

Electrolysis



Carbon electrode negatively charged

Carbon electrode positively charged

Copper chloride solution

Electrode	Observation
Positive (+)	
Negative (-)	

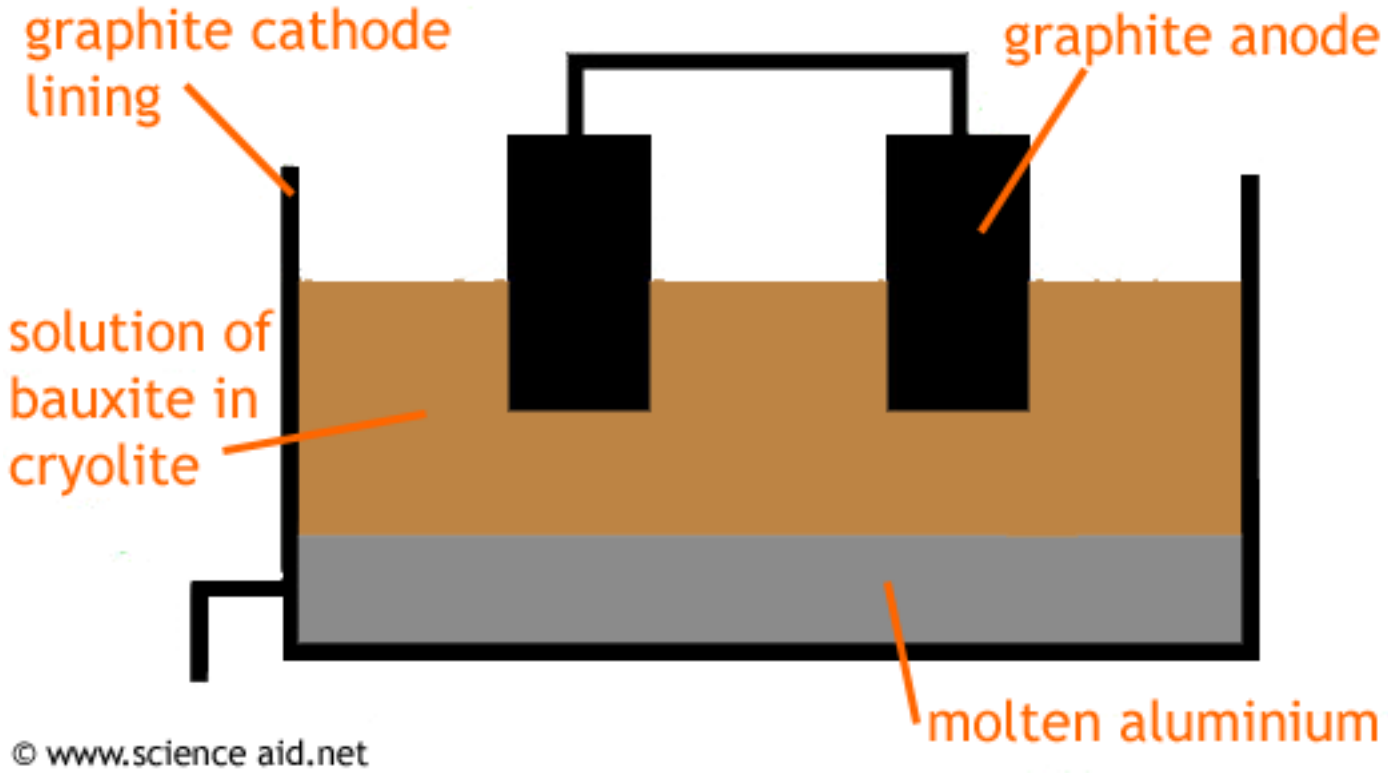
Electrolysis

Electrolysis is the breaking down of a compound by using electricity.

Aluminium Ores

- Aluminium metal is the most abundant in the Earth's crust.
- It's main ore is Bauxite.
- The ore contains aluminium, oxygen and hydrogen mainly.

Extracting Aluminium



Aluminium is extracted from its ore via electrolysis.
Aluminium is more reactive than iron so needs more energy to extract it from it's ores.