KNOWLEDGE ORGANISER

Seahaven Academy
The best in everyone™
Part of United Learning

YEAR 8:

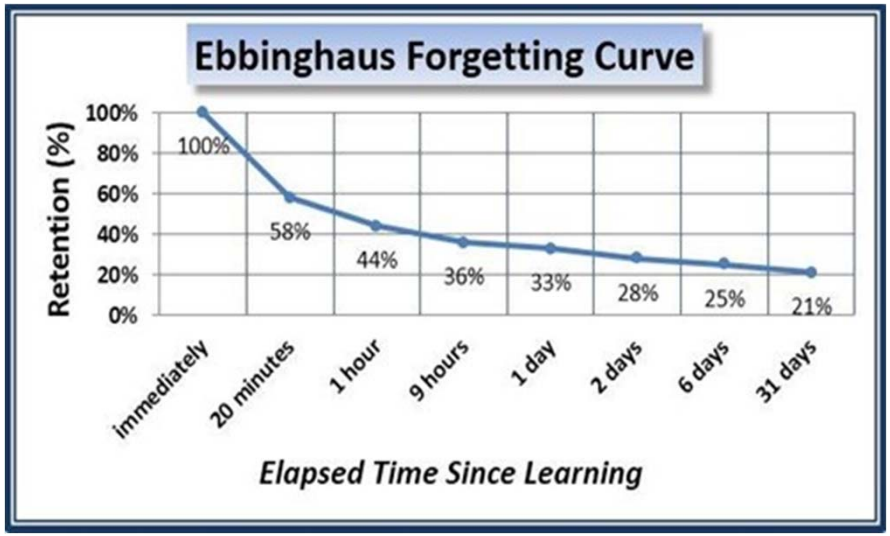
Terms 3 and 4

2023 - 2024

Core Subjects

Name: _____ Tutor Group: _____

Knowledge Organisers and The Forgetting Curve



Why are knowledge organisers important?

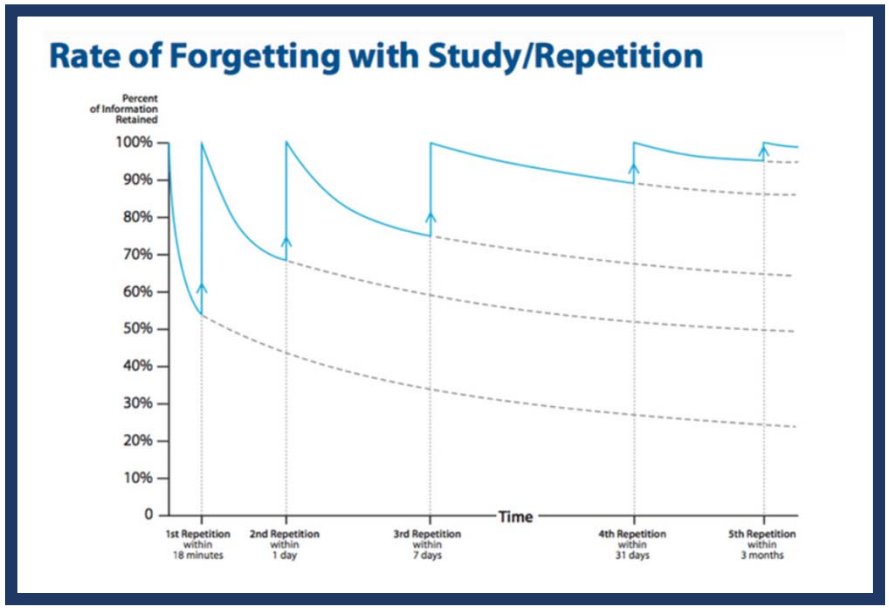
- Almost as soon as we have learnt something we begin to forget it
- In fact, it is surprising how quickly we begin to forget and within a few hours we usually only remember a fraction of what we have learnt ,the graph (left) is an example of how this happens

What can knowledge organisers be used for?

- The speed and amount of forgetting can be reduced by using knowledge organisers to practice recalling what you know
- By retrieving something back into our working memory we slow the rate of forgetting (see the second graph, below)

How will we be using our knowledge organisers?

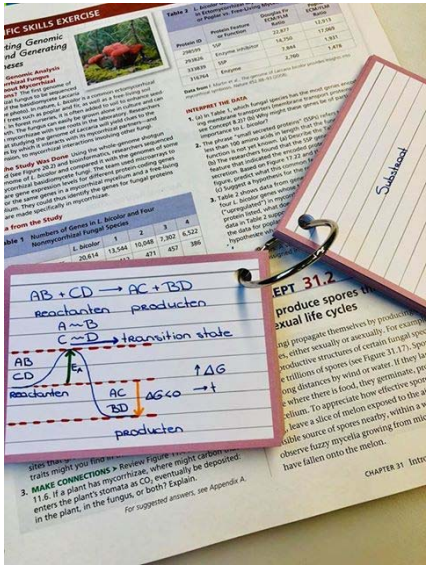
- You need to bring these to school each day in your bag, they may be used in lessons
- You will be set homework activities that use them
- You should use them to practice recall – there are tips on ways to do this in the next few pages
- You will use them to prepare for end of unit tests, including the 'Haven Hundred', set in drop-down tutor time during the penultimate week of each term



How To Use Your Knowledge Organiser

Make Flashcards

- A flashcard is a piece of card that has a cue or hint on the front side, and the answer on the back side.
- The cue can be a question, an image, or just one word that prompts or triggers a response
- Flashcards are one of the best ways to remember new information because they involve you in active learning, repetition, and reflection of your answers
- Use them to play memory test, pairing games, self quizzing or others quizzing you.
- They are very effective when used with the Leitner technique (see below)



Leitner Technique

When you've written the flashcards, they're sorted into three different boxes: 1, 2 and 3.

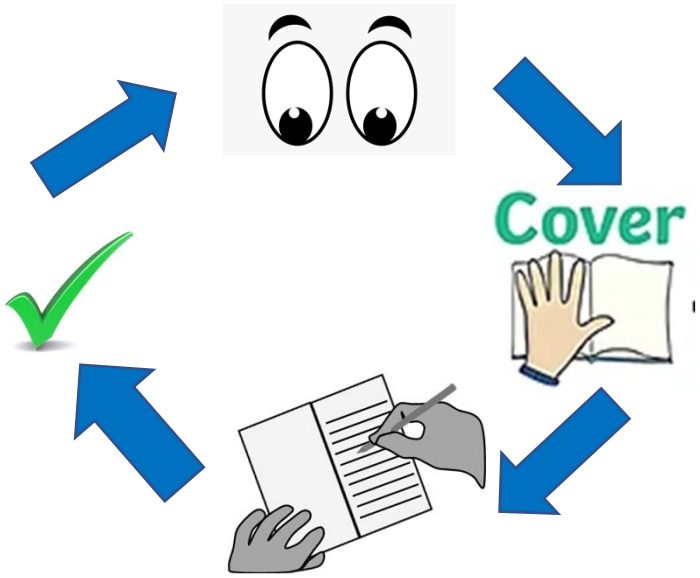
You start with all the cards in Box 1.
You learn these every day

You know a card from Box 1? Then it goes to Box 2.
You learn these every three days

You know are card from Box 2? Then it goes to Box 3
You learn these 3 every five days

If you get a card wrong, it goes back to Box 1

How To Use Your Knowledge Organiser



Read – Cover – Write – Check – Repeat

Read – a small section of your knowledge organiser
Cover – Cover the information so you are unable to read it
Write – out what you have remembered
Check – the knowledge organiser to see if you are right and add in any missing points in a different colour pen
Repeat this process the next day then a few days later

Help From Others
Parents/Carers /Siblings/ Friends

Where possible involve others in your review and recall practice. They can:

- Use your Knowledge Organiser to ask you questions or set you a quiz
- Play memory games with your flashcards – pairs or snap (with diagrams and specialist terms, specialist terms and definitions)
- Check your notes with you after read – cover – write
- Watch the videos and read the attached articles with you

Useful Links

Flashcards and Leitner Method

Read
https://study-stuff.com/how-to-study-flashcards-with-the-leitner-method/
https://e-student.org/leitner-system/

Watch
https://www.youtube.com/watch?v=d9u3KxGCio8
https://www.youtube.com/watch?v=C20EvKtdJwQ

Different Methods of Revision – Created by Staff at Seahaven
https://www.seahavenacademy.org.uk/parents/key-stage-information-evening/key-stage-4-information

Homework Sites We Use That Assist with Recall
https://senecalearning.com/en-GB/
https://hegartymaths.com/
https://www.languagenut.com/en-gb/

Y8 English Knowledge Organiser: Frankenstein by Mary Shelley Terms 3&4

The Romantics: Key ideas
Believed in the sublime power of nature

Idolised childhood innocence

Believed in the power of the individual – especially the 'ordinary man'

A reaction against the obsession with Science and rationalism of the Enlightenment

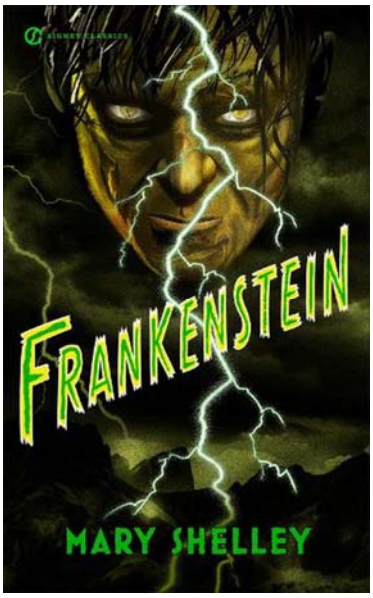
A reaction against the Industrial Revolution – factories/ destruction of nature/ terrible working conditions

Literary context (Frankenstein)
Frankenstein falls under two genres: Gothic and Science Fiction. Frankenstein embodies many of the setting and plot conventions of the gothic genre. Frankenstein is influenced by the literary movement of Romanticism. It is an **epistolary** novel – written in parts through a series of letters penned by the characters.

Historical context (Frankenstein)
Frankenstein was **set in the 18th century**, at the end of the enlightenment and romanticism period. Enlightenment emphasised reason, analysis, and individualism. Mary Shelley, a Romantic thinker, reflects Romantic ideas in the novel about the dangers of meddling with the sublime forces of nature.

BIG IDEAS- Frankenstein

- Selfish ambition can lead to personal downfall and suffering for others
- Disturbing and disrupting nature has terrible consequences for mankind
- Ill treatment of others can lead them to take revenge
- The true evil in the novel is isolation
- Prejudice and 'othering' leads to isolation and a desire to retaliate and destroy



Word	Meaning	Use
epistolary	Written in the form of letters	Frankenstein is an epistolary novel
equality	Same status and rights for all	We need to achieve true equality in society for all.
monarch	King, queen, emperor	King James was the second monarch of Shakespeare's time
nobility	People with titles who are of a high social class	The nobility were rewarded for their loyalty with land and wealth.
privilege	A special right or advantage that only one group or person has.	She was awarded the privilege of being first in the queue at lunchtime.
rationalism	Belief in science and logic	The Enlightenment was a time of rationalism.
revolutionary	Something or someone which aims to create political change	The Romantics had revolutionary ideas.
transgression	A sin or wrongdoing	Shelley believed the Peterloo massacre represented a transgression by the government against the people.
tyranny	Cruel harsh government	The people lived in a state of tyranny.
allusion	Reference to another literary or historical text	There are allusions to both the bible and Paradise Lost throughout Frankenstein
benevolent	Well meaning, kindly	Henry Clerval is a benevolent character
desolate	Bleak emptiness / unhappiness	He was left alone in this desolate place.
ephemeral	Lasting for a very short time	The ephemeral nature of the rainbow is what makes it special.
equate	Be equal to	The pain in his chest couldn't equate with the distress he felt at the situation
fiend	demon	Victor believes the monster is a fiend
foreboding	A sense that bad things will happen	Upon entering the house, she felt a great sense of foreboding.
hapless	unfortunate	The monster is a hapless soul
Phenomenon (pl.phenomena)	A remarkable person, thing or happening	Glaciers are interesting natural phenomena.
Sublime (literature)	Thoughts and emotions beyond ordinary experience	On meeting his monster, Frankenstein experienced sublime fear.
virtuous	Morally good	The monster was virtuous at the time of his creation
zeitgeist	Spirit of the time	Frankenstein captures the zeitgeist of the late Enlightenment /early Romantic period

Quotations

Victor Frankenstein

- 'It was the secrets of heaven and earth that I desired to learn.'
- 'Life and death appeared to me ideal bounds, which I should first break through'
- 'A new species would bless me as its creator and source'

The Monster

- 'the words they spoke sometimes produced pleasure or pain, smiles or sadness, in the minds and countenances of the hearers. This was indeed a godlike science'
- 'am I not alone, miserably alone? You, my creator, abhor me'
- 'what hope can I gather from your fellow-creatures, who owe me nothing? they spurn and hate me'
- 'the spirit of revenge enkindled in my heart'
- 'misery has made me a fiend'
- 'I ought to be thy Adam; but I am rather the fallen angel'

Themes

- 'in a scientific pursuit there is continual food for discovery and wonder'
- 'The girl was called sister, or Agatha; and the youth Felix, brother, or son. I cannot describe the delight I felt when I learned the ideas appropriated to each of these sounds, and was able to pronounce them'
- 'now misery has come home, and men appear to me as monsters thirsting for each other's blood'
- 'Unfeeling, heartless creator!'
- 'You had endowed me with perceptions and passions, and then cast me abroad an object for the scorn and horror of mankind'
- 'I am alone, and miserable; man will not associate with me; but one as deformed and horrible as myself would not deny herself to me.'

Perfect your SQZMICL paragraph!

- **SQ = Short Quotations (1-2 per paragraph)** *'……'*
- **Z = Zoom** *The word '……'…*
- **M = Methods** *The use of …….has connotations of…connotes…*
- **I = Impact** *…..suggests/implies/reflects….makes the audience/reader think/feel/imagine….shows/reflects…*
- **C = Context** *…..reflects ideas about…relates to….communicates the message that…Perhaps the writer is exposing/warning/teaching….*
- **L = Link to key words in the question – do this throughout your paragraph!**

- Have you written at least 3 sentences after each quotation?
- Can you add explanation or alternative interpretations?

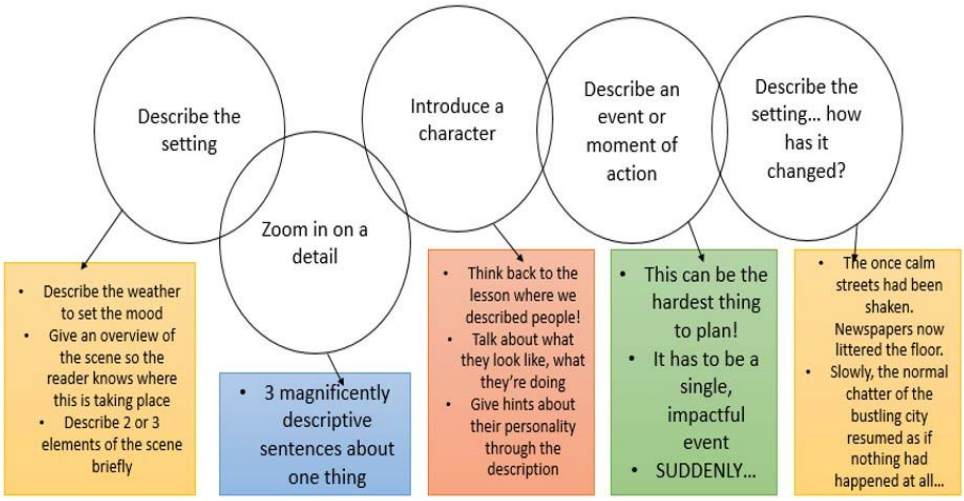
However,…

Alternatively,…

…because…

…but…

…so…



Method	What is it?	Example
Simile	When two things are compared using **like** or **as**.	His feet thundered along the path like a monster chasing its prey.
Metaphor (harder to spot!)	When two things are compared subtly saying one thing **is** the other thing.	His monstrous feet thundered along the path, chasing his prey.
Personification	Giving a non-human thing human characteristics (physical description, emotions or behaviour).	The moon gazed down in horror at the scene unfolding beneath it.
Repetition	Repeating a word or phrase to add emphasis or make it more memorable.	All that could be heard was the thundering of his feet along the path, thundering closer and closer towards his prey.
Contrast	Deliberately including images, ideas or characters that are very different in order to highlight their differences.	His feet thundered along the path whilst I waited noiselessly.
Alliteration	Repeated consonant sound to start two or more words that are close together.	His monstrous feet thundered along the path, chasing his powerless prey.
Allusion	Indirectly referencing or connecting to a story, text or idea from the past.	His was a devil risen from the fires of hell.
Imperative	A commanding sentence.	You must escape him.
Interrogative	A question.	How can I ever escape him?
Exclamative	A sentence ending with an exclamation mark.	Behold! The monster is upon us!

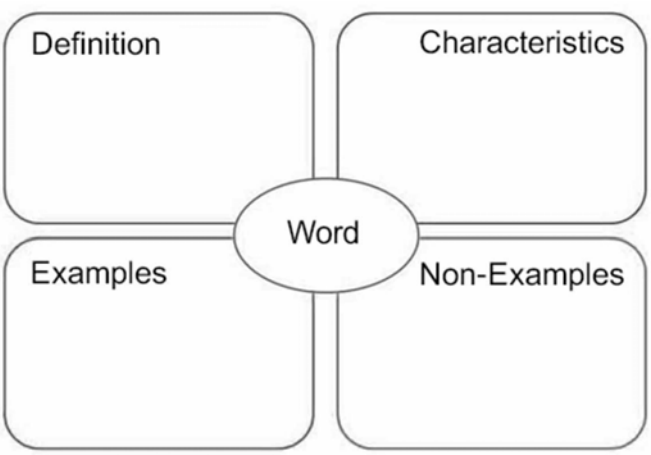
How do I revise key terminology / vocabulary?

1. Look / say / cover / write / check

Look → Say → Cover → Write → Check

Look/Say	Write / Check	Write / Check	Write / Check	Write / Check

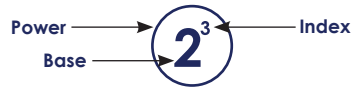
2. Frayer model



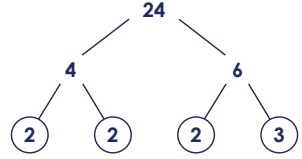
3. Use the words in practice sentences

As readers, we admire the protagonist as he faces his fears.

KPI 8.01 Powers and Roots

1) Square number	The result of multiplying a number by itself. It will always be positive. The first 12 square numbers are: 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121,144.	**2) Square root**	The opposite of squaring a number to find the original factor. E.g. $\sqrt{64} = 8$ or -8 because $8^2 = 64$ and $(-8)^2 = 64$
3) Cube number	The result of multiplying a number by itself, then itself again. The first 10 cube numbers are: 1, 8, 27, 64, 125, 216, 343, 512, 729, 1000.	**4) Cube root**	The opposite of cubing a number to find the original factor. E.g. $\sqrt[3]{8} = 2$ because $2^3 = 8$ Note: $(-2)^3 = -8$ so $\sqrt[3]{8} \neq -2$
5) Index notation	**Example** $a \times a \times a \times a = a^4$. The number 4 is called the index (plural indices). This tells us how many times the "base" a has been multiplied by itself.		
6) Multiplying powers	$a^m \times a^n = a^{m+n}$ ADD the powers only if the bases are the same. E.g. $a^5 \times a^3 = a^{5+3} = a^8$	**7) Dividing powers**	$a^m \div a^n = a^{m-n}$ SUBTRACT the powers only if the bases are the same. E.g. $a^6 \div a^2 = a^{6-2} = a^4$
8) Indices with brackets	$(a^m)^n = a^{m \times n}$ MULTIPLY the powers. E.g. $(a^3)^5 = a^{3 \times 5} = a^{15}$	**9) Indices with brackets**	$(ab)^n = a^n \times b^n$ Raise each number or variable to the same power. E.g. $(2p)^4 = 2^4 \times p^4 = 16p^4$
10) Power of 0	$a^0 = 1$. Any number or variable to the power of zero equals 1.	**11) Power of $\frac{1}{2}$**	$a^{\frac{1}{2}} = \sqrt{a}$ E.g. $16^{\frac{1}{2}} = \sqrt{16} = 4$

KPI 8.02 Prime Factorisation

1) Prime numbers	A prime number only has two distinct factors: 1 and itself. 2 is the only even prime number. 1 is not a prime number. Prime numbers between 1 and 100: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97.		
2) Prime factor decomposition	The process of expressing a number as a product of its prime factors. $24 = 2 \times 2 \times 2 \times 3 \rightarrow 24 = 2^3 \times 3$	**3) Prime factor trees**	

KPI 8.03 Rounding

1) Significant figures

The total number of digits in a number, not counting zeros at the beginning of a number or at the end of a decimal number.
345 000 has 6 significant figures.
0.3047 has 4 significant figures.
10.500 has 3 significant figures.

2) Rounding to significant figures

Round to...	0.007638 to 3 sf	0.007638 to 2 sf	0.007638 to 1 sf	2.0507 to 3 sf	2.0507 to 2 sf	2.0507 to 1 sf
Answer	0.00764	0.0076	0.008	2.05	2.1	2

3) Estimate

Find a rough or approximate answer by calculating with numbers rounded to one significant figure.
e.g. 2.3 x 18.4 ≈ 2 x 20 = 40
≈ "approximately equal to"

KPI 8.04 Fractions

1) Converting an improper fraction to a mixed number

$$\frac{15}{7} = 2\frac{1}{7}$$

2) Converting a mixed number to an improper fraction

$$3\frac{4}{5} = \frac{(3 \times 5) + 4}{5} = \frac{19}{5}$$

3) Adding and subtracting fractions

Make the denominators the same (find the LCM).
Use equivalent fractions to ensure fractions have a common denominator.
Add/subtract the numerators only.

$$\frac{2}{7} + \frac{2}{5} = \frac{10}{35} + \frac{14}{35} = \frac{24}{35}$$

4) Multiplying fractions

Multiply the numerators.
Multiply the denominators.
Simplify where possible.

$$\frac{4}{5} \times \frac{3}{8} = \frac{12}{40} = \frac{3}{10}$$

5) Dividing fractions

Keep the first fraction the same.
Change the second to its reciprocal.
Multiply the fractions.
Simplify or convert to a mixed number where possible.

$$\frac{4}{5} \div \frac{3}{8} = \frac{4}{5} \times \frac{8}{3} = \frac{32}{15} = 2\frac{2}{15}$$

KPI 8.05 Solving Equations 1

1) Inverse operations	Addition and Subtraction are inverse operations. Multiplication and Division are inverse operations. Squaring and taking the square root are inverse operations.	**2) Variable**	A letter used to represent any number.
3) Coefficient	The number to the left of the variable. This is the value that we multiply the variable by. $4x$ ➔ The coefficient of x is 4. x ➔ The coefficient of x is 1.	**4) Term**	A single number, variable or numbers and variables multiplied together.
5) Collecting like terms	Combining the like terms in an expression. $7x + 3y - 2x$ is simplified to $5x + 3y$.	**6) Expression**	A mathematical statement which contains one or more terms combined with addition and/or subtraction signs E.g. $4x + 3y$.
7) Linear equation	Contains an equals sign (=) and has one unknown. E.g. $5x - 2 = 2x + 7$.		

8) Solve

Use inverse operations to find the solution of an equation.

E.g. 1. (One step)

$\frac{x}{4} = 12$

x4 x4

$x = 48$

E.g. 2. (Two step)

$3p - 7 = 8$

+7 +7

$3p = 15$

÷3 ÷3

$p = 5$

E.g. 3. (Unknown on both sides)

$2x + 10 = 19 - 9x$

+9x +9x

$11x + 10 = 19$

-10 -10

$11x = 9$

÷11 ÷11

$x = \frac{9}{11}$

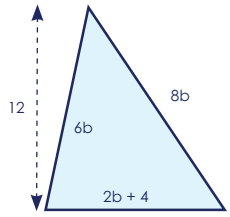
9) Form and solve a linear equation

E.g. 1
Jake is y years old. Lilly is 15. Kobe is 3 years younger than Jake. They have a total age of 36. Work out their individual ages.

$y + 15 + y - 3 = 36$
$2y + 12 = 36$
$2y = 24$
$y = 12$

Jake: 12, Lily: 15, Kobe: 9

E.g. 2
The area of the triangle is 120 cm². Find the value of b.



$\frac{12(2b + 4)}{2} = 120$

$\frac{24b + 48}{2} = 120$

$12b + 24 = 120$

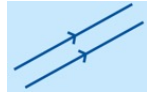
$12b = 96$

$b = 8\text{cm}$

KPI 8.06 Angles in Parallel Lines 1

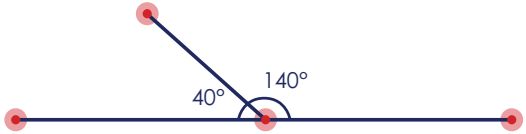
1) Parallel lines

Always equidistant.
Parallel lines have the same gradient.
They never meet however far they are extended.



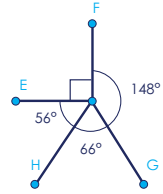
2) Angles on a straight line

Angles on a straight line sum to 180°



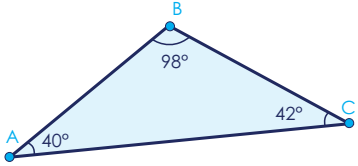
3) Angles around a point

Angles around a point sum to 360°



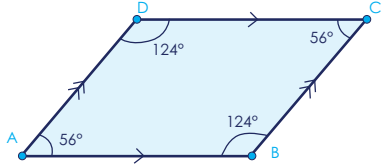
4) Angles in a triangle

Angles in a triangle sum to 180°



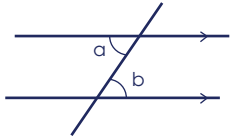
5) Angles in a quadrilateral

Angles in a quadrilateral sum to 360°



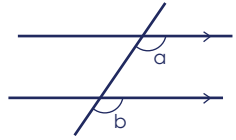
6) Alternate angles

Alternate angles are equal, so a = b



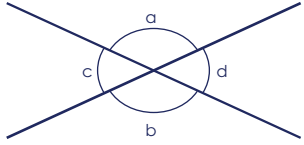
7) Corresponding angles

Corresponding angles are equal, so a = b



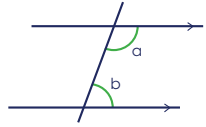
8) Vertically opposite angles

Vertically opposite angles are equal, so, a = b and c = d



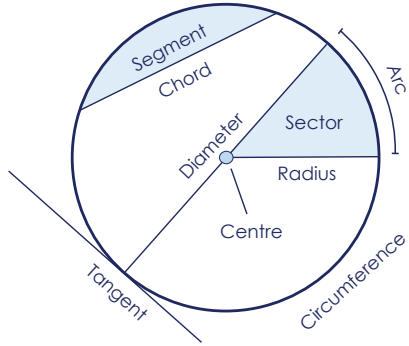
9) Co-interior angles

Co-interior angles sum to 180°, so a + b = 180°



KPI 8.07 Circumference

1) Diameter	A straight line going straight through the centre of the circle and touching the circumference at each end.
2) Radius **Plural: radii**	A straight line joining the centre to the circumference.
3) Chord	A straight line joining any two parts of the circumference.
4) Tangent	A straight line that touches the circumference at a single point.
5) Arc	A section of the circumference.
6) Sector	The area bound by two radii and an arc.
7) Segment	The area bound by the circumference and a chord.



8) Circumference

The perimeter of the circle.
C = π ×diameter
C = π d

d = 5cm

c = πd
c = π x 5
c = 5π cm

c = 15.70796327cm
c = 15.7cm (3*sf*)

9) π (Pi)

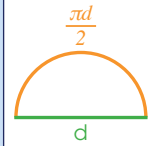
The ratio of a circle's circumference to its diameter.

It has an estimated value of $\frac{22}{7}$ or 3.14 rounded to 3 significant figures.

10) Revolution

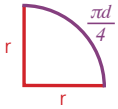
A revolution is a full turn of a circle.
The distance covered by one revolution is equal to the circumference of the circle.

13) Semi circle



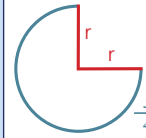
Perimeter $\frac{\pi d}{2}$ + d

12) Quarter- circle



Perimeter $\frac{\pi d}{4}$ + 2r

14) Three-quarter circle



Perimeter $\frac{3}{4}\pi d$ + 2r

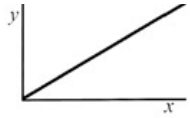
KPI 8.08 Direct Proportion

1) Proportion

A relationship between two quantities.

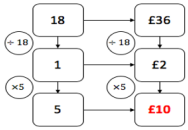
2) Direct proportion

A relationship between two variables where, as one increases, the other also increases.
The graphical representation of this relationship is a straight line through the origin.



3) Unitary method

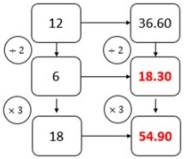
To find the value of one unit first.



5) Best buy

Better value for money means that the cost is cheaper when buying an identical item or amount. Equal quantities must be compared.

4) Multiple intersections



6) Recipes

Option 1: Find the amount of ingredients needed for a specific number of people.
Option 2: Find how much of the recipe can be made with the quantities available in the question.

KPI 8.09 Fractions, Decimals and Percentages

1) Common conversions

Fraction	Decimal	Percentage
$\frac{1}{10}$	0.1	10%
$\frac{1}{8}$	0.125	12.5%
$\frac{1}{5}$	0.2	20%
$\frac{1}{4}$	0.25	25%
$\frac{1}{3}$	0.33333....	33.3% (1dp)
$\frac{1}{2}$	0.5	50%
$\frac{3}{4}$	0.75	75%
$\frac{1}{1}$	1	100%

2) Fraction to decimal

Divide the numerator by the denominator.

$\frac{1}{5} \rightarrow 1 \div 5 \rightarrow 5\overline{)1.0}\ 0.2$

3) Decimal to percentage

Multiply by 100 and add the percentage symbol.

$0.09 \rightarrow 0.09 \times 100 = 9\%$

4) Percentage to fraction

Write the percentage as the numerator and make 100 the denominator. Simplify if possible.

$30\% \rightarrow \frac{30}{100} = \frac{3}{10}$

4) Percentage change

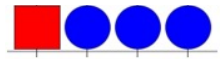
Percentage Increase or Decrease =

$\frac{\text{Change}}{\text{Original}} \times 100$

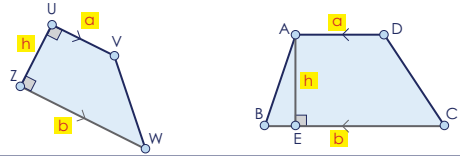
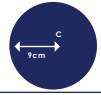
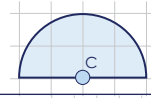
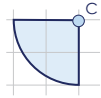
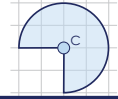
KPI 8.10 Percentages Calculations

1) Multiplier	A percentage written as a decimal is the percentage multiplier.	**2) Percentage of an amount with a calculator**	The percentage multiplier multiplied by the amount.
3) Percentage change	$\frac{\text{difference}}{\text{original}}$ x 100	**4) Reverse percentages**	$\text{original} = \frac{\text{new amount}}{\text{multiplier}}$

KPI 8.11 Ratio 1

1) Ratio	A part-to-part comparison. The ratio of a to b is written a:b	**2) Ratio as a fraction**	Fraction of shapes which are squares: $\frac{1}{4}$  Fraction of shapes which are circles: $\frac{3}{4}$
3) Equivalent ratios	Found by multiplying or dividing all parts of the ratio by the same number.		
4) Simplifying ratios	Ratios can be simplified by dividing each part of the ratio by the same number. ÷5 ↶ 25 : 15 / 5 : 3 ↷ ÷5	**5) Sharing into a given ratio**	Add the parts together. Divide the total by this. Multiply this by each part of the ratio. Share £18 in the ratio of 5:4 Add the part → 4 + 5 = 9 parts £18 ÷ 9 = £2 → 1 part = £2 5 parts: 5 x £2 = £10 4 parts: 4 x £2 = £8 £10: £8
6) Unitary Ratio	Write the ratio 5:3 in the form 1:n ÷5 ↶ 5 : 3 / 1 : $\frac{3}{5}$ ↷ ÷5		

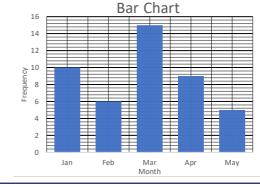
KPI 8.12 Area of Circles

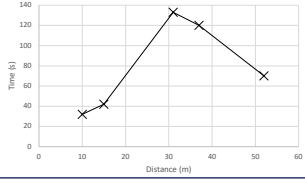
1) Trapezium	Quadrilateral with one pair of parallel sides.	**2) Isosceles trapezium**	Quadrilateral with one pair of parallel side and two right angles.
3) Area of trapezium	Sum of the parallel sides. Divide by 2. Multiply by the vertical height.	$A = \left(\frac{a+b}{2}\right) \times h$	
4) Area of a circle	$A = \pi r^2$ $A = \pi \times 9^2$ $A = 81\pi \text{ cm}^2$ 	**5) Area of a semi-circle**	$A = \frac{\pi r^2}{2}$ 
6) Area of a quarter-circle	$A = \frac{\pi r^2}{4}$ 	**7) Area of a three-quarter circle**	$A = \frac{3\pi r^2}{4}$ 

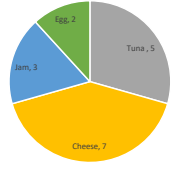
KPI 8.13 Statistics 1

1) Frequency table	A table showing how often (frequent) something occurs. Can include tally charts.	**2) Bar chart**	A way of displaying data, using horizontal or vertical bars which are the same width and have gaps between them. Data can also be presented in dual and composite bar charts in which case a key word would be used.
3) Line graph	Uses lines to join points on a graph to represent a data set.	**4) Pie chart**	Method of displaying proportional information by dividing a circle up into different-sized sectors.
5) Stem and Leaf diagrams	Presents data in a table where the place value columns are split. For example, the tens and the ones columns may be split where the tens become the "stem" and the ones become the "leaf". Stem and lead diagrams come with a key and must always be written in order.		

Score	Tally	Frequency (*f*)
1	||||	4
2	𝍸 ||||	9
3	𝍸 |	6
4	𝍸 |||	8
5	|||	3
6	|	1







12	5
34	31
27	22
19	6
39	40

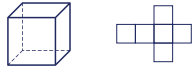
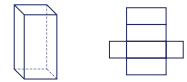
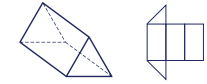
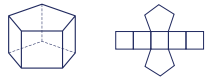
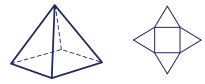
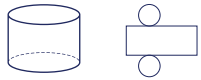
0	5 6
1	2 9
2	2 7
3	1 4 9
4	0

Key
2 | 9 = 29

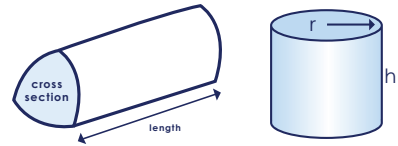
KPI 8.14 Averages and spread

1) Average	The central or typical value in a data set. There are three types of averages: mode, median and mean.	**2) Mode**	The most common/frequent value from a set of data. Mode of 3, 3, 6, **7, 7, 7**, 8, 9, 10 = 7
3) Median	The middle value when the data is in order. Median of 9, 5, 15, 6, 8 → 5, 6, **8**, 9, 15 = 8	**4) Mean**	Add up all the numbers and divide the total by how many numbers there are. Mean of 7, 8, 9: $\frac{7+8+9}{3} = \frac{24}{3} = 8$
5) Range	A measure of the spread of the data, = *Largest Value − Smallest Value*.		
6) Reversing the mean	If we have the mean but one of the data points is missing, we can find the missing value by: 1) Multiplying the 'mean' by the number of data points to get the total of the values; 2) Subtracting the sum of the known values from the total of all values.	E.g. The mean of three numbers is 5. Two of the numbers are 3 and 10. Find the third value. Total of the values: 5 x 3 = 15 15 – (3 + 10) = 2 The third value is 2	

KPI 8.15 3D Visualisation

1) Face	A face is a single flat surface.	**2) Edge**	An edge is a line segment between faces.	**3) Vertex**	A vertex is a corner.
4) Cube	6 faces 12 edges 8 vertices 	**5) Cuboid**	6 faces 12 edges 8 vertices 	**6) Triangular prism**	5 faces 9 edges 6 vertices 
7) Pentagonal prism	7 faces 15 edges 10 vertices 	**8) Square-based pyramid**	5 faces 8 edges 5 vertices 	**9) Triangular -based pyramid**	4 faces 6 edges 4 vertices 
10) Cylinder	3 faces 2 edges 0 vertices 	**11) Cone**	2 faces 1 edge 1 vertex 	**12) Sphere**	1 face 0 edges 0 vertices 

KPI 8.16 Volume

1) Volume	The volume of a solid body is the amount of 'space' it occupies. It is measured in cubic units e.g. cubic centimetres (cm^3).		
2) Volume of a prism	Volume of a prism = area of cross section × length Volume of cylinder = $\pi r^2 h$ 	**3) Units of capacity**	1 L = 1000 ml; 1 L = 1000 cm^3

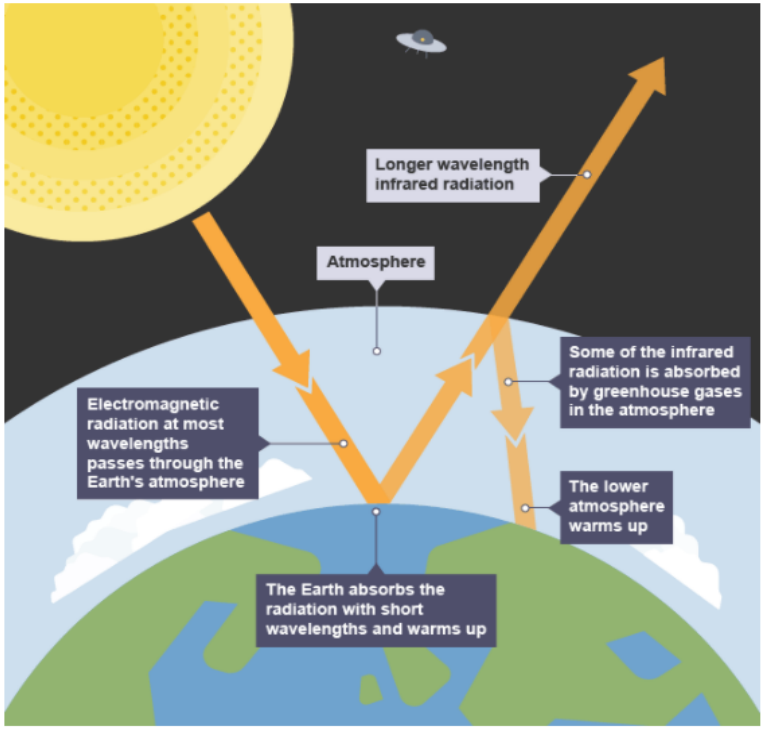
The greenhouse effect

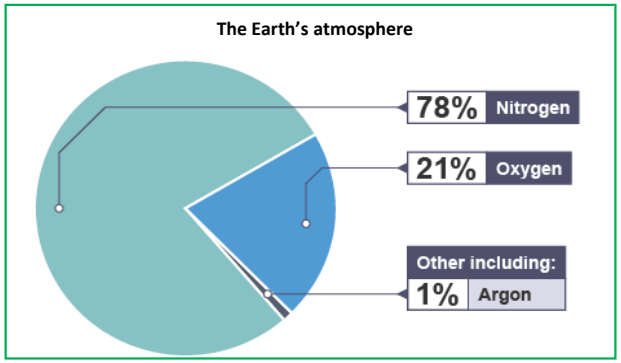
- Thermal energy from the Earth's surface escapes into space;
- If too much thermal energy escaped, the planet would be very cold;
- Greenhouse gases in the atmosphere, trap escaping thermal energy;
- This causes some of the thermal energy to pass back to the surface;
- This is called the greenhouse effect, and it keeps our planet warm;
- Carbon dioxide is an important greenhouse gas.

Humans burn fossil fuels which releases carbon dioxide, increasing the greenhouse effect. More thermal energy is trapped by the atmosphere, causing the planet to become warmer than it would be naturally. This increase in the Earth's temperature is called **global warming**.

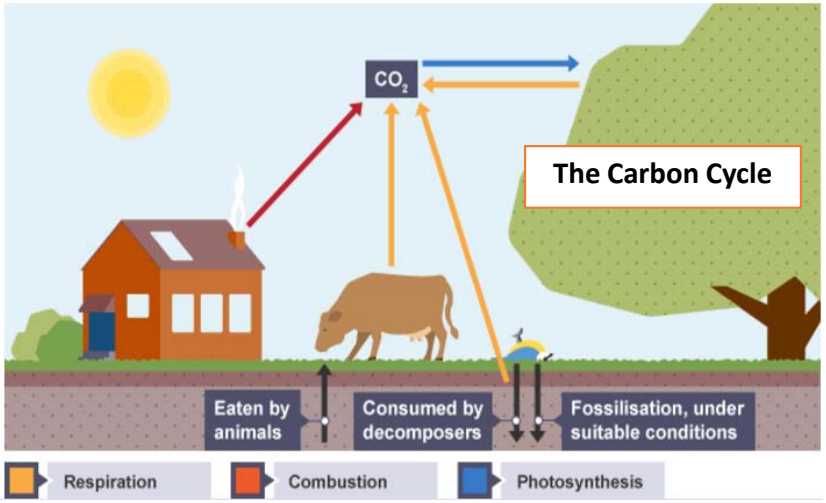
Climate change and its effects as a result of global warming includes:

- ice melting faster than it can be replaced in the Arctic and Antarctic
- the oceans warming up – their water is expanding and causing sea levels to rise
- changes in where different species of plants and animals can live





Science 8CM Materials and the Earth



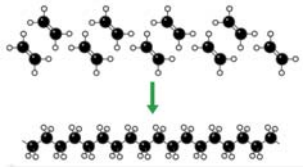
Ceramic materials:

- are solids made by baking a starting material in a very hot oven or kiln
- are hard and tough
- have very many different uses

Brick and pottery are examples of ceramics.

Polymers:

Polymers are made by joining lots of small molecules together to make long molecules.



- The properties of polymers are:
- chemically unreactive
- solids at room temperature
- plastic – they can be moulded into shape
- electrical insulators
- strong and hard-wearing

Polymers are usually chemically unreactive.
Advantage: plastic bottles will not react with their contents.
Disadvantage: they do not rot quickly and they can cause litter problems.

Composites

Composite materials are made from two or more different types of material.
e.g. MDF is made from wood fibres and glue; fibreglass is made from glass fibres and a tough polymer;

Reinforced concrete is a composite material made from steel and concrete. When the concrete sets, the material is:

- strong when stretched (because of the steel)
- strong when squashed (because of the concrete)

Science 8CM Materials and the Earth

Sedimentary rocks
Sedimentary rocks are formed from the broken remains of other rocks that become joined together.

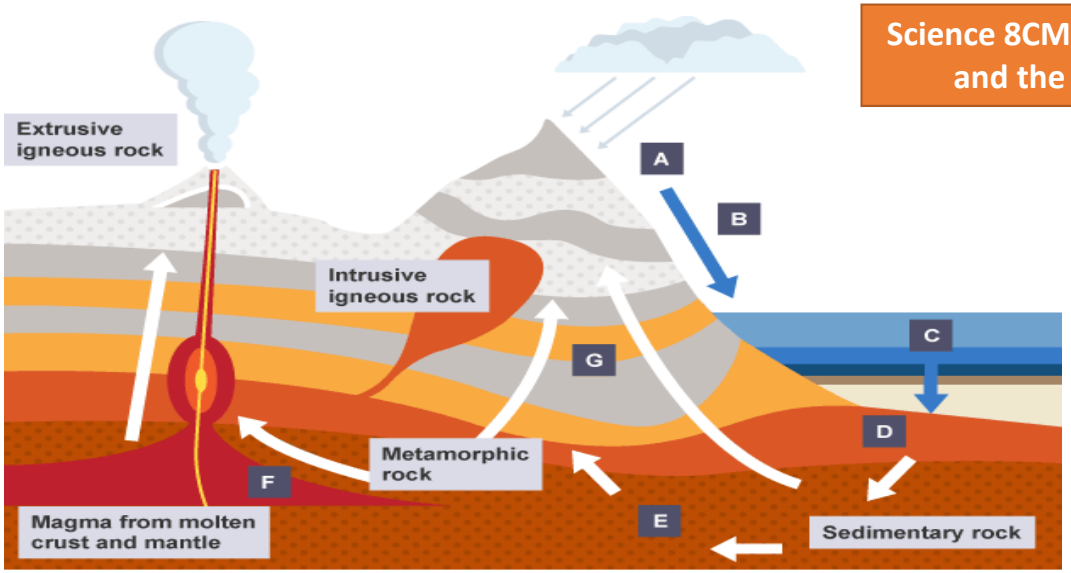
transport → deposition → sedimentation → compaction → cementation

- **Transport**: A river carries pieces of broken rock as it flows along.
- **Deposit**: When the river reaches a lake/sea, it settles at the bottom.
- **Sedimentation**: The deposited rocks build up in layers, called sediments.
- **Compaction**: Weight of sediments on top squashes sediments at bottom.
- **Cementation**: Water is squeezed out from between pieces of rock and crystals of different salts form. The crystals stick the pieces of rock together.

Igneous rocks
Igneous rocks are formed molten rock that has cooled and solidified. Molten (liquid) rock is called magma. If it:

- cools **slowly**, it will form rock with **large** crystals
- cools **quickly**, it will form rock with **small** crystals

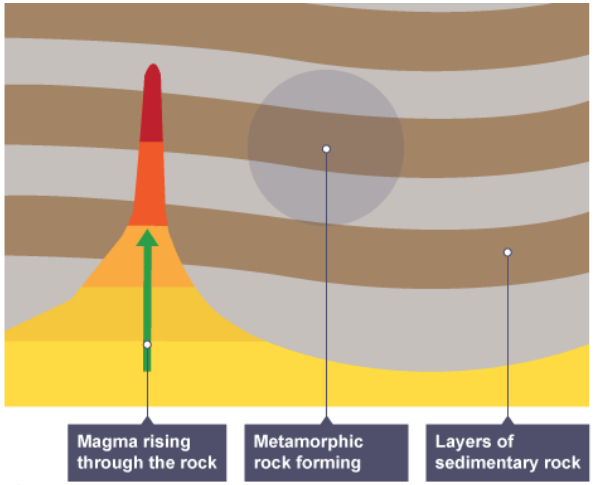
	Extrusive	Intrusive
Where the magma cooled	On the surface	Underground
How fast the magma cooled	Quickly	Slowly
Size of crystals	Small	Large
Examples	Obsidian and basalt	Granite and gabbro



A Weathering and erosion
B Transportation and deposition
C Sedimentation
D Compaction and cementation
E Burial, high temperatures and pressures
F Melting
G Slow uplift to the surface

Metamorphic rocks
Metamorphic rocks are formed from other rocks that are changed because of heat or pressure.

- Earth movements can cause rocks to be deeply buried or squeezed.
- These rocks are heated and put under great pressure.
- They do not melt, but the minerals they contain are changed chemically, forming metamorphic rocks
- Metamorphic rocks rarely contain fossils. Any that were present in the original sedimentary rock will not normally survive the heat and pressure.



Metamorphic rocks may form from rocks heated by nearby magma

Recycling
The Earth's resources are limited. We can recycle many resources, including:

- **Glass**. It can be melted and remoulded to make new objects. The energy needed is less than the energy needed to make new glass. Must be sorted into different coloured glass ready for recycling, and transported to recycling plants;
- **Metal**. It takes less energy to melt and remould metals than it does to extract new metals from their ores. Aluminium is a metal that melts at a low temperature, so it is attractive for recycling;
- **Paper**. It is broken up into small pieces and reformed to make new sheets of paper. Takes less energy than making new paper from trees. Paper can only be recycled a few times before its fibres become too short to be useful and it is often only good enough for toilet paper or cardboard, or used as a fuel or compost;
- **Plastic**. Many plastics (but not all) can be recycled. For example, some plastic bottles can be recycled to make fleece for clothing. Recycling means that we use less crude oil, the raw material needed for making plastics. They have to be sorted first and this can be difficult, but recycling does stop it ending up in landfill.

Bar magnets
Most materials are not magnetic.
A magnetic material can be **magnetised** or will be attracted to a magnet.
Not all metals are magnetic.
These metals are magnetic:
- Iron
- Cobalt
- nickel
- steel (because it contains iron).

A bar magnet is a **permanent magnet -** its magnetism cannot be turned on or off.

A bar magnet has two magnetic poles:
- north pole (or north-seeking pole)
- south pole (or south-seeking pole)

Attract and repel
Opposite poles will attract, and like poles will repel.

Testing for magnets
You can only show that an object is a magnet if it repels a known magnet.

Science 8BE Electricity and Magnetism

Electromagnets
When an electric current flows in a wire, it creates a magnetic field around the wire.
The magnetic field around an electromagnet is the same as around a bar magnet.

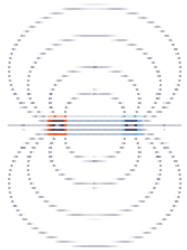
We can make the electromagnet stronger by:
- wrapping the coil around a piece of iron (such as an iron nail)
- adding more turns to the coil
- increasing the current flowing through the coil

Too much current can cause heating.

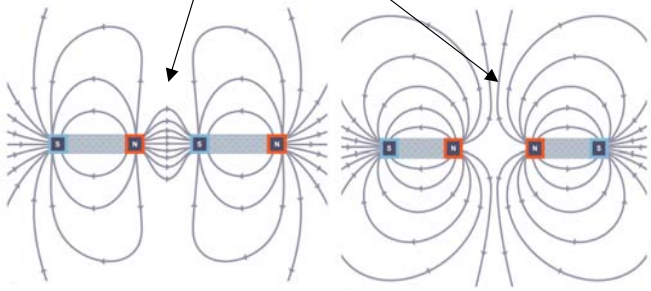
Advantages of electromagnets:
- they can be turned on and off
- the strength of the magnetic field can be varied
- reversing the current (turning the battery around), reverses the direction of the field (swaps the poles)

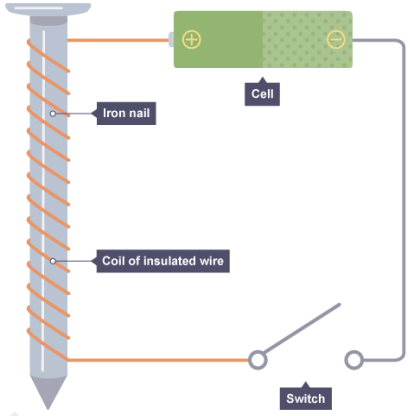
Magnetic fields
A magnet creates a magnetic field around it (you cannot see a magnetic field)
A **non-contact force** is exerted on a magnetic material brought into a magnetic field. It is **non-contact force** because the magnet and the material do not have to touch each other.

We represent magnetic fields using diagrams
- each field line has an arrow from **north to south**;
- the field lines are more concentrated at the poles;
- the magnetic field is strongest at the poles.



Field lines also show what happens to the magnetic fields of two magnets during attraction or repulsion.





DC motors
Passing an electric current through a wire in a field will make the wire move.
This is called the **motor effect**.

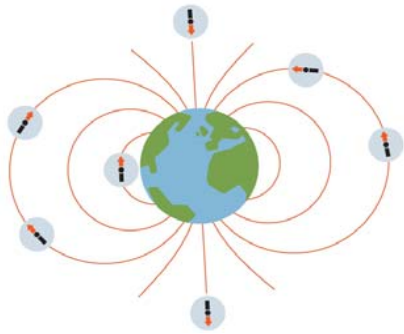
The diagram shows a simple electric motor:
- there is an electric current in the coil of wire
- this generates a magnetic field;
- which interacts with the fixed magnets;
- this makes the coil rotate

The speed of the motor can be increased by:
- increasing the **strength of the magnetic field**
- **increasing the current** flowing through the coil

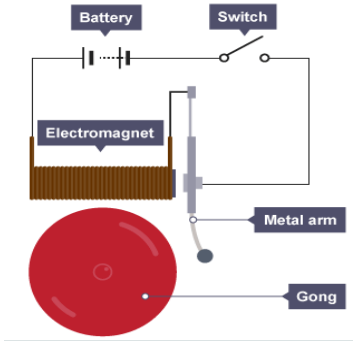
The Earth's magnetism
The Earth behaves as if it contains a giant bar magnet.
Its magnetic field lines are most concentrated at the poles.
This magnetic field can be detected using magnetic materials or magnets.

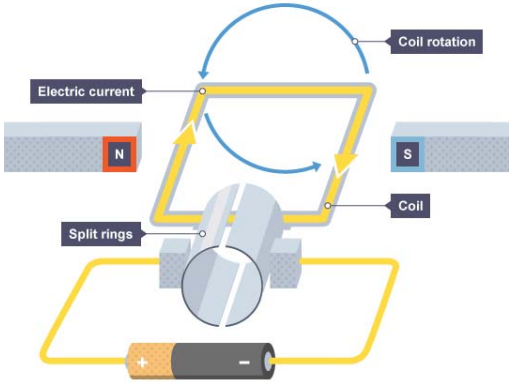
The compass
A compass comprises:
- a magnetic needle mounted on a pivot (so it can turn freely)
- a dial to show the direction

If the needle points to the N on the dial, you know that the compass is pointing north.



Electric bell
Electric bells like the ones used in most schools also contain an electromagnet.

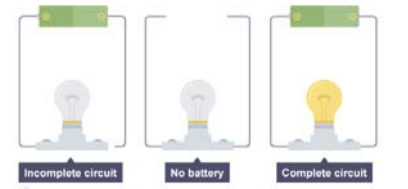


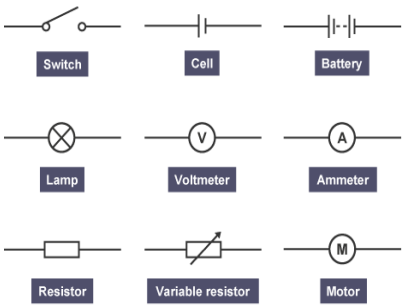


Electric charge
Some particles carry an electric **charge**.
In electric wires these particles are **electrons**.

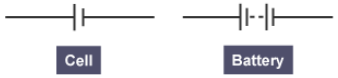
Electric current
An electric current is a flow of charge, and in a wire this will be a flow of electrons.

We need two things for an electric current to flow:
- something to transfer energy to the electrons, such as a battery or power pack
- a complete circuit for the electrons to flow through

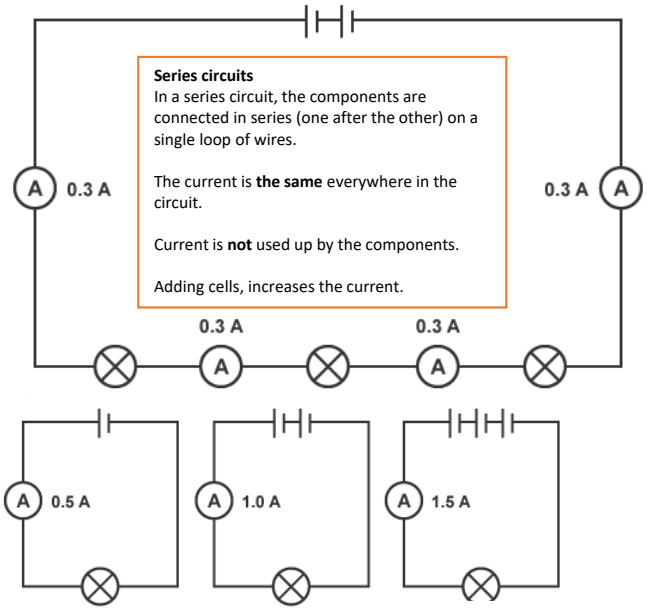




Circuit symbols



Conductors and insulators of electricity
Different materials have different resistances:
- an electrical **conductor** has a **low resistance;**
- an electrical **insulator** has a **high resistance.**



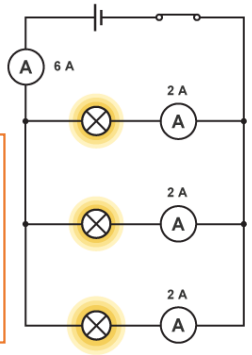
Series circuits
In a series circuit, the components are connected in series (one after the other) on a single loop of wires.

The current is **the same** everywhere in the circuit.

Current is **not** used up by the components.

Adding cells, increases the current.

Science 8BE Electricity and Magnetism



Parallel circuits
In a parallel circuit, the components are connected on different branches of the wire.

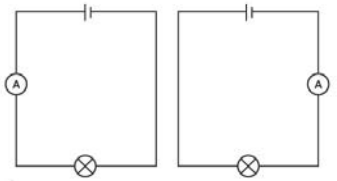
When components are connected in parallel, the current is **shared** between the components.

If a bulb breaks in a parallel circuit, the other bulb will remain lit.

Conductors	Insulators
Metal elements	Most non-metal elements, e.g. sulfur, oxygen
Graphite (a form of carbon, a non-metal element)	Diamond (a form of carbon, a non-metal element)
Mixtures of metals, e.g. brass, solder	Plastic
Salt solution	Wood
Liquid calcium chloride	Rock

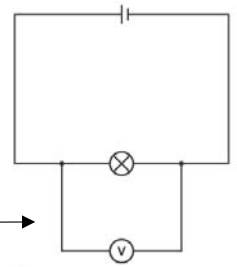
Current
The more charge that flows, the bigger the current.
Current is measured in **amperes (A)**.
This can be shortened to **amps**.

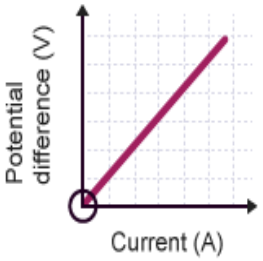
Measuring current
We measure current using an **ammeter**.
It is connected in **series**.



Potential difference
Potential difference is a measure of the difference in energy between two parts of a circuit.
The bigger the difference in energy, the bigger the potential difference.
Potential difference is measured in **volts (V).**
It is sometimes called **voltage**.

Measuring potential difference
Potential difference is measured using a device called a voltmeter.
It is connected in **parallel**.

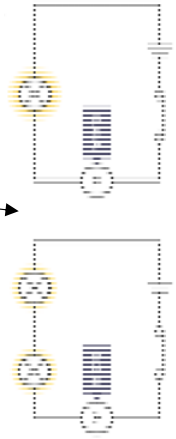




	Current	Potential difference
Unit	ampere, A	volt, V
Measuring device	Ammeter in series	Voltmeter in parallel
Circuit symbol of measuring device	A	V

Resistance
Wires and the components in a circuit reduce the flow of charge. This is called **resistance**.
The unit of resistance is the ohm (Ω).

Adding components
The resistance increases when you add more components in series.



Calculating resistance
To find the resistance of a component, you need to measure:
- the potential difference across it;
- the current flowing through it.

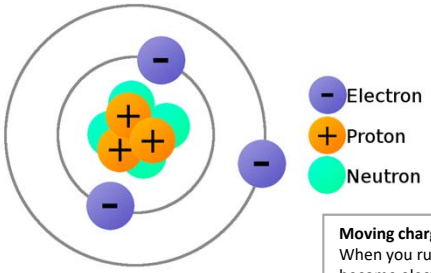
The resistance is the ratio of potential difference to current. We use this equation to calculate resistance:

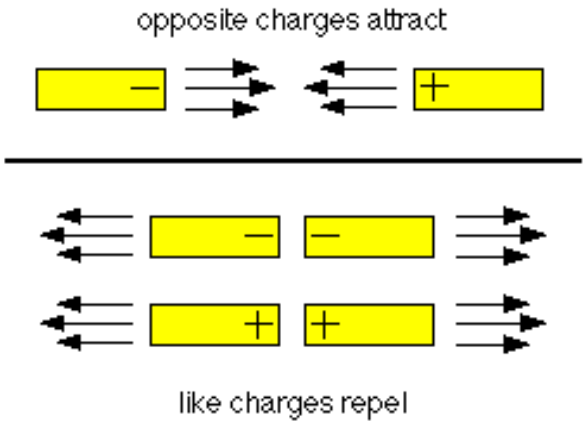
resistance = potential difference ÷ current

Science 8BE Electricity and Magnetism

Atoms and electrons
All substances are made of **atoms**.
These are often called **particles**.
An atom has no overall electrical charge (**electrically neutral**);
Each atom contains even smaller particles called **electrons**.
Each electron has a negative charge.
- atom **gains** an electron, it becomes **negatively charged**.
- atom **loses** an electron, it becomes **positively charged.**

Electrons can move from one substance to another when objects are rubbed together.





Forces from static electricity
A charged object creates an **electric field** (you cannot see an electric field).
If another charged object is moved into the electric field, a force acts on it.
The force is a non-contact force because the charged objects do not have to touch for the force to be exerted.

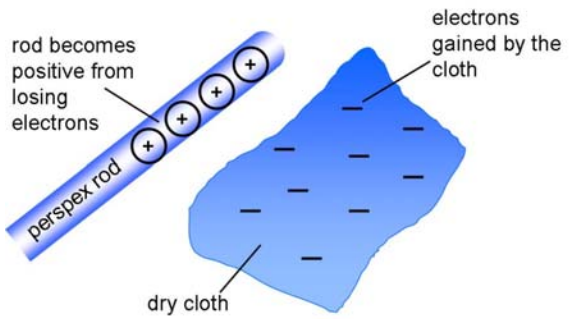
Repulsion and attraction
Two charged objects will:
- repel each other if they have like charges (they are both positive or both negative);
- attract each other if they have opposite charges (one is positive and the other is negative).

Attract and repel
Opposite charges will attract, and like charges will repel.

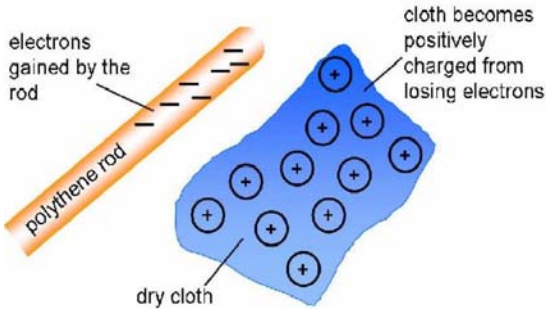
Electric fields
We represent electric fields using diagrams (just like with magnetic fields):
- each field line has an arrow from **positive to negative**;
- the field lines are more concentrated where the field is strongest.

Field lines also show what happens to the electric fields during attraction or repulsion.

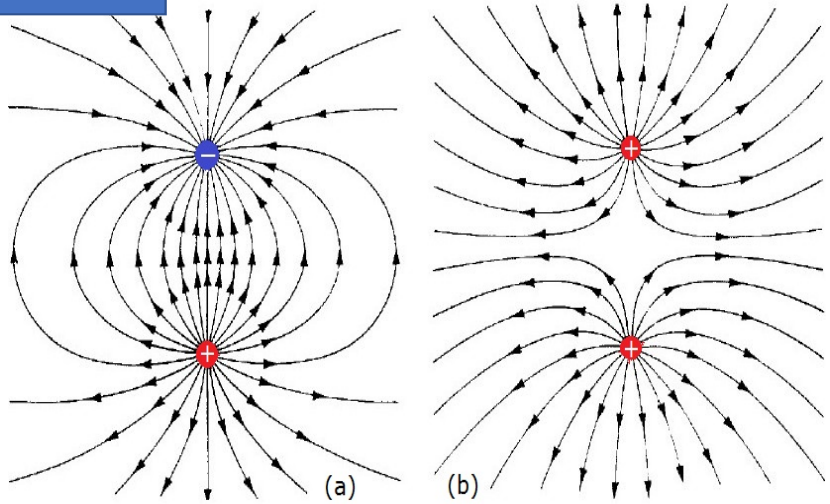
Moving charges
When you rub two different materials against each other, they become electrically charged.
This only works for electrically insulated objects and not with materials like metals, which conduct.
and the duster becomes positively charged



For example, if you rub an perspex plastic rod with a duster:
- electrons move from the rod to the duster
- the duster becomes negatively charged and the rod becomes positively charged



The opposite thing happens with a polythene rod:
- electrons move from the duster to the rod
- the rod becomes negatively charged and the duster becomes positively charged

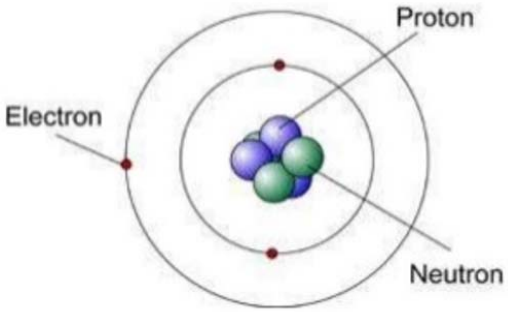


Science 8CP: Periodic Table

Atoms are tiny particles that everything is made of.

They are made of smaller particles called:

- **Protons** (+ positive)
- **Neutrons** (neutral)
- **Electrons** (- negative)



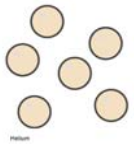
Elements

There are over a hundred different elements.

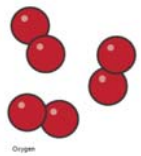
Atoms have the same number of protons as each other.

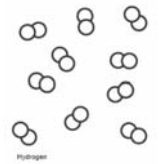
Atoms of differing elements have a different number of protons.

The atoms of some elements do not join together, but instead they stay as separate atoms, eg Helium.



The atoms of other elements join together to make **molecules**, eg oxygen and hydrogen**.**

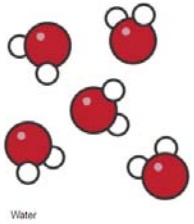




Compounds

A compound is contains atoms of **<u>two or more different</u> elements**, and these atoms are **<u>chemically joined together.</u>**

For example, water is a compound of hydrogen and oxygen.

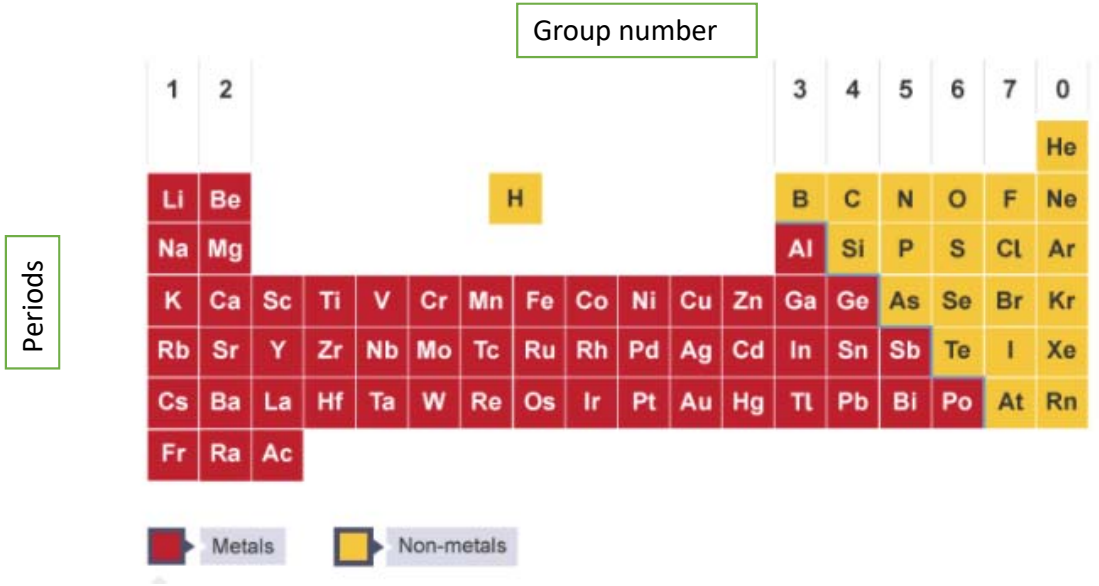


Each of its molecules contains two hydrogen atoms and one oxygen atom.

The elements are arranged in a chart called the periodic table. A Russian scientist, Mendeleev, produced the first periodic table in the 19th century.

The modern periodic table is based closely on the ideas he used:

- the elements are arranged in order of increasing atomic number (number of protons);
- the **horizontal** rows are called **periods;**
- the **vertical** columns are called **groups;**
- elements in the same group have the same number of electrons in their outside shell



We can use the periodic table to predict the properties of elements in the same group.

Group 1	**Melting point**	**Density**	**Reactivity**
Lithium	**Decreases** down the group	**Increases** down the group	**Increases** down the group
Sodium			
Potassium			
Rubidium			

Metals have properties in common. They are:

- **shiny**, especially when they are freshly cut
- **good conductors** of heat and electricity
- **malleable** (they can be bent and shaped without breaking)

Group 7	**Melting point**	**Density**	**Reactivity**
Fluorine	**Increases** down the group	**Increases** down the group	**Decreases** down the group
Chlorine			
Bromine			
Iodine			

Chemical formulae
Remember that we use chemical symbols to stand for the elements. For example, **C stands for carbon**, **S stands for sulfur** and **Na stands for sodium.**

For a molecule, we use the chemical symbols of all the atoms it contains to write down its formula. For example, the formula for **carbon monoxide is CO.**

It tells you that each molecule of carbon monoxide is made of one carbon atom joined to one oxygen atom.

Be careful about when to use capital letters. For example, CO means a molecule of carbon monoxide but **Co is the symbol for cobalt** (an element).

Each element is given its own chemical symbol, like **H for hydrogen** or **O for oxygen.**

Chemical symbols are usually one or two letters.

Every chemical symbol **starts with a capital letter, with the second letter written in lower case**.For example, Mg is the correct symbol for magnesium, but mg, mG and MG are wrong.

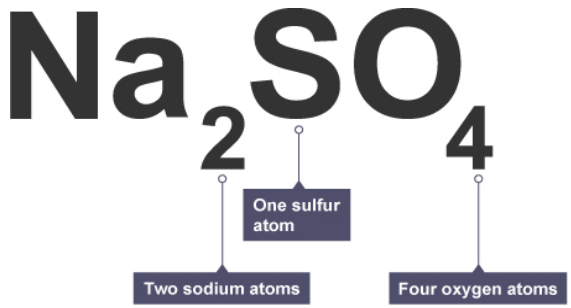
Mg	mg	mG	MG
✓	✗	✗	✗

Numbers in formulae
We use numbers to show when a molecule contains more than one atom of an element.

The numbers are written **below** the element symbol. For example, CO_2 is the formula for carbon dioxide.

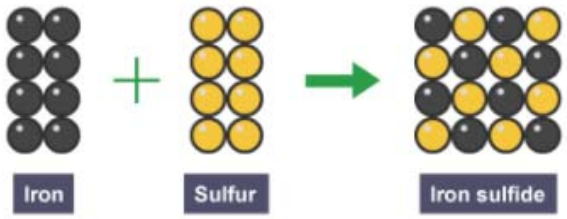
It tells you that each molecule has **one carbon atom** and **two oxygen atoms**.

The **small numbers go at the bottom**. For example:
- CO_2 is correct**;**
- CO^2 and CO2 are wrong.



Some formulae are more complicated. For example, the formula for sodium sulfate is Na_2SO_4. It tells you that sodium sulfate contains two sodium atoms (Na x 2), one sulfur atom (S) and four oxygen atoms (O x 4).

Chemical reactions
When chemicals react, the atoms are rearranged. For example, iron reacts with sulfur to make iron sulfide



Iron sulfide, the compound formed in this reaction, has different properties to the elements it is made from.

	Iron	Sulfur	Iron sulfide
Type of substance	Element	Element	Compound
Colour	Silvery grey	Yellow	Black
Is it attracted to a magnet?	Yes	No	No
Reaction with hydrochloric acid	Hydrogen formed	No reaction	Hydrogen sulfide formed, which smells of rotten eggs

- The atoms in a compound are joined together by forces called **bonds**.
- The properties of a compound are different from the elements it contains;
- You can only separate its elements using another chemical reaction;
- Separation methods like filtration and distillation will not do this.

Chemical equations
We summarise chemical reactions using equations:

reactants → products

- **Reactants** are shown on the **left** of the arrow;
- **Products** are shown on the **right** of the arrow.

Do not write an equals sign instead of an arrow.

If there is more than one reactant or product, they are separated by a + sign. For example:

copper + oxygen → copper oxide

Reactants: copper and oxygen
Products: copper oxide

A **word equation** shows the names of each substance involved in a reaction, and **must not include any chemical symbols or formulae**

Science 8CP: Periodic Table

Conservation of mass
When atoms are rearranged in a chemical reaction, they are not destroyed or created.

- **Reactants** - the substances that react together;
- **Products** - the substances that are formed in the reaction;
- **Mass is conserved** in a chemical reaction, this means…
- Total mass of the reactants = total mass of the products;

Symbol equations

A balanced **symbol** equation includes the **symbols** and **formulae** of the substances involved. For example:

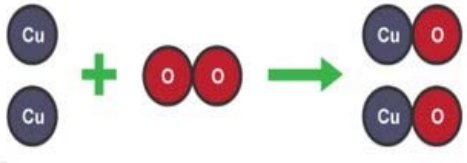
Word equation:
Copper + Oxygen → Copper Oxide

Symbol equation (unbalanced):
$Cu + O_2 \rightarrow CuO$

There is one copper atom on each side of the arrow, but two oxygen atoms on the left and only one on the right. This is **unbalanced.**

A **balanced** equation has the **same number of each type of atom on each side of the arrow.** Here is the balanced symbol equation:

2Cu + O2 → 2CuO



Some more examples of balanced symbol equations

- C + O2 → CO2
- 2H2 + O2 → 2H2O
- 2Mg + O2 → 2MgO
- CuCO3 → CuO + CO2
- Mg + 2HCl → MgCl2 + H2

Take care when writing formula – e.g. for carbon dioxide:
CO_2 NOT CO^2 or Co_2