Year 8 Chemistry Cycle 1

Newton Abbot College

Name:	
Class:	
Teacher:	

The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

**** The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.***

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.

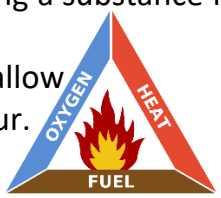
Knowledge Organiser: Year 8 Science Cycle 1

The Periodic Table

- **Physical Change:** A change in which no new substances are formed.
- **Chemical Change:** When two substance react to form a new substance.
- **Periodic Table:** Table containing all of the known elements.
- **Dmitry Mendeleev:** Russian chemist who published the first periodic table by ordering elements by increasing masses of the element. Also formed groups of elements with similar properties. He left gaps for undiscovered elements and was able to predict their properties.
- **Groups:** A vertical column in the periodic table, contains elements with similar properties.
- **Alkali Metals:** Group 1. Very reactive metals, they even react with water.
- **Halogens:** Group 7. React with most metals to form solid compounds.
- **Noble Gases:** Group 0, unreactive gases.

Chemical reactions

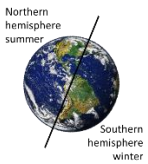
- **Oxidation:** Reacting a substance with oxygen.
- **Combustion:** Burning a substance in air.
- **Fire triangle:** The 3 factors that allow combustion to occur.



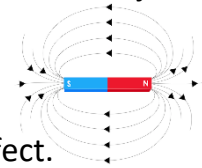
- **Exothermic:** A reaction that releases energy.
- **Endothermic:** A reactions that takes in energy.
- **Thermal Decomposition:** Using heat to break down a compound.
- **Test for carbon dioxide:** Lime water goes cloudy.
- **Test for hydrogen gas:** Lit splint makes a squeaky pop.
- **Catalyst:** Speeds up the rate of reaction without being used up itself.

Space and Magnetism

- **Light year:** Distance travelled by light in one year.
- **Tilt of the earth:** 23.5^{o}
- **Summer in the UK:** When the northern hemisphere is tilted toward the Sun.



- **Winter in the UK:** When the northern hemisphere is tilted away from the sun.
- **Gravity:** Force exerted by all objects with mass trying to pull other objects toward it.
- **Weight:** The force of gravity pulling on an object. (N)
- **Mass:** The amount of matter an object is made up of. (Kg)
- **Magnetic field:** The area around magnet where magnetism has an effect.



- **Attract:** When two magnets are pulled together.
- **Repel:** when two magnets are pushed apart.

Motion and Pressure

- **Speed:** How fast an object is moving.
- **Slope on a distance time graph:** represents how fast an object is moving.
- **Straight line on a distance time graph:** represents the object not moving.
- **Fluid:** Liquid or gas.
- **Pressure:** The force of particles hitting an object.
- **Density:** The mass of a certain volume of material.

$$density = \frac{mass}{volume}$$

- **Upthrust:** The force of water pushing upwards.
- **Density of water:** $1 g/cm^3$
- **Floating:** The object has a density less than water.
- **Sinking:** The object has a density greater than water.

Science Strength and Target codes.

1	Check the **command word** used for this task to ensure you understand what is needed from your response.
2	Review the language you have used to ensure you have used the most appropriate and relevant **scientific vocabulary** in your response.
3	When **describing** a scientific idea or observation, ensure to include as much detail as possible. You can use diagrams to help when appropriate.
4	When **explaining** a scientific idea or observation, ensure you discuss the reason why this observation is made. You will need to include the word "because".
5	When **evaluating** a scientific idea or argument, ensure you have compared the similarities and contrasted the difference. Always sum up with a conclusion.
6	When making a scientific point or statement, always support it **referencing actual data** or facts from a graph, table or experimental observation. Carry out a mathematical operation whenever possible.
7	When discussing a theory or principle, give specific **scientific examples** to back up your points.
8	When completing any **calculations**, ensure your show all working using the FIFA structure and remember to state the appropriate units for your answer.

Feedback highlighters

GREEN	Great work!	**PINK**	Re-think	**BLUE**	Add examples	**YELLOW**	Add detail

Marking for literacy

SPaG Key. You will see and use these codes to correct and improve SPaG in your written work.

Sp	P	//	G
Spelling error	Punctuation error	New paragraph	Grammatical error

Accountable talk

Use this page in class discussions to help you formulate your verbal responses to questions

Stating a new opinion:

- I think/ believe that…
- In my opinion…
- From my perspective…
- Based on…., it seems that….
- After reading… I conclude that…
- Overall, the evidence suggests…
- On the one hand… on the other hand…

Agree, disagree, or add on

- I agree with you because…
- That answer makes sense because…
- I respectfully disagree with you because…
- I have a different point of view…
- I would like to add on…
- To expand on what…. said….
- This reminds me of…
- To piggyback on what… said…

Ask for clarification

- What do you mean by…?
- Why do you think that?
- Will you explain that again?
- I have a question about…
- I don't quite understand. Can you explain it a little bit more?

Paraphrase or restate your opinion

- So what you are saying is that…
- In other words, you think…
- I noticed that…
- If I understand you correctly, your opinion is that…

Topic Overview

Why this? Why now?

Why this? Listen as your teacher gives an overview of the content you'll be covering during this topic. Complete notes on the topic content below when asked to do so.

Why now? How does this topic lead on from and build upon your previous learning? Which work is it linked to in previous cycles or years?

What next? How will this topic be built upon in future learning? Which topics will require a good understanding of this work?

Cross-curricular. How might the learning from this topic be linked to learning in your other subjects across school?

Which careers might be linked to this topic?

Skills Builder: Which skills we will have the chance to develop during this topic?

Cultural Context

What is the Cultural Context of this cycle?

What British Values are covered in this topic?

1. **Democracy**
2. **Rule of Law**
3. **Tolerance**
4. **Mutual Respect**
5. **Individual Respect**

How will this topic link to the 9 protected characteristics?

The 9 protected characteristics are:

Age	Gender reassignment	Marriage / Civil Partnership
Pregnancy	Disability	Race
Religion or belief	Sex	Sexual Orientation

How will this topic support my cultural capital?

How will this topic support my disciplinary literacy?

How will this topic link to us being a sustainable school?

How will this topic reflect our school values?

Year 8
Chemistry
Module 1

The Periodic Table

Knowledge Tracker

Lesson	What will I learn today
1. How was the periodic table developed?	• Describe how Mendeleev arranged the periodic table in order of atomic mass. • Explain why Mendeleev left gaps in his version of the periodic table.
2. What information can we get from the periodic table?	• Use the periodic table to find elements. • Identify metals and non-metals by their position in the periodic table. • State that elements are arranged in groups with similar properties.
3. What is a physical property?	• Identify metals and non-metals by their physical properties. • State that physical changes such as changes in state and dissolving are reversible. • Explain melting point and boiling point and use them to predict the state of a substance.
4. What is a chemical property?	• State that the chemical property of a substance us how it reacts with other. • State that chemical changes are difficult to reverse. • State that a chemical change means that a chemical reaction has happened and a new product has formed.
5. What are the properties of Group 1?	• State where the alkali metals are located in the periodic table. • Describe the trends in chemical and physical properties of the first 3 alkali metals. • Predict using the periodic table the physical and chemical properties of the last 3 alkali metals.
6. What are the properties of Group 7 and Group 0?	• State where the halogens and noble gases are located in the periodic table. • Compare the physical and chemical properties of Group 7. • Compare the physical and chemical properties of Group 0.

LESSON C1.1

How was the periodic table developed?

Do Now - Complete the retrieval quiz. When you are finished, get your purple pen ready to tick, correct or add to your answers.

1. What is an element?

2. Write the symbol for the following elements:

Copper:

Cobalt:

3. Describe the arrangement of particles in a solid.

4. Draw the particle diagram for a liquid and gas.

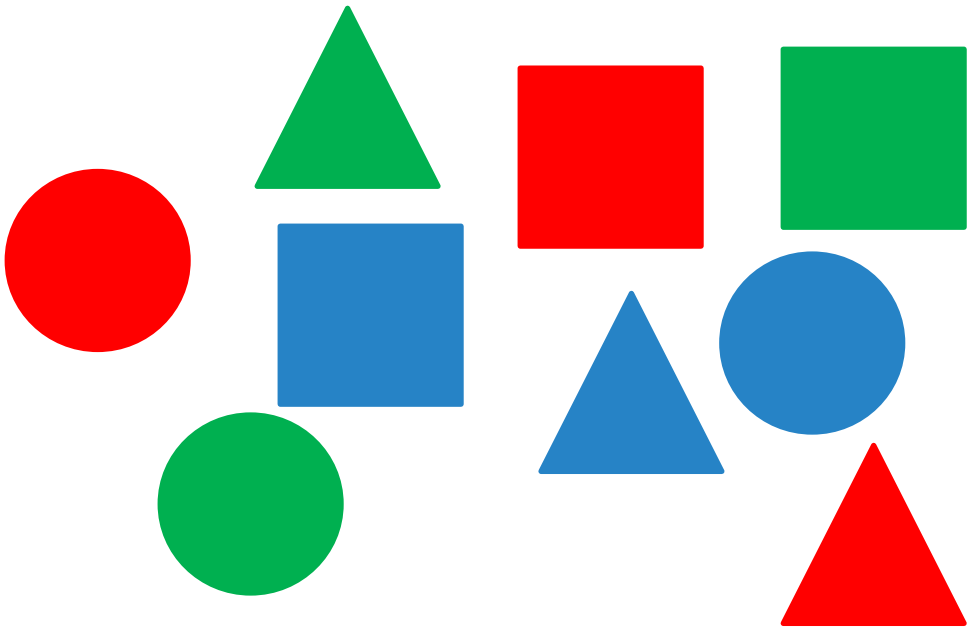
Liquid

Gas

Key vocabulary.

- **Periodic table**—the chart on which the elements are arranged in order of increasing atomic number.
- **Atomic number** - the number of protons in the nucleus of an atom.
- **Relative atomic mass**—the mean mass of an atom relative to the mass of an atom of carbon-12, which is assigned the mass of 12.

Think and be ready to share: Look at the shapes below, how could you arrange them?



Front Loading: The first periodic table.

One of the first steps towards producing a periodic table was in 1864 by the English chemist John Newlands. He knew that atoms of different elements had different masses. He had noted that if the elements were listed in order of increasing masses of their atoms, which he called 'atomic weights' (At. wt.), then certain properties recurred every eighth element. However, there were some obvious failings in his ideas and they were not widely accepted by other scientists at the time.

Two of Newlands' sets of elements with recurring properties are shown below. They include his atomic weights and additional information about some of the elements.

hydrogen At. wt. = 1	**fluorine** At. wt. = 8	**chlorine** At. wt. = 15	**cobalt/ nickel** At. wt. = 22 unreactive metal	**bromine** At. wt. = 29	**palladium** At. wt. = 36 unreactive metal	**iodine** At. wt. = 142	**platinum/ iridium** At. wt. = 50 unreactive metal
lithium At. wt. = 2	**sodium** At. wt. = 9	**potassium** At. wt. = 16	**copper** At. wt. = 23 unreactive metal	**rubidium** At. wt. = 30	**silver** At. wt. = 37 unreactive metal	**caesium** At. wt. = 44	**osmium** At. wt. = 51 unreactive metal

Check for understanding

1. How did John Newlands describe the mass of different elements?

2. What did John Newlands notice about the different elements when he listed them in order of atomic masses?

3. What chemical property do cobalt and copper have in common?

Key vocabulary: Complete the definitions below

Atom	
Element	
Compound	

Front Loading: Mendeleev

The first periodic table published by Dmitri Mendeleev in 1869 is shown opposite. He organised the elements in a similar way to Newlands. However, to make the pattern of properties fit better, he made a few changes to the order, and left gaps for unknown elements.

His table was not accepted at first. But in the years that followed, three new elements were discovered: scandium, gallium and germanium. Their properties were almost a perfect match for those predicted by Mendeleev, and so the periodic table became accepted by all chemists.

Series	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8
1	H 1							
2	Li 7	Be 9.4	B 11	C 12	N 14	O 16	F 19	
3	Na 23	Mg 24	Al 27.3	Si 28	P 31	S 32	Cl 35.5	
4	K 39	Ca 40		Ti 48	V 51	Cr 52	Mn 55	Fe 56 Co 59 Ni 59 Cu 63
5	(Cu 63)	Zn 65			As 75	Se 78	Br 80	
6	Rb 85	Sr 87	Y 88	Zr 90	Nb 94	Mo 96		Ru 101 Rh 104 Pd 106 Ag 108
7	(Ag 108)	Cd 112	In 113	Sn 118	Sb 122	I 127	Te 128	
8	Cs 133	Ba 137	Di 138	Ce 140				
9								
10			Er 178	La 180	Ta 182	W 184		Os 195 Ir 197 Pt 198 Au 199
11	(Au 199)	Hg 200	Tl 204	Pb 207	Bi 208			
12				Th 231		U 240		

Check for understanding

1. What do the numbers on Mendeleev's table represent?

2. Explain why did Mendeleev leave gaps in his periodic table?

3. Explain why gallium was placed just after aluminium ?

4. Why did chemists come to accept Mendeleev's periodic table?

Consolidate: Sort the following statements into the correct column of the table, some statements can be used more than once.

- Ordered by atomic weight
- Elements in groups had similar properties.
- Was seen as a curiosity to begin with, but then a useful tool once elements that had been predicted were discovered.
- Every 8 elements has similar properties.
- Included only the elements known at the time.
- Left gaps for the elements be predicted would be discovered later.
- Criticised for grouping elements that were clearly different from each other.
- Maintained a strict order of atomic weights.
- Swapped the order of some elements if it fitted their properties better.

Newlands	Mendeleev

Lesson outcomes

- Describe how Mendeleev arranged the periodic table in order of atomic mass.
- Explain why Mendeleev left gaps in his version of the periodic table.

What careers could be linked to the topics we have looked at today?

LESSON C1.2

What information can we get from the periodic table?

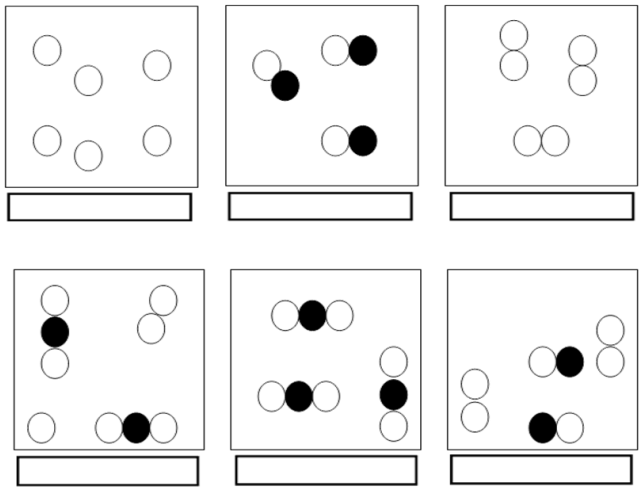
Do Now - Complete the questions. When you are finished, get your purple pen ready to tick, correct or add to your answers.

1. Why did Mendeleev leave gaps?

2. What number did Mendeleev organise the periodic table by?

3. What is an atom?

4. Element, compound or mixture?



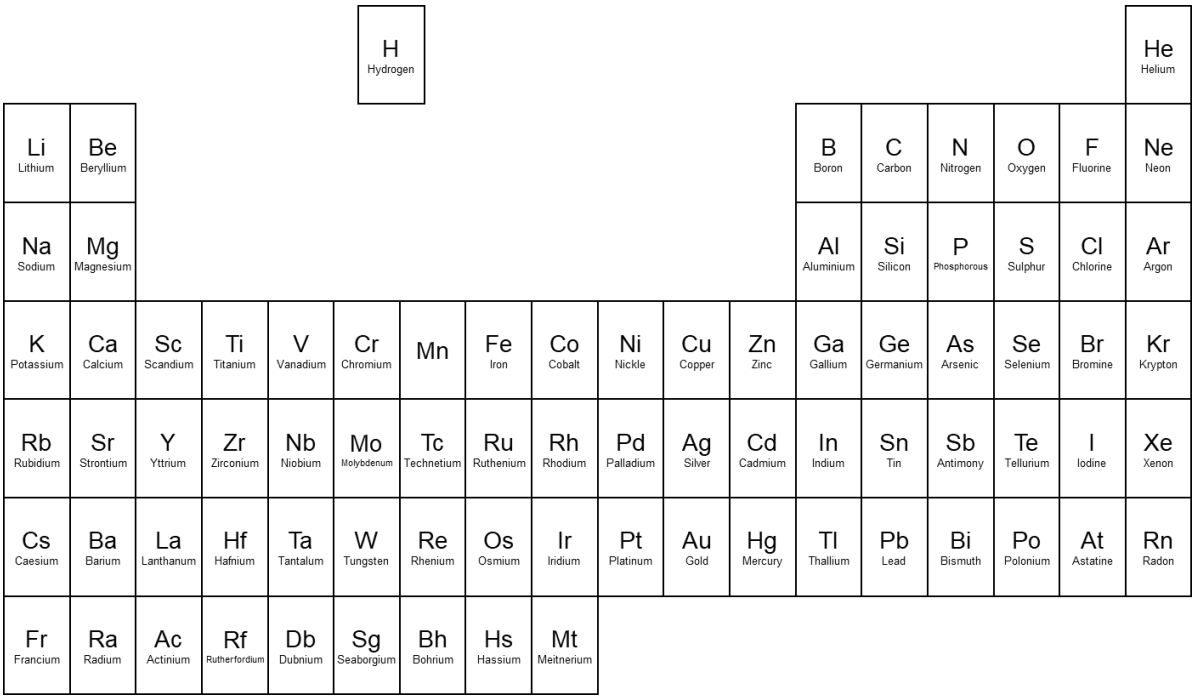
How many of the elements below can you name or write the symbols for? Use the periodic table in your booklet to help you.

Element	Symbol	Element	Symbol
Hydrogen		Sodium	
	He		Mg
Lithium		Aluminium	
	Be		Si
Boron		Phosphorus	
	C		S
Nitrogen		Chlorine	

Key vocabulary.

- **Metal:** a usually solid material which is typically hard, shiny, malleable and ductile with good electrical and thermal conductivity.
- **Non Metal:** elements that lack metallic attributes.

Blank Canvas: Annotate the periodic table as your teacher talks through it.



Write: What elements have been used to make these words?

Word	Elements
HeAt	
HoUSeS	
BrAsS	
SKAtEs	
CAr	
LaNe	
RaCK	
WINd	
ClAsS	
PaTh	
RuTh	
SONY	

	**Think and be ready to share:** Explain why are some of the letter capitals and other lower case?

	**Using the information on previous pages, answer the following questions.**

1. Which side of the periodic table are the metals on?

2. Which side of the periodic table are the non-metals on?

3. Are the following metals or non-metals:

Calcium:	Iron:
Oxygen:	Sodium:
Mercury:	Neon

4. How many groups are there in the periodic table?

5. How many elements are in group 1?

6. What group are the following elements in?

Cl

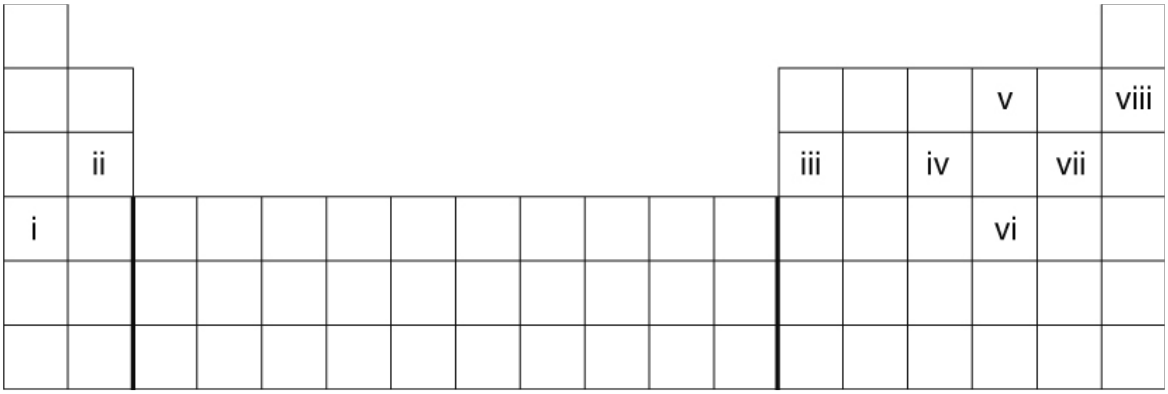
Na

Co

7.Which of these elements is the odd one out? Li, Ma, Mg, K, Rb, Cs

8. Explain your answer to question 7.

Check your understanding: Answer the exam question below.



1. Which of the elements I to vii fit the following descriptions?

a) An unreactive element

b) Has the symbol P

c) Is in group 1

d) Two elements with similar chemical and physical properties?

e) Is in group 7

f) Is in group 0

Lesson outcomes

- Use the periodic table to find elements.
- Identify metals and non-metals by their position in the periodic table.
- State that elements are arranged in groups with similar properties.

What careers could be linked to the topics we have looked at today?

Independent practice as directed by your teacher.

LESSON C1.3

What is a physical property?

Do Now - Complete the questions. When you are finished, get your purple pen ready to tick, correct or add to your answers.

1. What is an element?

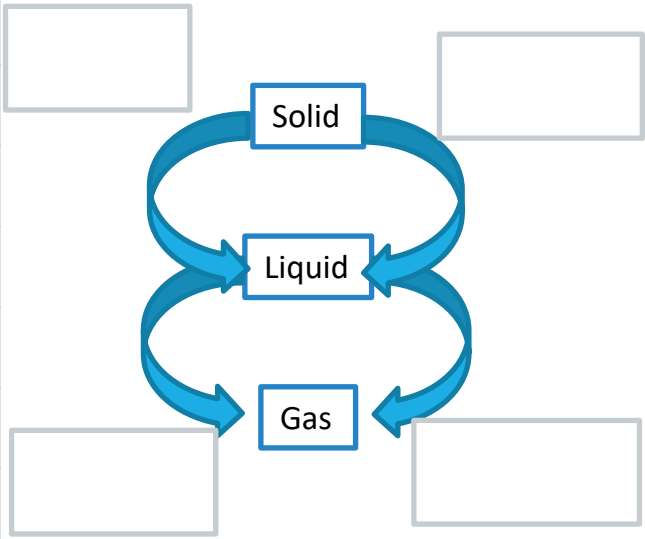
2. How are elements arranged in the periodic table?

3. What is the symbol for the following elements:

Potassium:

Chlorine:

4. Fill in the states of matter:



Key vocabulary: Complete the definitions below

State of matter	
Metals	
Non-Metals	

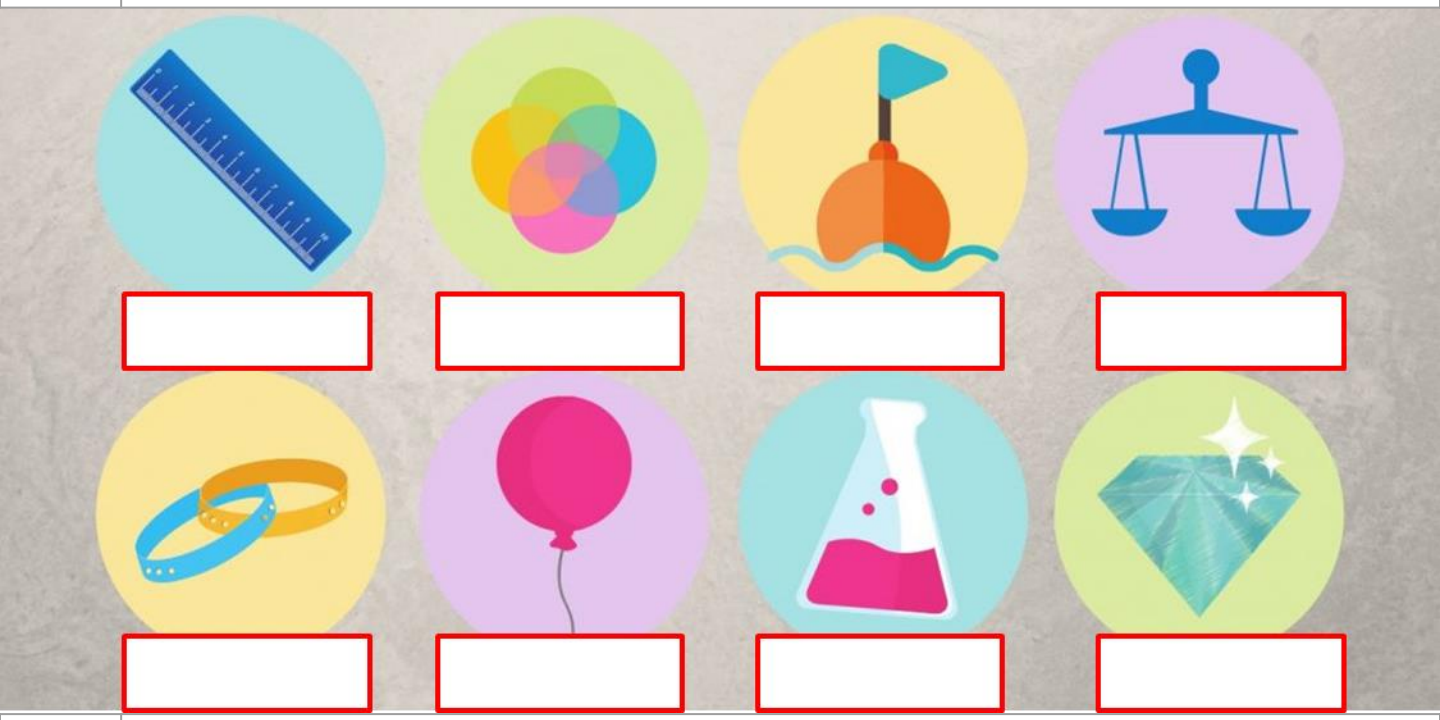
Front Loading: Physical Properties.

A property is something that describes how a substance behaves. Physical properties is a physical change, a substance simply changes physical state. For example, from a solid to a liquid.

Physical properties can be seen and can usually be measured quite easily in an experiment. Here are some examples:

- By applying force to an object you can observe it's physical properties. If something is brittle the object may snap, or if it is flexible the object will bend.
- By observing a solid's melting point, or a liquid's boiling point these physical properties can be measured.

Think and be ready to share: What scientific terminology would best describe the images of physical properties below.



Using the information below and your understanding, sort the properties into the table.

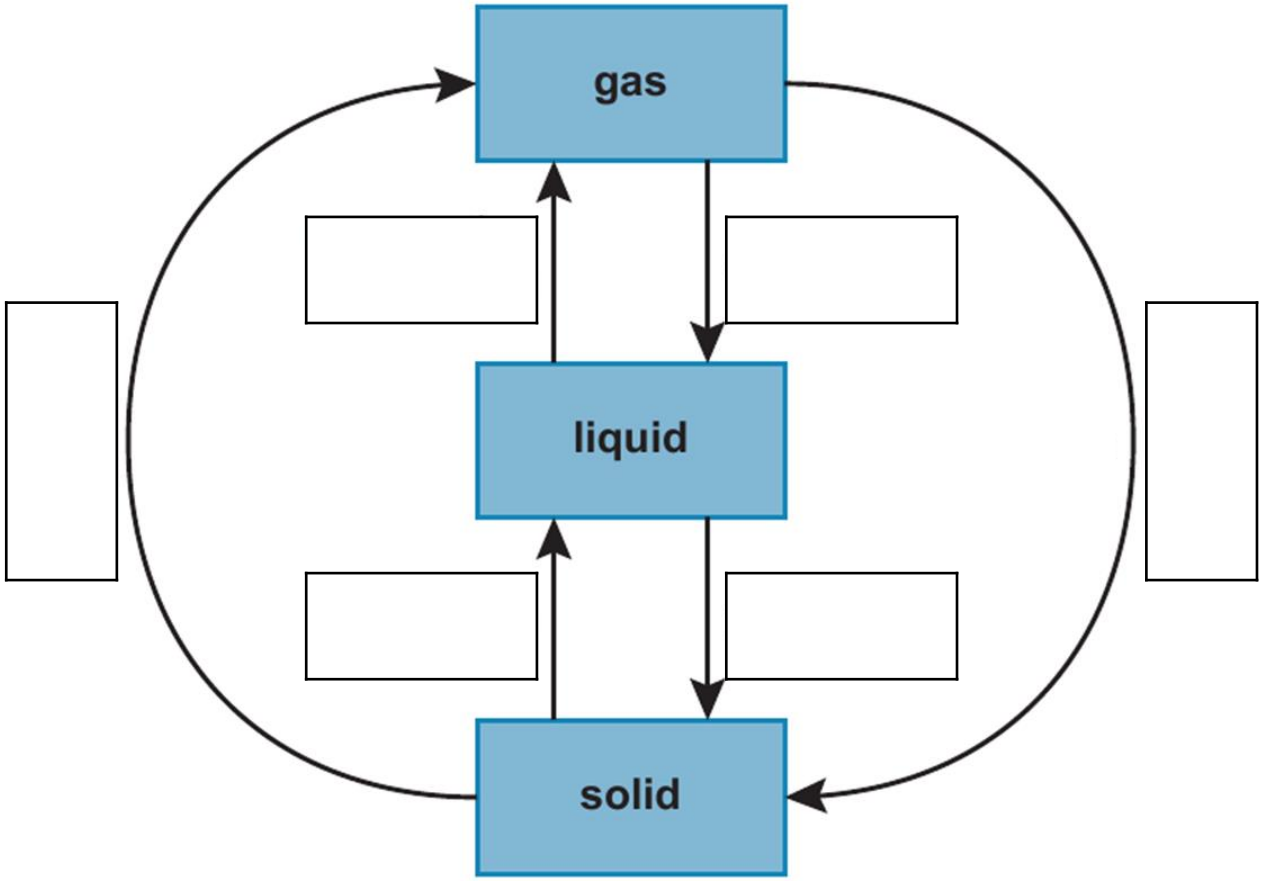
- Shiny
- Low density
- Brittle
- High density
- Usually solid
- Good conductors
- High melting point
- Poor conductors
- Malleable
- Ductile
- Dull
- Usually liquids or gases
- Sonorous

Metals	Non-Metals

Key vocabulary.

- **Sonorous:** a substance that makes a sound when hit.
- **Density:** a material that contains a lot of particles in a small space.
- **Brittle:** a material that is delicate and easily broken.
- **Ductile:** materials that can be easily bent without breaking and drawn into wires.
- **Malleable:** a material that can be bent or shaped.
- **Conductor:** a substance that allows heat or energy to flow through it.

Blank canvas. Listen as your teacher describes physical changes. Annotate the diagram when asked to do so.



Check for understanding.

1. State the name of the process where a liquid changes state to a solid.

2. State the name of the change of state seen if energy is transferred to a solid.

3. Identify the change that sees a liquid change into a solid.

4. Which states are changed between during the process of condensation.

5. State the names given to water in the following states:

- Solid:
- Liquid:
- Gas:

Front loading - Predicting states.

Particles in a substance are attracted to each other by **weak forces of attraction**. When you heat a solid, the energy the particles gain from their surroundings means they can overcome some of these forces, which causes the solid to melt. If the liquid continues to be heated, the particles overcome the remaining forces and the liquid evaporates into a gas. If a substance is cooled, the particles lose energy to their surroundings and can no longer overcome these forces.

It is possible to predict the state of a substance if your know its **melting** and **boiling** points:

- Below its melting point a substance will be solid;
- Between its melting and boiling point, a substance will be liquid;
- Above its boiling point, a substance will be a gas.

Use the information above to answer the following questions.

1. Define the following terms:

- Melting point:

- Boiling point:

2. The substances in the table below are at room temperature (around 25°C). Identify the state each substance would be at based on their melting and boiling points.

Substance	Melting point (°C)	Boiling point (°C)	State
W	-18	42	
X	150	875	
Y	-190	-84	
Z	-56	16	

Lesson outcomes

- Identify metals and non-metals by their physical properties.
- State that physical changes such as changes in state and dissolving are reversible.
- Explain melting point and boiling point and use them to predict the state of a substance.

What careers could be linked to the topics we have looked at today?

LESSON C1.4

What is a chemical property?

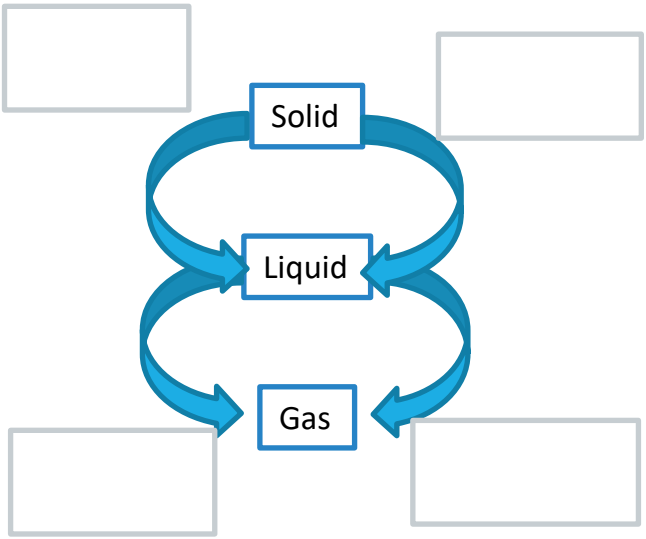
Do Now - Complete the questions. When you are finished, get your purple pen ready to tick, correct or add to your answers.

1. Define malleable.

2. Name 2 physical properties of a metal.

3. Name 2 physical properties of a non-metal.

4.



Key vocabulary: Complete the definitions.

Atom	
Element	
Compound	
Molecule	

Front Load: Chemical Properties.

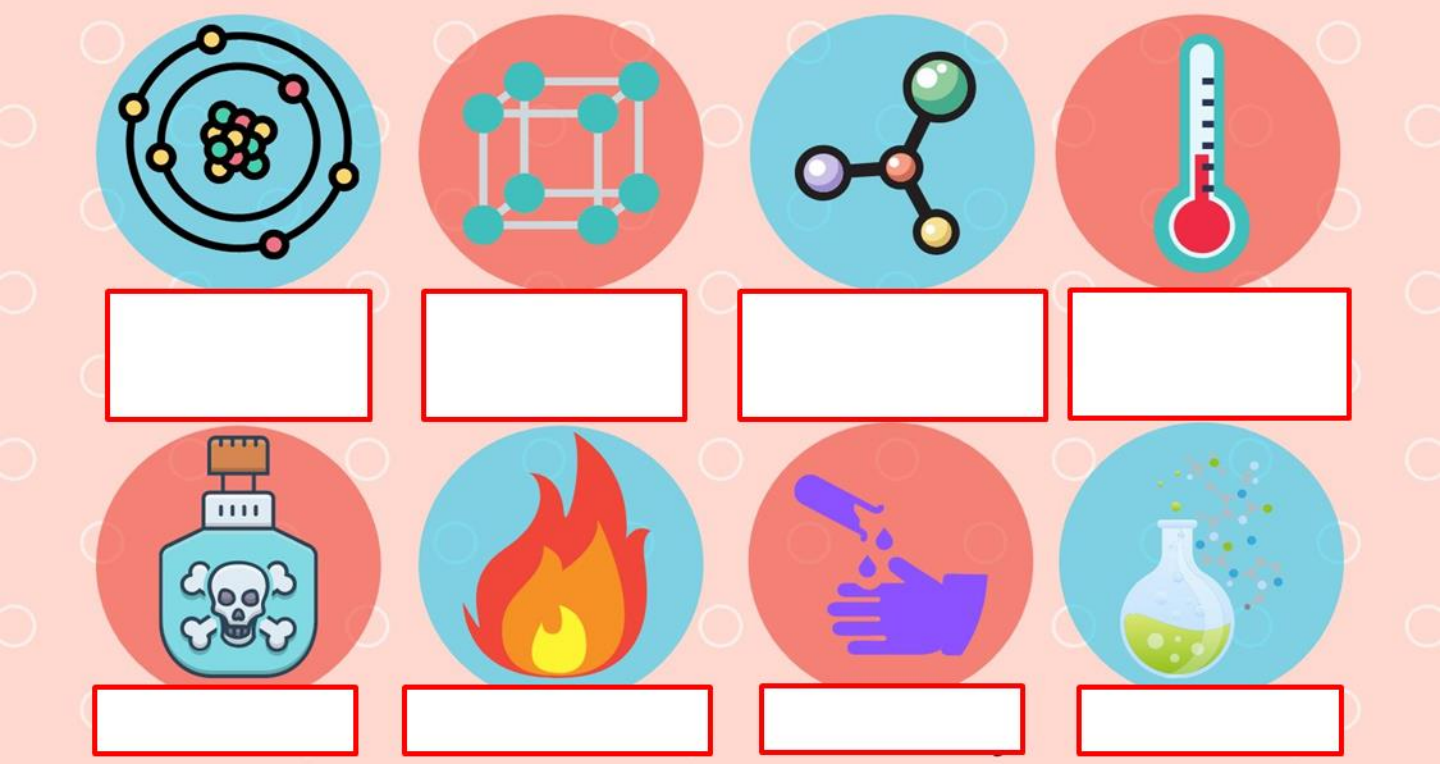
A property is something that describes how a substance behaves. Chemical changes happen when chemical reactions occur. They involve the formation of new chemical elements or compounds. However, the properties cannot be learnt just by looking at, touching or taking a simple measurement of the substance. Examples of how we can measure chemical properties include:

- Observing how elements react with air
- Measuring the pH of a liquid

Practical demonstration: Record your observations as your teacher demonstrates 5 chemical reactions.

Reactants	Observations
Ethanol and oxygen (Whoosh Bottle)	
Lead nitrate and potassium chloride	
Hydrochloric acid and calcium carbonate	
Sulfuric acid and sodium hydroxide	
Ammonium nitrate and water	

Think and be ready to share: What scientific terminology could be used to describe the following images?



Front Loading: Chemical Reactions.

Under the right conditions metals like sodium, aluminium and calcium can burn in oxygen to form a metal oxide.

Magnesium metal burns brightly in oxygen gas to form white clouds of solid magnesium oxide. During the reaction the magnesium and oxygen atoms join together to form a new substances. We can model this chemical reaction by drawing diagrams of the atoms and molecules of reactants and product or using a simple word equation.

Magnesium + Oxygen → Magnesium Oxide

Check for understanding.

1. What is all matter made of?

2. Oxygen exists as a molecule, what is a molecule?

3. Describe sodium, aluminium and calcium by 3 of their chemical properties.

4. What do all particles of a particular element have in common?

5. What is a compound?

6. Calcium reacts with oxygen in a similar way to magnesium. Write a word equation for this reaction.

Lesson outcomes.

- State that the chemical property of a substance us how it reacts with other.
- State that chemical changes are difficult to reverse.
- State that a chemical change means that a chemical reaction has happened and a new product has formed.

What careers could be linked to the topics we have looked at today?

Space for independent practice as directed by your teacher.

LESSON C1.5

What are the properties of Group 1?

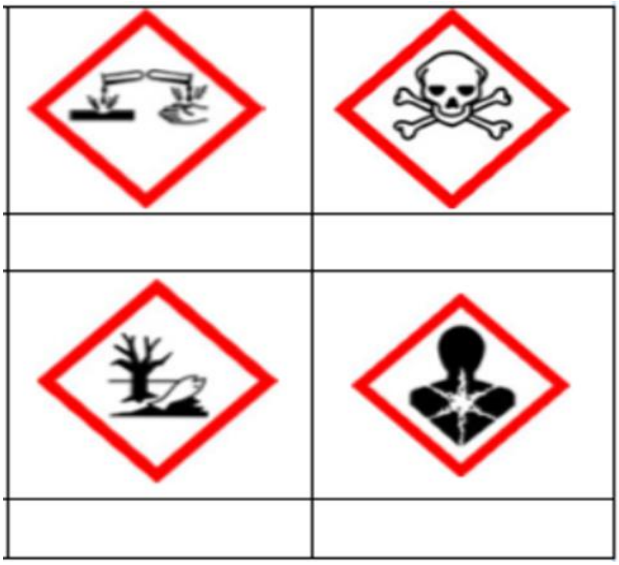
Do Now - Complete the questions. When you are finished, get your purple pen ready to tick, correct or add to your answers.

1. What is an element?

2. How can you tell a chemical reaction is taking place?

3.Define compound.

4. Name the following hazard symbols.



Key vocabulary.

- **Alkali metals**—A group of very reactive metals found in group 1 of the periodic table.
- **Reactivity**—the tendency of a substance to undergo chemical reaction, either by itself or with other materials, and to release energy.
- **Trend**—a regular variation in the properties of a group of elements.

Element	
Compound	

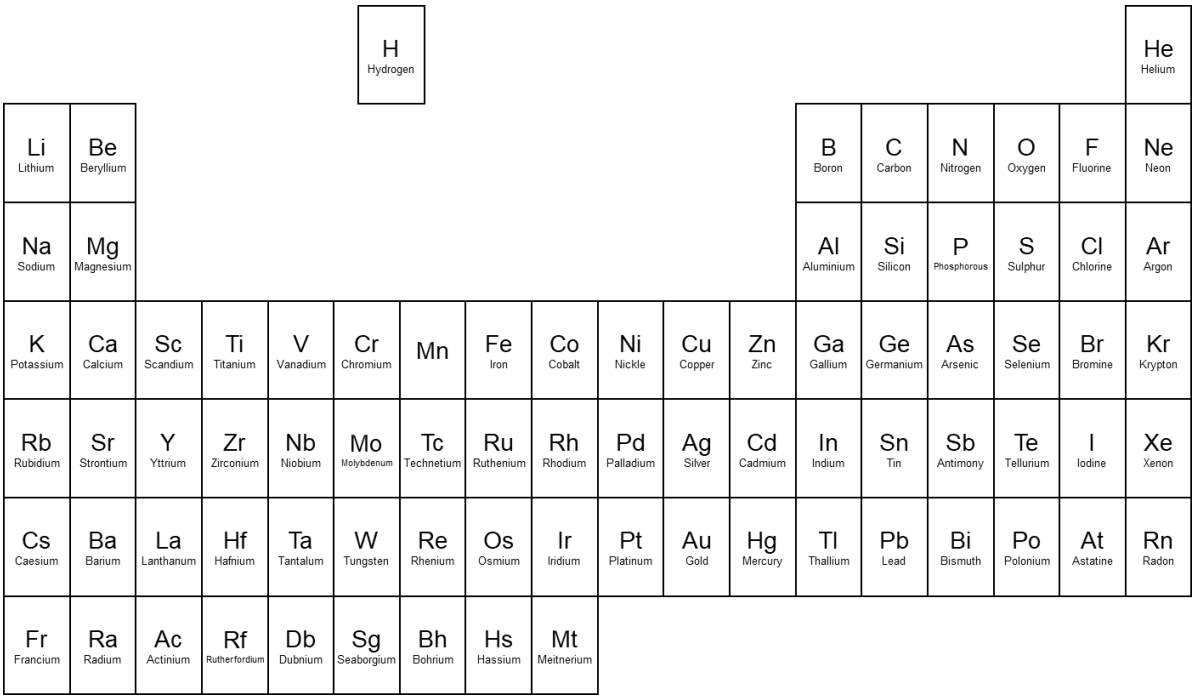
Front loading: Group 1 Metals.

As well as having the properties that are typical of all metals such as conducting heat and electricity, the **Alkali metals** have other properties that are specific to group 1.

- Relatively low melting point;
- Soft and easily cut;
- Very reactive
- Readily form compounds with non-metals
- Easily oxidised (react with oxygen to form metal oxides)

The reactivity of the alkali metals increases as you move down the group.

Blank Canvas: Annotate the periodic table as your teacher talks through it.



Record your observations as your teacher demonstrates the reactions of group 1 alkali metals

Metal	Appearance	When cut	Reaction with water	Flame colour
Lithium				
Sodium				
Potassium				

Blank canvas: Listen and make notes as your teacher describes the reactions of alkali metals with water and with oxygen.

Reaction with air:

Alkali metal + oxygen → metal oxide

Example:

Lithium

Reaction with water:

Alkali metal + water → metal hydroxide + hydrogen

Example:

Potassium

Use the information above to answer the following questions.

1. Explain why sodium potassium are both placed in the same group of the periodic table.

2. State two physical properties of alkali metals that make them different from other metals.

3. Write a word equation for the reaction of sodium with oxygen.

4. Write a word equation for the reaction of potassium with oxygen.

5. Write a word equation for the reaction of sodium with water.

6. Write a word equation for the reaction of potassium with water.

7. Predict the **reaction** of rubidium (Rb) with water compared with the reaction of potassium that you saw in the demonstration. Explain why you have made your prediction.

Lesson outcomes

- State where the alkali metals are located in the periodic table.
- Describe the trends in chemical and physical properties of the first 3 alkali metals.
- Predict using the periodic table the physical and chemical properties of the last 3 alkali metals.

What careers could be linked to the topics we have looked at today?

Use this space for independent practice or for other activities directed by your teacher.

LESSON C1.6 What are the properties of Group 7 and Group 0?

Do Now - Complete the retrieval quiz. When you are finished, get your purple pen ready to tick, correct or add to your answers.

1. What is an element?

2. Write the symbol for the following elements:

Copper:

Cobalt:

3. Describe the arrangement of particles in a solid.

4. Draw the particle diagram for a liquid and gas.

Liquid

Gas

Key vocabulary.

- **Halogen**— An element in group 7 of the periodic table.
- **Diatomic**— Two atoms chemically bonded together.
- **Halide**— A compound form between an halogen and another element such as a metal or hydrogen.

- **Noble gases**— An unreactive gas found in group 0 of the periodic table.
- **Inert**— Does not react.

Element	
Compound	

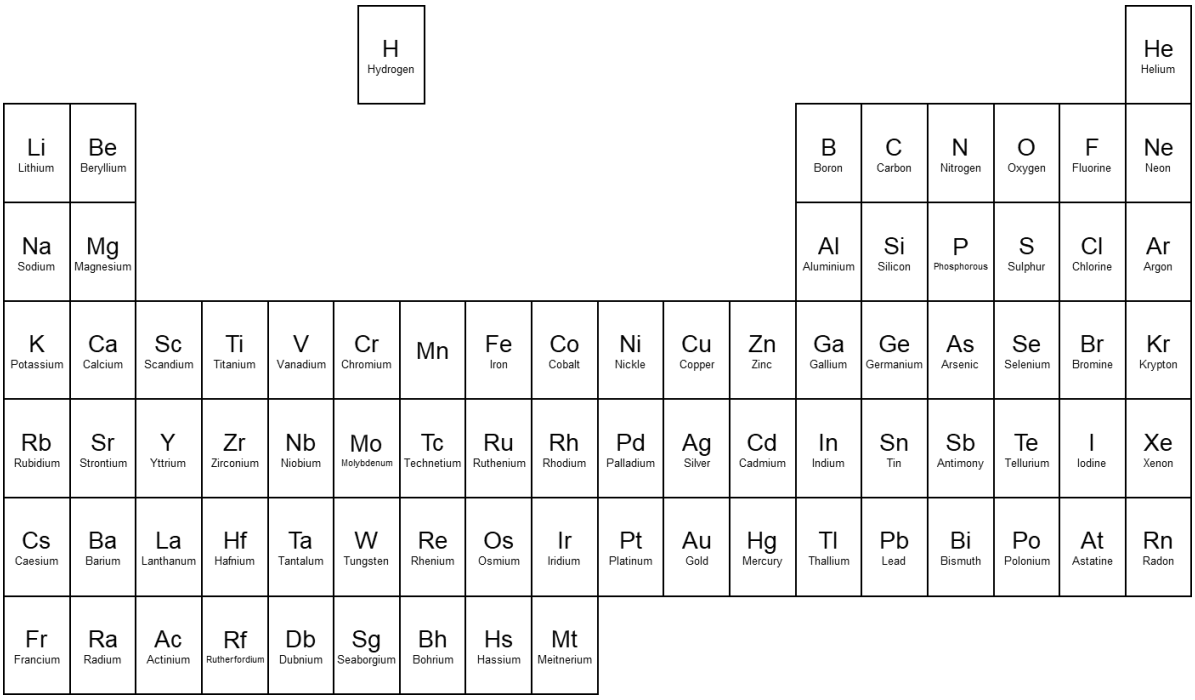
Front loading: Group 7 Non-metals.

The Halogens are all non-metals. They have properties that are specific to group 7.

- Halogens exist as diatomic molecules (two atoms held together with a single covalent bond).
- They are non-metallic elements which are poor conductors of heat and electricity.
- They are toxic and corrosive.
- The melting and boiling point increases as you move down the group.

The reactivity of the alkali metals increases as you move down the group.

Blank Canvas: Annotate the periodic table as your teacher talks through it.



Use the information above to answer the following questions.

1. Halogens are all diatomic. Explain what this means

2. Explain why a fume cupboard is used when reacting chlorine with iron.

3. State the most reactive group 7 element.

4. Complete the table below:

Property	Chemical or physical?
Low melting point	
Poor conductor of electricity and heat	
Reacts readily with metals	
Low density	
Reacts readily with hydrogen	

Look at the data in the table below. You will need this to answer the following questions.

Halogen	Melting point (°C)	Boiling point (°C)	Density (g/cm^3)	Appearance
Chlorine	-101	-34	0.0032	Green gas
Bromine	-7	59	3.12	Brown liquid
Iodine	114	184	4.95	Purple/black solid

5. Using the data, estimate the melting point and boiling point of fluorine.

- Melting point:
- Boiling point:

6. Using the data above, suggest the appearance of fluorine.

7. Identify in which state would you find bromine at the following temperatures:

- -50℃
- 50℃
- 150℃

8. State which halogen can be found as a solid at 100℃. Explain why you made this choice.

9. State which of the halogens has the lowest density. Explain why you made this choice.

10. State which halogen would be found as a gas at room temperature. Explain why you made this choice.

Front loading: Group 0 Noble Gases.

The Noble gases are all non-metals. They have properties that are specific to group 0. These properties are caused by the fact that they all have a full outer shell of electrons so are unreactive.

Main properties:

- They are colourless.
- They have very low melting and boiling points.
- They are poor conductors of heat and electricity.
- They are inert—this meant they were not found until the end of the 19th century.
- They exist as single atoms as they do not easily form bonds with other atoms.
- They are only present in very small amounts in our atmosphere

Noble Gas	% in atmosphere
Helium	0.00052
Neon	0.0018
Argon	0.934
Krypton	0.00011
Xenon	0.000009

Blank Canvas: Listen and annotate the periodic table on a previous page.

Key vocabulary: Complete the definitions for the following keywords.

Noble gas	
Inert	

Complete the table below to describe the uses of Noble Gases.

Noble gas	Uses
Helium	
Neon	
Argon	
Krypton	

Check for understanding

1. All of group 0 are inert. Explain what this means and why they are inert.

2. Explain why all group 0 exist as single atoms rather than bonded with another atom.

3. Suggest and explain why the group 0 elements were among the most recent to be discovered.

4. Explain why helium is used in balloons.

5. State one problem with the use of helium to fill balloons.

Lesson outcomes.

- State where the halogens and noble gases are located in the periodic table.
- Compare the physical and chemical properties of Group 7.
- Compare the physical and chemical properties of Group 0.

What careers could be linked to the topics we have looked at today?

Use this space for independent practice or for other activities directed by your teacher.

Year 8
Chemistry
Module 2

Chemical Reactions

Knowledge Tracker

Lesson	What will I learn today
1. Is it a chemical or physical change?	• State that a chemical reaction results in a new substance being made. • Describe the evidence of a chemical reaction. • Predict is a chemical reaction has happened from experimental observations.
2. What is oxidation?	• Describe the test for oxygen gas • State that oxygen is added in an oxidation reaction. • Predict the names of the products of oxidation reactions. • Explain why mass increases during oxidation reactions.
3. What is combustion?	• State that combustion is an oxidation reaction • Explain why complete/incomplete combustion occurs. • State the products of complete and incomplete combustion.
4. Is it endothermic or exothermic?	• State that an exothermic reaction gets hotter • State that an endothermic reaction gets colder • Classify reactions as endothermic or exothermic based on experimental data. • Explain in terms of energy why the temperature changes during endothermic and exothermic reactions.
5. What is thermal decomposition?	• State the meaning of thermal decomposition. • State that thermal decomposition is an endothermic reaction • Write word equations for thermal decomposition reactions. • State the test for carbon dioxide gas.
6. How do catalysts work?	• State that a catalyst is used to speed up a chemical reaction. • State that a catalyst is not used up in a reaction. • Give the names and uses of some catalysts.

LESSON C2.1

Is it a chemical or physical change?

Do Now - Complete the retrieval quiz. When you are finished, get your purple pen ready to tick, correct or add to your answers.

1. Are chemical changes irreversible?

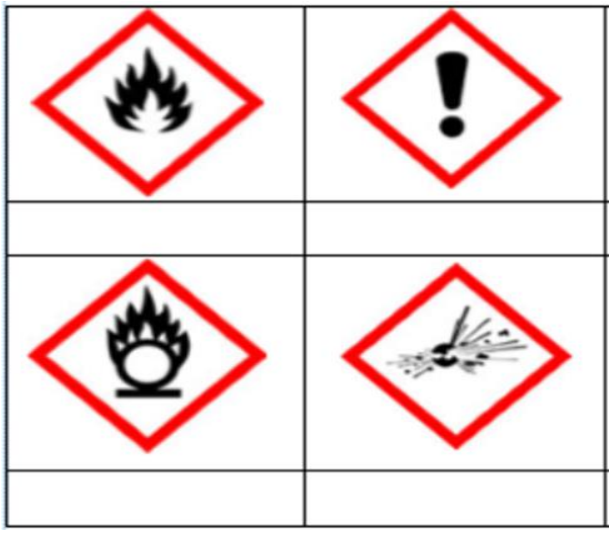
2. What is the pH of:

Acid?

Alkali?

3. What is a neutralisation reaction?

4. Identify the hazard symbols.



Key Vocabulary.

- **Physical change -** where reactants are not used up and no reactants are formed, like melting chocolate or ice.
- **Chemical change -** where atoms are rearranged to form new products such as in the combustion of wood.

Listen as your teacher explains the difference between a physical change and a chemical change. Complete notes below when asked to do so.

Front loading: Chemical changes.

Ice is frozen water, made of H_2O. When ice melts, it is still H_2O but the particles are further apart making it take the liquid state. This is called a physical change. Physical changes are easy to reverse, E.g. the liquid water can be refrozen back into solid ice.

When substances react, they form a new substance with a different arrangement of atoms. This is a chemical change. Chemical changes are very hard to reverse, E.g. once you have burnt word, you cannot “un-burn” it again.

Chemical reactions have observable characteristics. These include:

- A new substance being made;
- A colour change;
- Effervescence (fizzing or bubbling);
- Energy being transferred.

Watch the demonstration of the screaming jelly baby - how could you tell that a chemical reaction had taken place?

Check understanding - for each of these changes, decide if it is a chemical or a physical reaction

1. Making a cake:
2. Boiling water:
3. Burning a log on a fire:
4. A bike rusting:
5. Dissolving salt into water:
6. Melting an ice lolly:
7. Burning a piece of magnesium:
8. Inflating a football:

Practical: Complete each of the activities described below. For each activity, write an observation and explain whether it is a chemical or physical change.

Activity	Description	Observation
1	Blue Bottle	
Chemical or physical? Why		
2	Iron chloride and sodium hydroxide	
Chemical or physical? Why		
3	Hydrochloric acid and calcium carbonate	
Chemical or physical? Why		
4	Hydrochloric acid and sodium hydroxide	
Chemical or physical? Why		
5	Burning magnesium	
Chemical or physical? Why		
6	Melting wax	
Chemical or physical? Why		
7	Sodium thiosulfate and water	
Chemical or physical? Why		
8	Copper sulfate and sodium hydroxide	
Chemical or physical? Why		
9	Sodium chloride and water	
Chemical or physical? Why		

Check for understanding

1. A pupil mixes two chemicals together but is unsure if a reaction has taken place. Describe the signs the pupil is likely to see in the event of a chemical reaction.

2. A pupil melts some chocolate in the palm of their hand and states that a chemical reaction is taking place. Explain if the pupil is correct or not.

Lesson outcomes.

- State that a chemical reaction results in a new substance being made.
- Describe the evidence of a chemical reaction.
- Predict is a chemical reaction has happened from experimental observations.

What careers could be linked to the topics we have looked at today?

Use this space for independent practice or for other activities directed by your teacher.

LESSON C2.2

What is oxidation?

Do Now - Complete the questions. When you are finished, get your purple pen ready to tick, correct or add to your answers.

1. What is a chemical change?

2. How do you know if a chemical change had occurred?

3. Explain whether the diagram shows a chemical or physical change

Key Vocabulary.

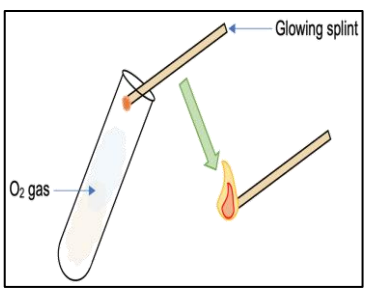
- **Oxidation:** When a substance reacts and gains oxygen.
- **Combustion:** When a substance is burnt.

Front Loading: Oxidation.

Oxidation is a type of chemical reaction. In an oxidation reaction, an element or compound gains oxygen atoms. Oxidation reactions occur when a substance reacts with the element oxygen to produce an oxide.

Combustion, or burning, is an example of an oxidation reaction. This is because a fuel reacts with oxygen to release energy. Some fuels are hydrocarbons. When there is plenty of oxygen around, these combust to give carbon dioxide and water (plus energy).

Blank canvas: Watch as your teacher demonstrates how to test for oxygen. Write an observation.



	**Think and be ready to share:** Can you think of any oxidation reactions?

A quick oxidation reaction:
A slow oxidation reaction:
A useful oxidation reaction:
A problematic oxidation reaction:

	**Blank canvas:** Watch as your teacher demonstrates how to write word equation for an oxidation reaction.

Complete the word equations below:
Tin + Oxygen →
Magnesium + Oxygen →
Sodium + Oxygen →
Calcium + Oxygen →
Carbon + Oxygen →

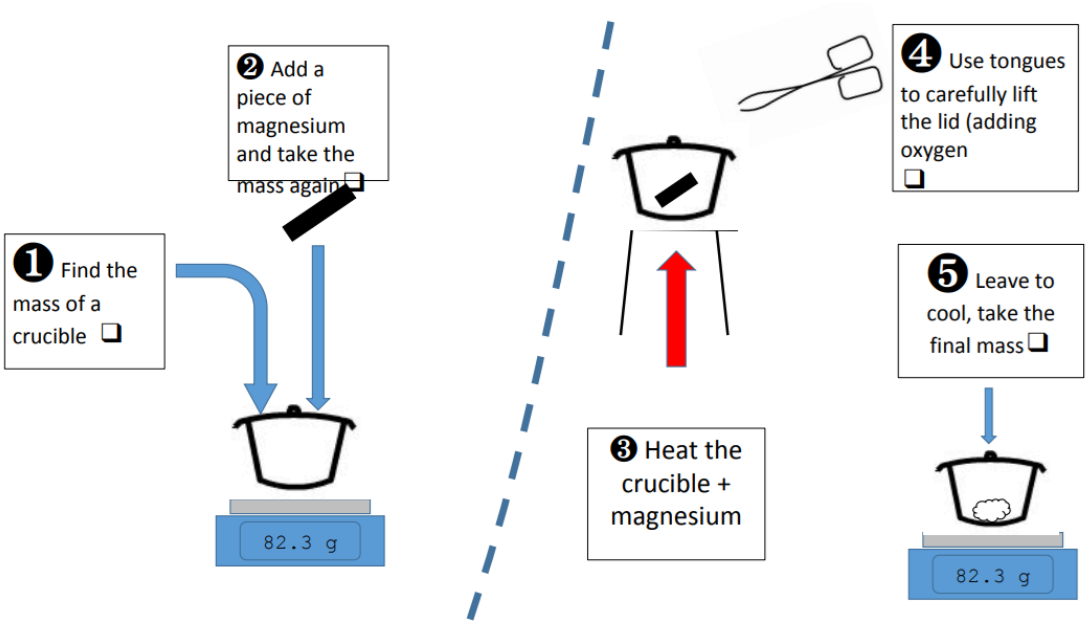
	**Front loading: Conservation of mass.**

When chemical reactions take place, the atoms of the reactants are rearranged to form the products. When this happens, the total number of atoms in the reactants and the products is the same. This means the mass of the reactants will always be equal to the mass of the reactants.

This is not always obvious. For example, when paper burns, the mass of remaining material seems to be much less than the paper you started with. This is because some of the atoms in the paper formed the smoke and spread out into the air.

This is known as conservation of mass - atoms cannot be created or destroyed in chemical reactions, they are simply rearranged.

Investigating oxidation. Listen as your teacher explains the method. Add details to the diagram if asked to do so.



Complete the risk assessment for your investigation.

Hazard	Risk (Low, medium, high)	Precautions

Results.

Starting mass of magnesium (g)	Mass of empty crucible (g)	End mass of crucible with the magnesium oxide inside (g)	Mass of magnesium oxide produced (g)

Conclusion: Use the Point Evidence Explain Evaluate structure below to write a conclusion for our experiment.

Point: (State if mass was conserved or not in our reaction)

Evidence: (Describe the data you have to support your point)

Explain: (the science behind the results you obtained)

Lesson outcomes.

- Describe the test for oxygen gas
- State that oxygen is added in an oxidation reaction.
- Predict the names of the products of oxidation reactions.
- Explain why mass increases during oxidation reactions.

What careers could be linked to the topics we have looked at today?

Use this space for independent practice or for other activities directed by your teacher.

LESSON C2.3

What is combustion?

Do Now - Complete the questions. When you are finished, get your purple pen ready to tick, correct or add to your answers.

1. Define compound.

2. How do you test for oxygen?

3. What is oxidation reaction?

4.

Key vocabulary: Complete the definitions below.

Compound	
Combustion	
Oxidation	

Front Loading: Combustion.

Combustion is another word for burning. In a combustion reaction, a fuel is heated and it reacts with oxygen.

The three things needed for combustion
1. a fuel
2. heat
3. oxygen.

If one of these things is removed from a fire, the fire goes out.

When fuels burn in combustion reactions, they release useful thermal energy (heat). Combustion reactions are used to heat our homes, power most cars, and to generate a lot of our electricity.

Blank Canvas: Annotate the diagram as your teacher talks through the fire triangle.

Practical: Investigating Combustion.

Method:

1. Block the lip of the beaker with blue tac.
2. Light a tealight and place underneath.
3. Start timer.
4. Stop timing once candle has gone out.
5. Record the time it takes.

For the procedure above, carry out a risk assessment, identifying the hazards. State the precautions we should take to reduce the risk.

Hazard	Risk (L, M, H)	Precautions

Results

Volume of beaker (cm^3)	How long the candle burns for (s) 1	2	3	Average (s)

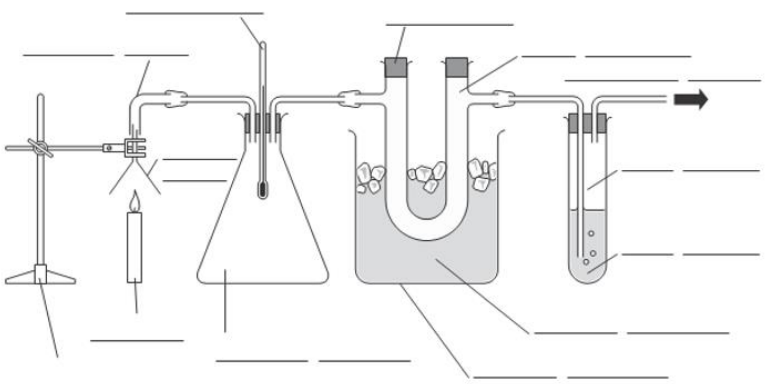
Conclusion: Use the Point Evidence Explain Evaluate structure below to write a conclusion for our experiment.

Point: (State whether volume of beaker affect burn time)

Evidence: (Describe the data you have to support your point)

Explain: (the science behind the results you obtained)

Blank Canvas: Annotate the diagram as your teacher demonstrates how to test for the products of combustion.



Check for understanding

1. What are the products of combustion?

2. Complete the word equation:

Hydrocarbon + Oxygen →

3. How do you test for carbon dioxide?

4. Why did you burn each candle 3 times?

Lesson outcomes.

- State that combustion is an oxidation reaction
- Explain why complete/incomplete combustion occurs.
- State the products of complete and incomplete combustion.

What careers could be linked to the topics we have looked at today?

Use this space for independent practice or for other activities directed by your teacher.

LESSON C2.4

Is it endothermic or exothermic?

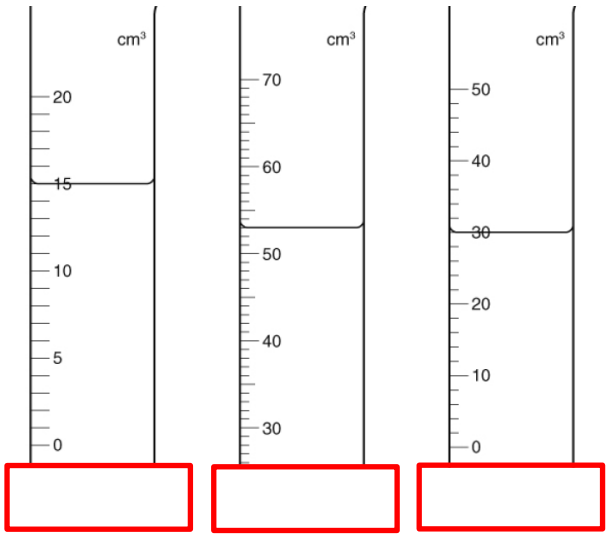
Do Now - Complete the questions. When you are finished, get your purple pen ready to tick, correct or add to your answers.

1.What equipment is used to measure temperature?

2. What equipment is used to measure volume?

3. Name 2 safety precautions in a laboratory.

4. What volumes do the measuring cylinders show?



Key Vocabulary.

- **Exothermic**—A type of reaction where energy is transferred to the surroundings from the reactants, i.e. combustion.
- **Endothermic**— A type of reaction where energy from the surroundings is transferred to the products, i.e. photosynthesis.

Blank Canvas: Listen as your teacher discusses energy changes in reactions. Add details to the diagram below when asked to do so.

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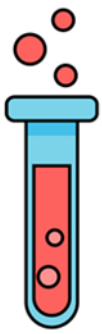
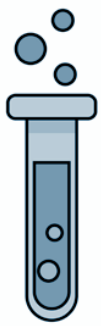




Front loading: Endo and Exothermic reactions.

Endothermic reactions are reactions that take in energy from their surroundings, cooling the surroundings down. When you touch something that's undergoing an endothermic reaction, it might feel cold because it's taking in heat from your skin. The energy is being used to break existing chemical bonds.

On the other hand, exothermic reactions release energy into their surroundings. This means the reaction is giving off heat or energy like a firework exploding. If you touch something that's undergoing an exothermic reaction, it might feel hot because it's giving off heat to your skin. The energy is released as new chemical bonds are made.

Check for understanding.

Type of reaction	Energy transferred from	Energy transferred to	Feels…	Example
Endothermic				
Exothermic				

Analyse the data below and determine if the reaction is endo or exothermic

Reaction	Starting Temp (^{O}C)	End Temp (^{O}C)	Temp Change (^{O}C)	Exothermic or Endothermic?
A	12	24		
B	16	15		
C	-12	-42		
D	-6	3		
E	-9	-2		
F	106	144		
G	37	39		
H	21	9		
I	43	-1		

Blank Canvas: Watch and make notes as your teacher demonstrates how to test if a reaction is exo or endothermic.

Write a method to investigate exo and endothermic reactions.

Results.

Liquid	Temperature (°C)	Solid	Min/Max Temperature (°C)	Endothermic or exothermic
Hydrochloric acid		Magnesium		
Water		Ammonium chloride		
Water		Potassium nitrate		
Water		Sodium thiosulphate		
Hydrochloric acid		Sodium hydroxide		

Conclusion: Use the Point Evidence Explain Evaluate structure below to write a conclusion for our experiment.

Point: (State which reaction was most strongly exothermic)

Evidence: (Describe the data you have to support your point)

Explain: (the science behind the results you obtained)

Check for understanding.

1. Explain why combustion is an exothermic reaction.

2. Describe how you determine a reaction is endothermic.

Lesson outcomes.

- State that an exothermic reaction gets hotter.
- State that an endothermic reaction gets colder.
- Classify reactions as endothermic or exothermic based on experimental data.
- Explain in terms of energy why the temperature changes during endothermic and exothermic reactions.

What careers could be linked to the topics we have looked at today?

LESSON C2.5

What is thermal decomposition?

Do Now - Complete the questions. When you are finished, get your purple pen ready to tick, correct or add to your answers.

1. How can you tell if a gas is produced?

2. What is the test for carbon dioxide?

3. What is an exothermic reaction?

4. Draw the particle diagram for a solid and gas.

Solid

Gas

Key Vocabulary.

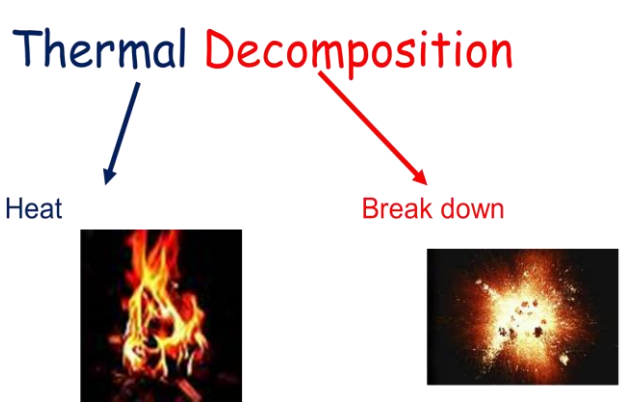
- **Thermal:** Heat
- **Decomposing:** Process of breaking down
- **Thermal Decomposition:** Breaking down a substance with heat.

Exothermic	
Endothermic	

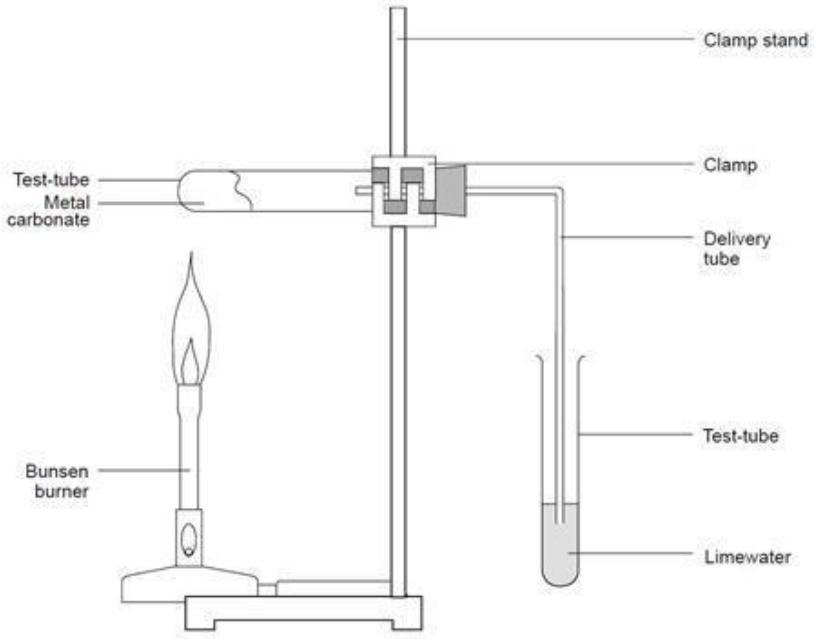
Front Loading: Thermal decomposition.

Thermal decomposition reactions happen at high temperatures. The reactants absorb lots of energy as they break down into the products. The starting compound is the reactant. It breaks down to simpler substances, which could be elements or they could be compounds.

Thermal decomposition reactions are examples of endothermic reactions, and are useful when cooking and baking cakes



Blank canvas: Watch and take notes as your teacher demonstrates a thermal decomposition reaction.



Check for understanding

1. Explain the safety precautions the teacher took.

2. How did you know a chemical reaction occurred?

3. What was the purpose of the limewater?

4. Explain why this is an endothermic reaction

Blank canvas: Your teacher is going to demonstrate how to write word equations .

Check for understanding

1. What do the state symbols stand for?

s:

l:

g:

aq:

2. Complete the following two word equations:

Calcium carbonate →

Lithium carbonate →

3. Write the chemical formula for carbon dioxide.

4. Convert the following two word equations into symbol equations, include state symbols:

Magnesium carbonate → Magnesium oxide + Carbon dioxide

Calcium carbonate → Magnesium oxide + carbon Dioxide

Key Vocabulary: Complete the definitions below.

Thermal decomposition	
Endothermic	

Lesson outcomes.

- State the meaning of thermal decomposition.
- State that thermal decomposition is an endothermic reaction
- Write word equations for thermal decomposition reactions.
- State the text for carbon dioxide gas.

What careers could be linked to the topics we have looked at today?

Use this space for independent practice or for other activities directed by your teacher.

LESSON C2.6

How do catalysts work?

Do Now - Complete the retrieval quiz. When you are finished, get your purple pen ready to tick, correct or add to your answers.

1. Are chemical changes irreversible?

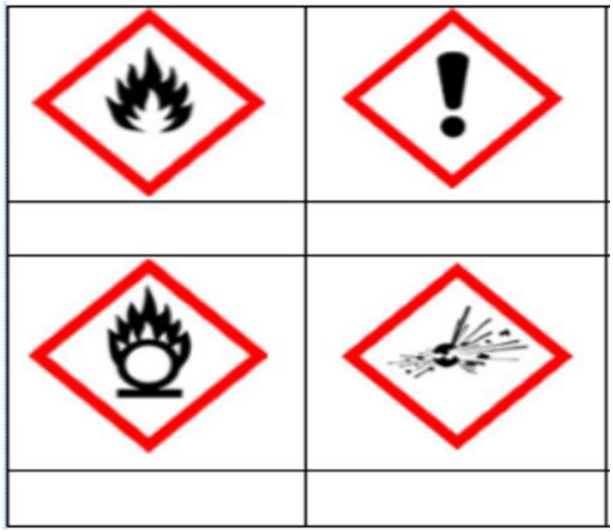
2. What is the pH of:

Acid?

Alkali?

3. What is a neutralisation reaction?

4. Identify the hazard symbols.



Key Vocabulary.

- **Speed:** How fast something goes.
- **Catalyst:** A substance that speeds up a chemical reaction

Front Loading: Catalysts.

A catalyst is a substance that speeds up a chemical reaction without being used up or chemically changed. Catalysts are usually specific to a particular reaction. The best catalyst for one reaction is unlikely to have any effect at all on a different reaction. Different catalysts are needed for different reactions.

Biological reactions in the cells of living things are sped up by catalysts called enzymes. Enzymes are biological catalysts. They are important for biological reactions like digestion.

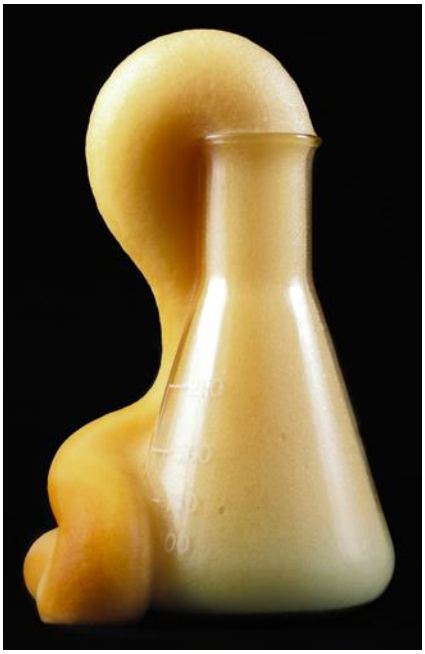
The mass of the catalyst at the end of the reaction will be the same as the mass of the catalyst at the start.

The picture shows a reaction with a catalyst. The left hand side shows manganese dioxide (black powder) being added to hydrogen peroxide (colourless liquid) and right hand side shows the end of the reaction. The products are water and oxygen

Manganese dioxide is a very effective catalyst for this reaction. The bubbles are oxygen.

Notice how all the manganese dioxide powder is still there at the end of the reaction. This means the catalyst has not been used up or changed.

Blank canvas: Your teacher is demonstrating a catalytic reaction, annotate the diagram with your observations.



Check for understanding

1. What does a catalyst do?

2. Why is the mass of the catalyst the same at the start and end of the reaction?

3. Name a biological catalyst.

4. Can the same catalyst be used for different reactions?

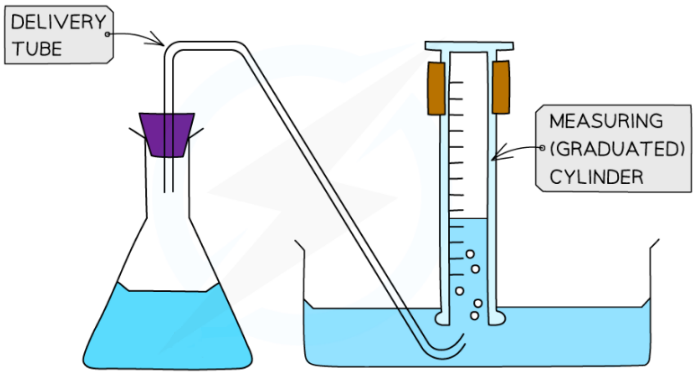
5. Define decomposition.

6. What gas was produced during the decomposition of hydrogen peroxide?

7. How do you test for this gas?

Practical: Decomposition of Hydrogen peroxide.

Hydrogen Peroxide was decomposed using the method shown in the diagram. The data is shown in the table.



Mass of catalyst (g)	Time taken to produce 100cm^3 of oxygen (s)
0	-----
0.2	100
0.4	75
0.6	60
0.8	50
1.0	50

Draw a scatter graph displaying the data.

Conclusion: Use the Point Evidence Explain Evaluate structure below to write a conclusion for our experiment.

Point: (State what happened to the time as the mass of catalyst increased.

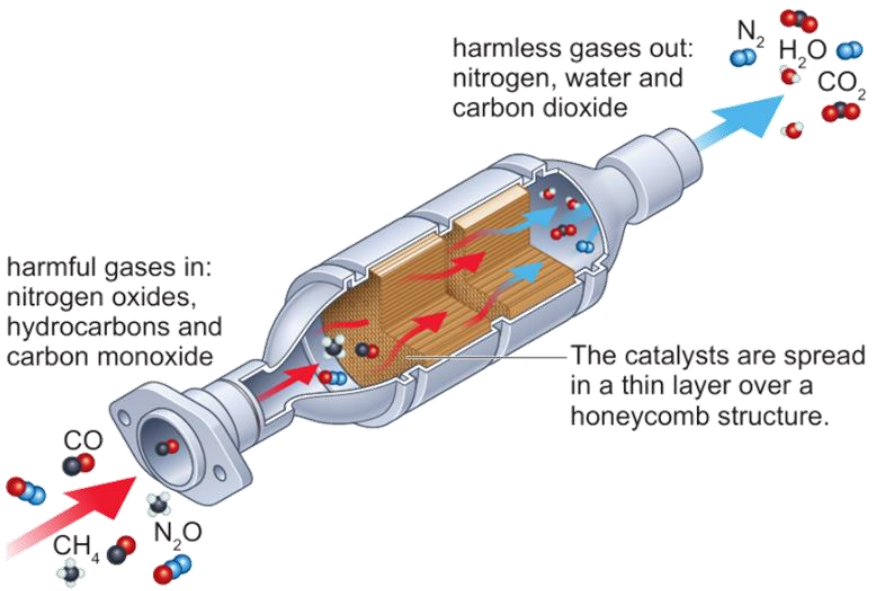
Evidence: (Describe the data you have to support your point)

Explain: (The science behind the results you obtained)

Front Loading: Using catalysts.

The combustion of petrol in car engines produces a number of exhaust gases that can cause air pollution. These harmful gases include carbon monoxide, unburnt hydrocarbons and nitrogen oxides.

Since 1993, all new petrol engine cars must have had a catalytic converter built into their exhaust systems. These converters reduce pollution by changing harmful gases into harmless gases. However, they use expensive metals like platinum, rhodium and palladium. The metal catalysts are spread very thinly over a honeycomb structure inside the catalytic converter. Once the exhaust system has heated up, the gases going into the catalytic converter are different from the ones coming out



Check for understanding

1. Why must all new petrol engine car contain a catalytic convertor in their exhaust systems?

2. Name two metal catalysts used in catalytic convertors in car exhausts.

3. Describe a danger cause by carbon monoxide gas.

4. Suggest a possible reason why the catalysts are spread very thinly.

5. Suggest a reason why the catalytic convertor works better when the exhaust system is hot.

6. List and name the gases that go into the catalytic convertor and those that come out.

Key Vocabulary: Complete the definitions below.

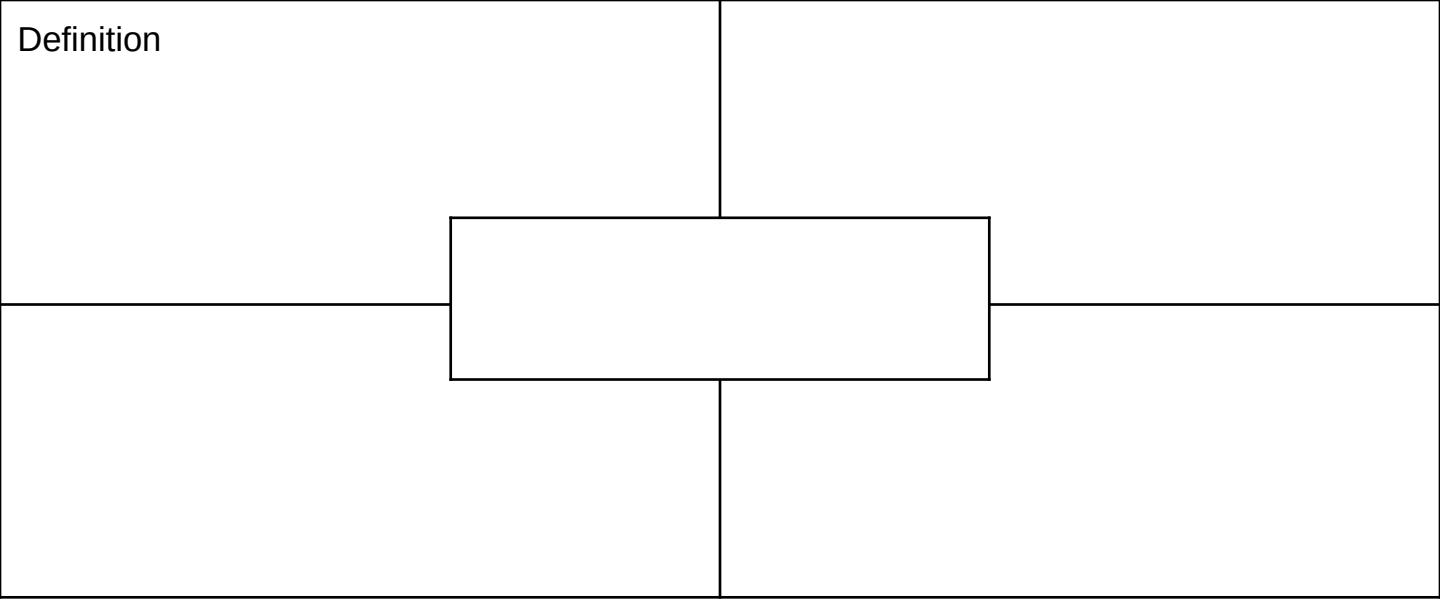
Catalyst	
Exothermic	

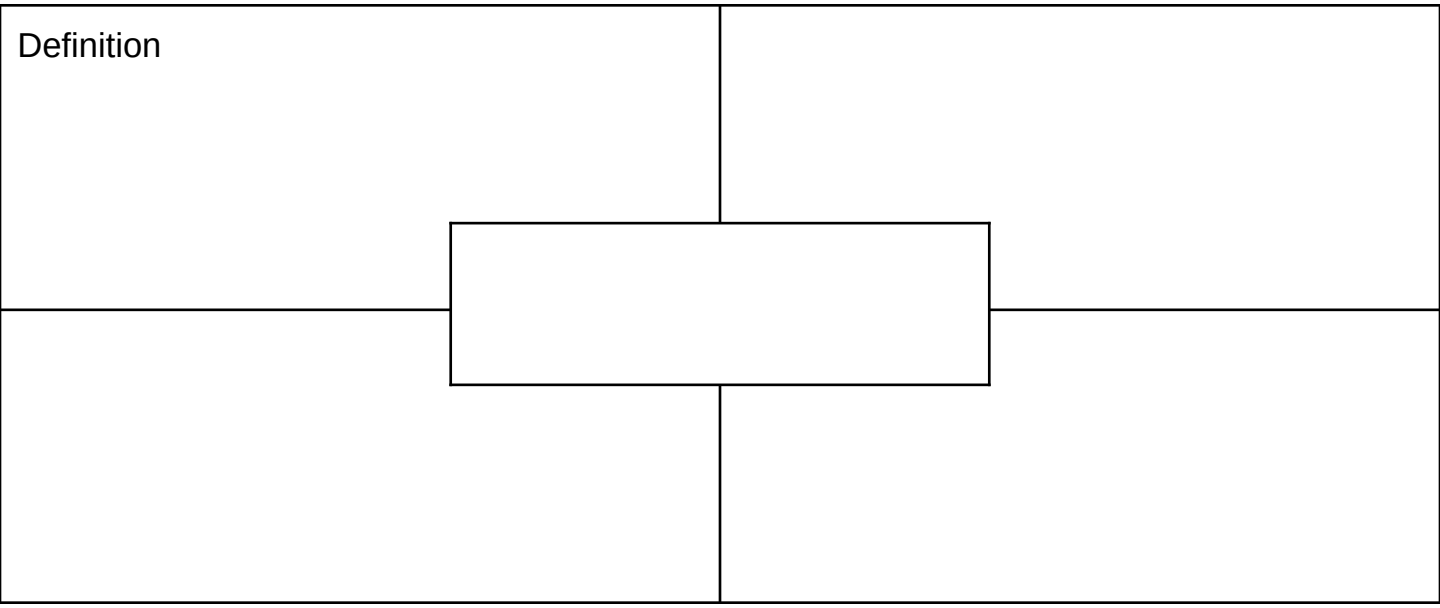
Lesson outcomes.

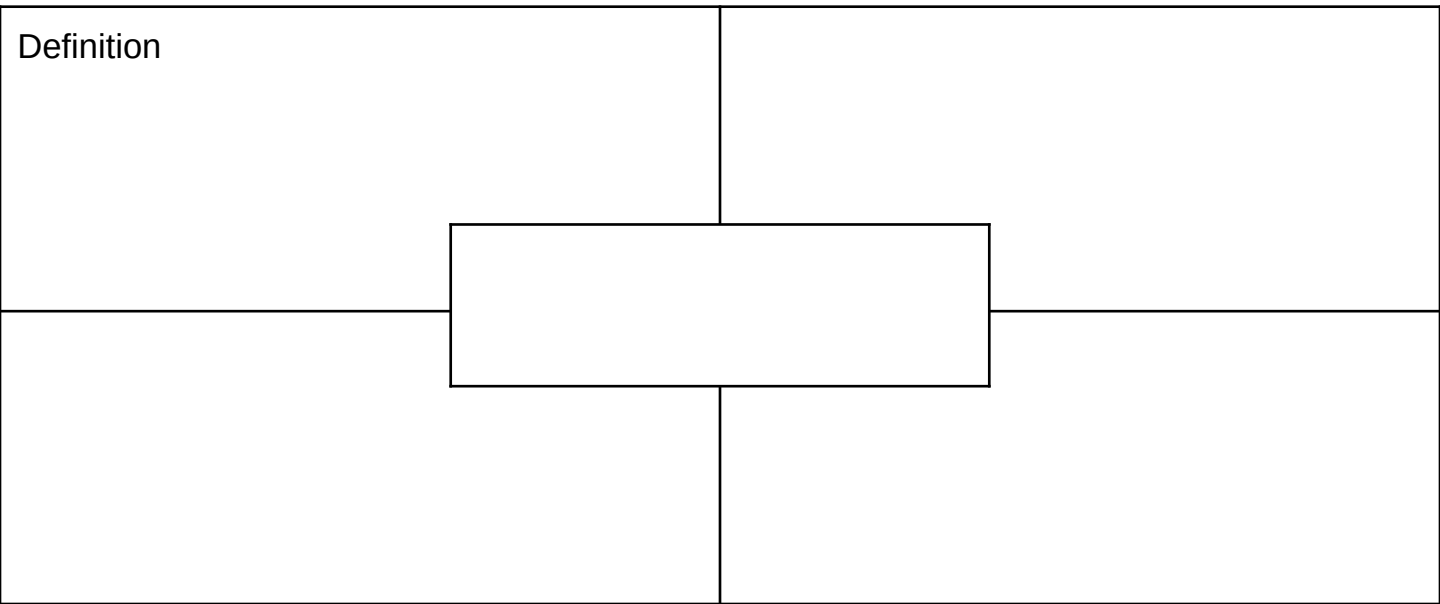
- State that a catalyst is used to speed up a chemical reaction.
- State that a catalyst is not used up in a reaction.
- Give the names and uses of some catalysts.

What careers could be linked to the topics we have looked at today?

Use this space for independent practice or for other activities directed by your teacher.


Definition


Definition


Definition

Cornell Notes

Title:

Keywords, ideas and questions	Notes

Summary:

Learning Journey: Combined Science

Cycle 2
- Fuels
- Earth & Atmosphere
- Particle Model
- Forces & Matter
- Paper 2 Core practical reviews

Revision and GCSE Exams

Courses	GCSE Science is an entry requirement for a majority of Post-16 courses
Careers	Psychologist, Ecologist, Vet, Lawyer, Anthropologist, Biochemist., Archaeologist
Skills	Problem solving, critical thinking, ICT literacy, collaboration, adaptability, self-management
Real World	Asking/answering questions about your world and making decisions based on evidence

Year 11

Cycle 1
- Hormones
- Exchange & Transport
- Paper 1 Core practical reviews

Cycle 3
- Eco Systems
- Material Cycles
- Groups
- Electricity
- Rates & Energy

Cycle 2
- Electrolytic Processes
- Plants & Photosynthesis
- Extracting metals & Equilibria
- Work & Forces

Year 10

Cycle 2
- Cells & Control
- Energy Stores & Transfers
- Bonding and Structure
- Genetics

Cycle 3
- Waves
- Light & EM spectrum
- Acids & Alkalis
- Natural selection & Genetic modification

Cycle 1
- Forces & Motion
- Health & Preventing Disease
- Calculations involving masses
- Radioactivity

Year 9

Cycle 1
- States of Matter
- Separating Substances
- Cells and Microscopes
- Enzymes
- Transporting Substances
- Speed & Acceleration
- Atomic Structure

Cycle 3
- Light
- Energy stores & Transfers
- Nutrition & Digestion
- Genetics & Inheritance

Cycle 2
- Respiration
- Plants & Photosynthesis
- Earth & Atmosphere
- Metals & Reactivity

Year 8

Cycle 2
- Cells
- Human Organ Systems
- Mixtures & Separation
- Acids & Alkalis

Cycle 3
- Electricity
- Energy in the Home
- Reproduction
- Interdependence & Health

Cycle 1
- Periodic Table
- Chemical reactions
- Space & Magnetism
- Motion & Pressure

Year 7

Cycle 1
- Particle Theory
- Atoms, Elements & Compounds
- Forces
- Waves & Sound

Cycle Assessment points

- **End of unit assessments marked**
- **End of cycle assessment week 11**

AO1

Demonstrate knowledge and understanding of:
- **scientific ideas;**
- **techniques and procedures**

AO2

Apply knowledge and understanding of:
- **scientific ideas;**
- **techniques and procedures**

AO3

Analyse information and ideas to:
- **interpret and evaluate;**
- **make judgements & draw conclusions;**
- **improve experimental procedures**