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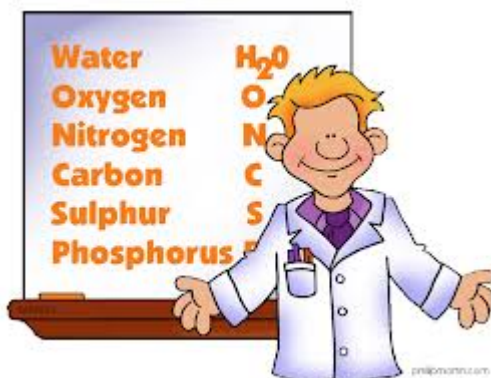
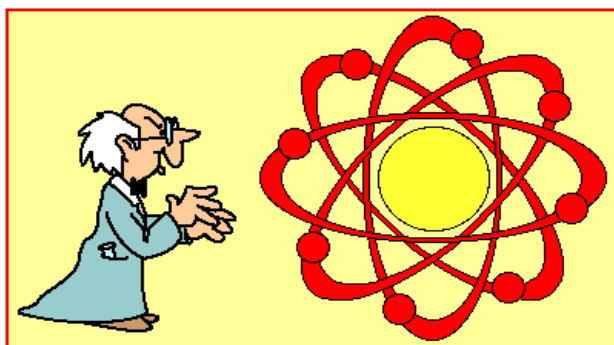
Form:

MYP 2

Year 8

Mapping Matter

Statement of Inquiry:	By changing matter , we can identify patterns in properties to enable us to make models and use these to invent new kinds of materials and explain the existence of matter.
Key Concept:	Change
Related Concepts:	Models and Patterns



4-5

8C MYP Command Terms

Term	Definition
Analyse	Break down in order to bring out the essential elements or structure. To identify parts and relationships, and to interpret information to reach conclusions.
Apply	Use knowledge and understanding in response to a given situation or real circumstances
Describe	Give a detailed account or picture of a situation, event, pattern or process
Design	Produce a plan, simulation or model
Discuss	Offer a considered and balanced review that includes a range of arguments, factors or hypotheses. Opinions or conclusions should be presented clearly and supported by appropriate evidence
Document	Credit sources of information used by referencing (or citing), following one recognized referencing system. References should be included in the text and also at the end of the piece of work in a reference list or bibliography
Evaluate	Make an appraisal by weighing up the strengths and limitations
Explain	Give a detailed account
Formulate	Express precisely and systematically the relevant concept(s) or argument(s)
Interpret	Use knowledge and understanding to recognize trends and draw conclusions from given information
Outline	Give a brief account
Present	Offer for display, observation, examination or consideration
Recall	Remember or recognize from prior learning experiences
Select	Choose from a list or group
Solve	Obtain the answer(s) using appropriate methods
State	Give a specific name, value or other brief answer without explanation or calculation
Suggest	Propose a solution, hypothesis or other possible answer
Summarize	Abstract a general theme or major point(s)

Glossary: Mapping Matter

Word	Meaning
element	All the atoms in an element are the same. A substance that cannot be split up into anything simpler by chemical reactions.
compound	Two or more elements bonded together. A substance that can be split up into simpler substances by chemical reactions.
mixture	Two or more different substances that are not joined to each other. Can be separated easily.
metals	Elements that are shiny, conduct heat and electricity well, and often have high melting and boiling points.
non-metals	Elements that are not shiny, and do not conduct heat and electricity well.
Periodic Table	Table that shows all the elements.
atom	The smallest part of an element you can get.
symbol	The letter or letters that represent an element.
properties	Ways of describing a substance.
electrical conductor	Something which allows electricity to flow through it easily.
heat conductor	Something which allows heat to flow through it easily.
high melting point	Something with a high melting point has to be at a very high temperature before it melts. It is a solid at room temperature.
low melting point	Something with a low melting point turns into a liquid at a relatively low temperature. It can be a solid, liquid or gas at room temperature.
magnetic	A metal (iron, nickel or cobalt) that can be magnetised or attracted to a magnet.
shiny	Reflects light well.
alloy	A mixture of different metals.
chemical formula	A combination of symbols and numbers that show how many atoms of different kinds there are in a particular compound.
molecule	Unit formed when two or more atoms join together.
reactants	Chemicals that join together to form a new substance.
product	New chemical formed in a chemical reaction.
word equation	A way of writing out what happens in a chemical reaction using the names of the substances involved.

Word	Meaning
symbol equation	A way of writing out what happens in a chemical reaction using the symbols that represent the substances involved
sodium chloride	Chemical name for common salt.
bond	Force holding atoms together.
oxide	A compound that includes oxygen.
decompose	Break down into simpler parts.
thermal decomposition	To break into simpler parts by heating
electrolysis	To break into simpler parts using electricity
irreversible change	Permanent change.
physical change	A change where no new substances are formed.
precipitate	Insoluble solid produced by mixing two solutions.

8C 1a The Periodic Table of Elements

Period	Groups																		
	I	II											III	IV	V	VI	VII	0	
1	1 H Hydrogen 1																		
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	
3	23 Na Sodium 11	24 Mg Magnesium 12											27 A/ Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulphur 16	35.5 Cl/ Chlorine 17	40 Ar Argon 18	
4	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	64 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	
5	85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	96 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	
6	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	209 At Astatine 85	209 Rn Radon 86	
7	226 Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89																
a X b	a = relative atomic mass X = atomic symbol b = proton (atomic) number			140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	147 Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71		
	232 Th Thorium 90	232 Pa Protactinium 91	238 U Uranium 92	237 Np Neptunium 93	244 Pu Plutonium 94	247 Am Americium 95	251 Cm Curium 96	254 Bk Berkelium 97	259 Cf Californium 98	261 Es Einsteinium 99	267 Fm Fermium 100	271 Md Mendelevium 101	277 No Nobelium 102	289 Lr Lawrencium 103					

8C 1b Elementary Questions

Here are some names of **elements** and their **symbols**.

You will need a copy of **the Periodic Table** to help you answer these questions.

Hydrogen	He	Ca	O	N	Calcium
Chlorine	Na	Helium	F		Oxygen
Argon	C	Carbon	Fe		Fluorine
Potassium	Mg	Nitrogen	K		Sodium
Iron	H	Ar	Cl		Magnesium

- 1 Draw lines between the names and the correct **symbols**.
- 2 After the name of each **element** write in whether it is a **solid**, a **liquid** or a **gas**. Do not write the full words but write (s) for solid, (l) for liquid and (g) for gas.
- 3 On the above diagram, colour all the **metals** blue
- 4 Write a list of all the **non-metals** above that are **solids**.

- 5 **Elements** are sometimes named after the people who discovered them. Imagine you have just found a new **element**.

a What would you call it? _____

b What would its symbol be? _____

Extension: Find out some of the names of the 'groups' in the periodic table. For example, what is group 1 and group 7 called?

Key words: element, symbol, solid, liquid, gas, metal, non-metal

8C 1c Sorting the Elements

Aim: Know where to find metals and non-metals in the Periodic Table. Know the names of some chemical elements. Know some of the properties of elements. Know how to write chemical symbols for elements correctly.

You will need to refer to **Worksheet 1a** which shows the elements in the **Periodic Table**.

- 1 Choose 5 different coloured pencils.
- 2 Colour in your copy of the Periodic Table to show the metals. Show this colour in a key alongside it.
- 3 Choose a different colour. Colour in the squares that contain non-metals. Add the colour to your key.
- 4 There are only two elements in the Periodic Table that are liquids. One is a metal, and one is a non-metal. Pick another colour, and outline the squares with these two elements in. Add this outline colour to your key.
- 5 Find the elements that are gases. How many gases are there in the table? Pick another colour and outline all the squares of elements that are gases. Add this colour to your key.
- 6
 - a What state are all the remaining elements in?.....
 - b How many are there?.....
- 7 Use your copy of the Periodic Table to look up the elements represented by each of these symbols. Write each symbol into the table below in the correct box.

Fe Al S Hg O Cu Zn N C He Ag Br Cl Au H Mg

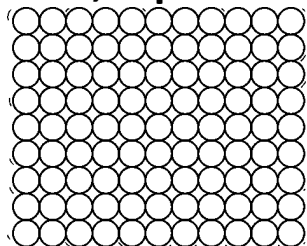
	Metal	Non-metal
solid		
liquid		
gas		

Key words:

metal, non-metal, solid, liquid, gas, properties, Periodic Table,

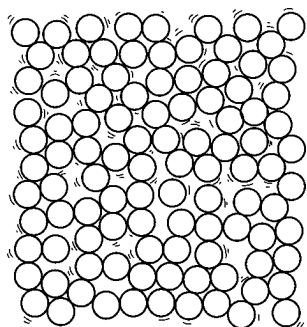
8C 2a Particle Diagrams and Changes of State

Solids, liquids and gases



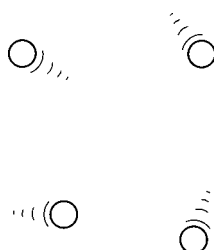
SOLID

- Solids are made up of particles that are very close together and are held tightly together by strong **bonds**.
- Solids cannot be squashed, do not flow, have a fixed shape and volume, and have a high density.



LIQUID

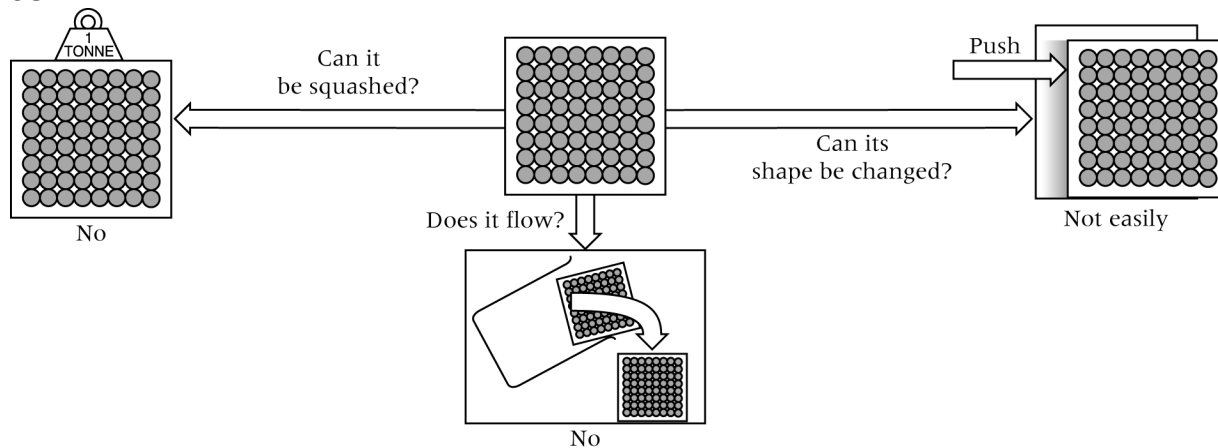
- Liquids are made up of particles that are fairly close together; the bonds between the particles are weaker than the bonds in solids.
- Liquids cannot be squashed, flow quite easily, and have a fixed volume but no fixed shape.
- Although they are dense, liquids usually have a lower density than solids.



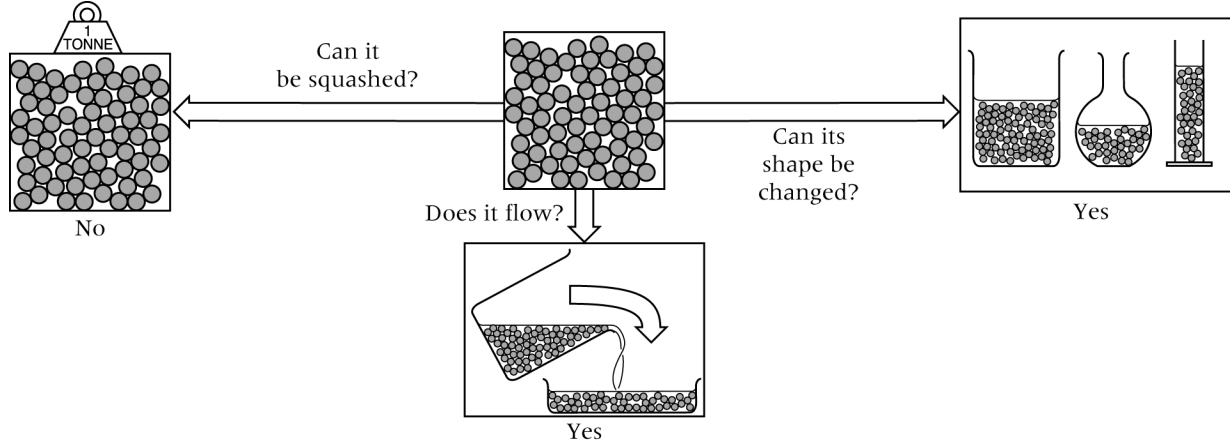
GAS

- Gases are made up of particles that are well spread out, with no bonds between them.
- Gases are quite easy to squash, flow easily, have no fixed volume and no fixed shape.
- Gases have a lower density than liquids.

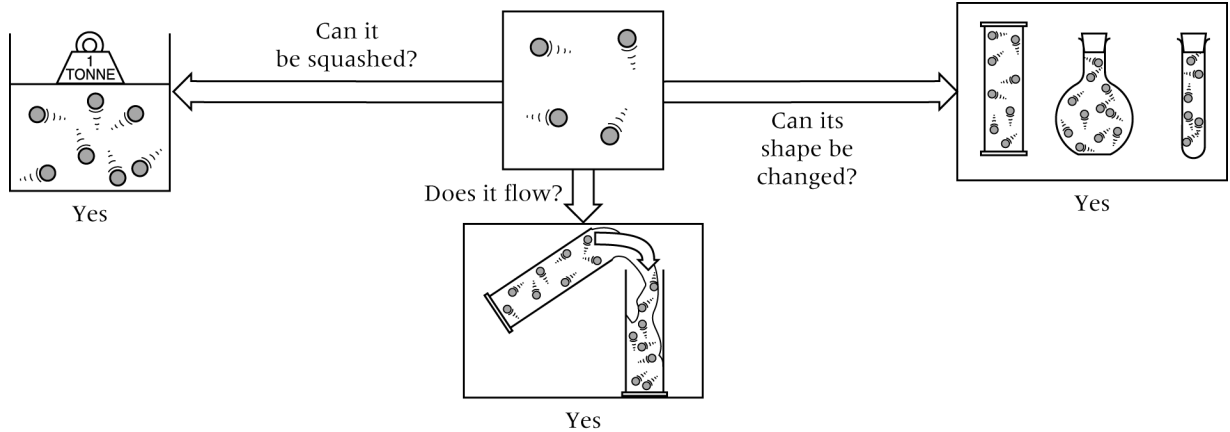
SOLID



LIQUID



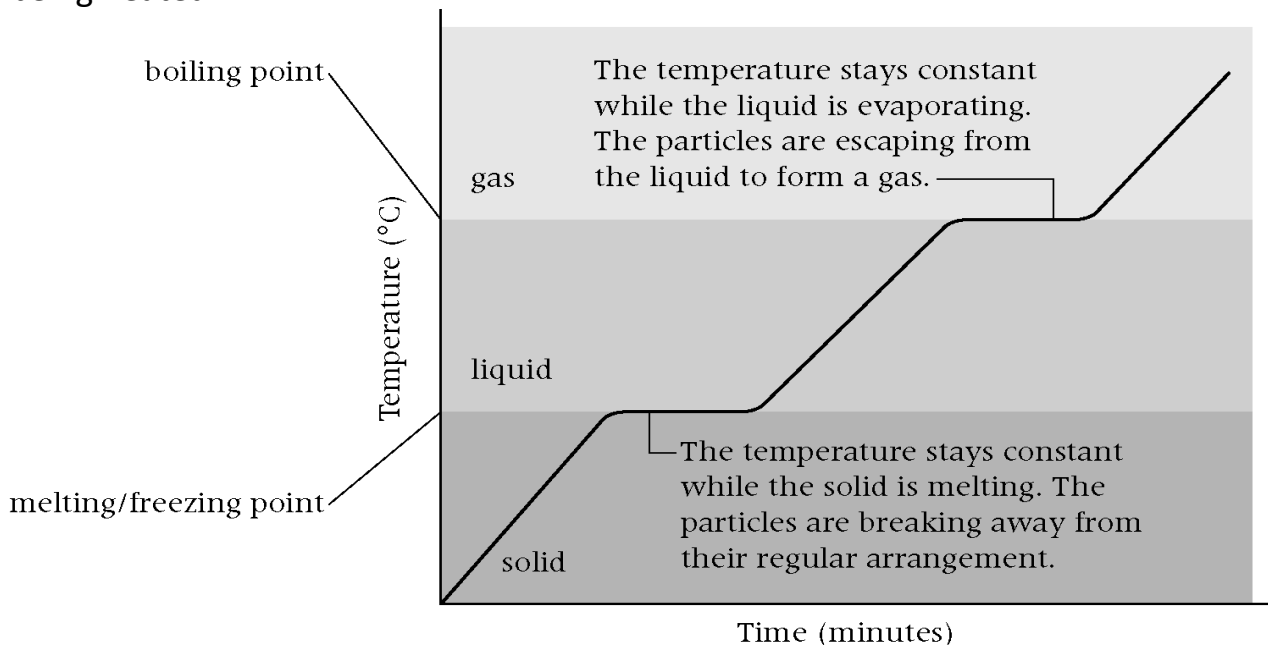
GAS



Changes of state

Substances can change state when they are heated or cooled.

The melting point and the freezing point of a substance are the same temperature. The temperature of a substance does not change while it is melting, even if it is still being heated.



8C 2b States of Matter and their Properties

Aim: Refer to worksheet 2a to describe the arrangement of particles in solids, liquids and gases according to particle theory. Describe the properties of different states of matter.

Property	Solids	Liquids	Gases
Shape			
Ability to be poured			
Ability to be squashed			
Do they expand when heated?			
Particle diagram			
Are the particles widely spaced or closely packed?			
Are the particles able to move?			
Are the particles random or regular?			
Are the particles bonded strongly/weakly or have no bonds?			

8C 2c Practical Investigation – Iron and Sulphur

Aim: Know the difference between an element and a compound

Test 1 : Appearance

- Collect 3 *dry* test tubes and put 1 spatula of iron into tube 1, Put 1 spatula of sulphur into tube 2 and a spatula of the mixture into tube 3.
- How does each appear

Test 2 : Magnetism Test

- Bring a magnet up to each tube.
- Record which substances are attracted to the magnet and which are not.

Test 3 : Floating & Sinking

- Collect 3 test tubes and fill each one about half full with water.
- Put 1 spatula of iron into tube 1, Put 1 spatula of sulphur into tube 2 and a spatula of the mixture into tube 3. Write your observations in the table.

Materials required

- Test tubes
- Bunsen burner
- Mineral wool
- Magnet
- Iron powder
- Sulphur
- Mixture of iron & sulphur
- Heatproof mat
- Tongs
- Eye protection

Safety. Wear eye protection. Sulfur powder can be irritating. **Test 4: Demo** (fume cupboard) Heat gently and use mineral wool to prevent gas escaping (This can be SO₂ toxic if heated))strongly)

Substance	Iron	Sulphur	Iron & Sulphur mixture
Appearance	Grey powdered solid		
Is it magnetic?			
Does it float or sink?			

Your teacher will **DEMONSTRATE** the next test in a FUME CUPBOARD.

Test 4 : Demo: Making a compound of iron and sulphur

1. Put two spatulas of iron and sulphur mixture into a test tube.
2. Put a piece of mineral wool in the end of the tube to help stop fumes escaping.
3. Heat the tube carefully in a Bunsen until it starts to change colour and react. Be careful not to heat it for too long.
4. Take the tube out of the flame.
5. When the reaction is finished, leave the tube on a heatproof mat to cool.
6. Write down what the product (iron sulfide) looks like.
7. Get a magnet and bring this to the tube (make sure it is not still hot). Can you separate the iron from the sulfur?
8. Record your results in the table:

Test	Result for iron sulphide
Appearance	
Can the iron be separated from the sulfur?	

Analysis of results:

1. The compound that you have made is different from the elements.
How can you tell? Write down two ways.

i _____

ii _____

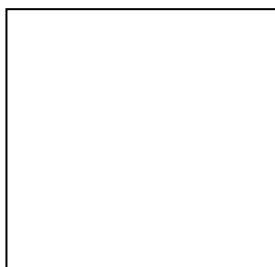
2. Complete this word equation for the reaction

iron + _____ → _____ sulphide

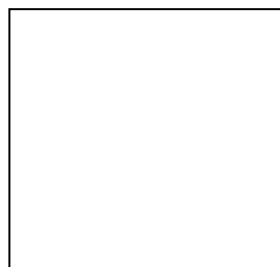
3. Draw particle diagrams to represent the **elements** iron and sulphur, a **mixture** of iron and sulphur and the **compound** iron sulphide



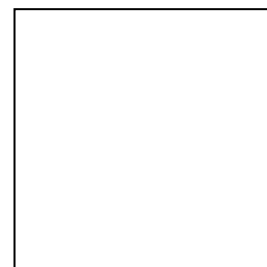
Iron



sulphur



iron & sulphur



iron sulphide

Extension: Sodium reacts with chlorine to give sodium chloride. Research about the elements sodium and chlorine and explain how they have different properties to the compound sodium chloride.

8C 3a Diffusion of Gases

Aim: To investigate if all gases diffuse at the same speed?

Safety for Demo: Fume cupboard and wear safety goggles. Conc HCl is corrosive (use gloves). Conc NH_3 is corrosive and very pungent. Pay special attention that the top is not left off the reagent bottles and entire experiment is conducted in the fume cupboard.

In this experiment you will investigate what happens when **two different gases diffuse through the air**.

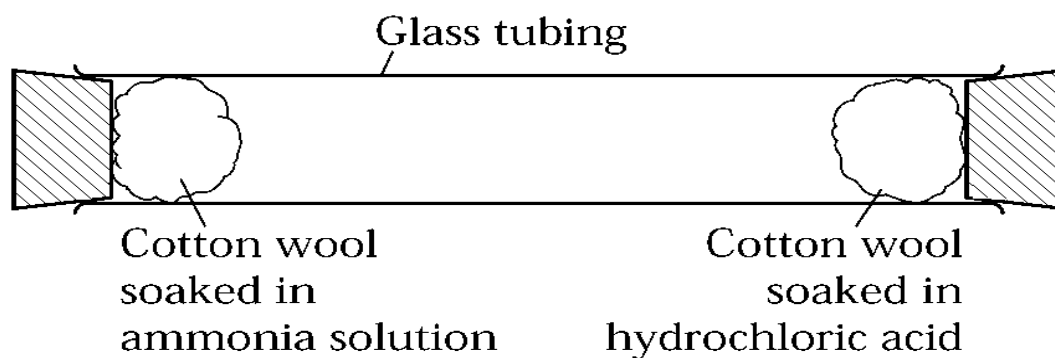
Hydrogen chloride and ammonia will react together to give a white solid.

When the two gases meet, this appears as **white smoke in the air**.

Particles of hydrogen chloride are about twice as heavy as particles of ammonia.

Prediction

- 1 How do you think the particles will move? Discuss your ideas with a partner and draw line on the diagram to show the movement of an ammonia particle
- 2 Where in the tube do you think the two gases will meet? Put a cross on the diagram to show your prediction.



Recording your results

- 3 When your teacher puts the cotton wool in the tube look carefully to see when the white smoke ring appears. Mark this clearly on the diagram.

Considering your results/conclusions

- 4 Which gas moved faster?
- 5 Did this agree with your prediction?
- 6 Explain why the gases meet where they did.

Extension: Given that $\text{KE} = \frac{1}{2}mv^2$ explain why gases with a smaller mass tend to diffuse faster at the same temperature. Use the internet to research and explain this.

8C 3b Diffusion – how observant are you?

Watch the following youtube clip that demonstrates diffusions:
(Your teacher will show the video to the entire class or provide you with login details)

HYPERLINK “[https:// www.youtube.com/watch?v=b8f6dDnm](https://www.youtube.com/watch?v=b8f6dDnm)”

<https://science.cleapss.org.uk/Resource-Info/Demonstrating-diffusion-with-ammonia-and-hydrogen-chloride.aspx>

1. Why is a fume cupboard used for this experiment?
2. What is a “vial”?.....
3. A concentrated solution of hydrochloric acid contains **lots of / few** particles of hydrochloric acid
4. Identify whether Ammonia (NH_3) is a **mixture** an **element** or a **compound**. Explain your answer.....
.....
5. What is the chemical formula for hydrochloric acid?.....
6. Why should the demonstrator wear gloves?
7. How *long*cm and *wide*.....cm is the gas tube?
8. State the colour of HCl gas.....
9. State the colour of NH_3 gas.....
10. Name the white ring of smoke produced.....

Extension

11. How far did the HCl travel?.....cm
12. How far did the NH_3 travel?.....cm
13. Write a word equation for this reaction:

..... + $\longrightarrow$
14. Write a chemical symbol equation for this reaction:

..... + $\longrightarrow$
15. Predict which of these two gases would diffuse faster. Explain your answer. Use your periodic table to help you.

He - Helium gas

CO_2 - Carbon Dioxide gas

.....
.....

8C 4a Burning Magnesium (Law of Conservation of Mass)

When **magnesium** burns in **air**, there is a **very bright flame** and **white smoke**. Ash is formed. Usually the smoke rises up into the air. In this experiment you will try to catch all the smoke and ash, to find out how much is produced.

Predicting

When the magnesium is heated, there are three possible things that could happen to the mass:

- the white ash could have a *higher* mass than the magnesium
- the white ash could have a *lower* mass than the magnesium
- the mass of the magnesium and the ash could be *the same*.

Highlight your prediction and explain your choice.

What to do:

- 1 Find the mass of the crucible with the lid. Record this in the table overleaf.
- 2 Take the strip of magnesium. Make sure it is shiny and silver. If it needs cleaning, use a piece of emery paper to clean off any coating.
- 3 Coil up the magnesium so that it fits inside the crucible. Try not to coil it too tightly, so that the air will be able to get to all parts of the metal.
- 4 Put the coil of magnesium inside the crucible, and put the lid on. Find the mass of the crucible and magnesium together. Write it down in the table.
- 5 Put the crucible into the pipe-clay triangle, and support this on the tripod, as shown in the diagram. Leave the lid off at the start.
- 6 Heat the crucible with a strong blue Bunsen flame.
- 7 When the magnesium starts to burn, use the tongs to put the lid onto the crucible. This will stop the smoke escaping.
- 8 About every 30 seconds, using the tongs, carefully lift up the lid (only a little bit) to let some air in. Try not to let any smoke out.
- 9 Keep heating the crucible for about 3 to 5 mins or until all the magnesium has reacted.
- 10 When the reaction is finished, turn the Bunsen burner off.
- 11 Find the mass of the crucible with the ash in it. Don't forget to put the lid on! Write down the mass.

Materials required

- Crucible & lid
- Tripod
- Sandpaper
- Strip of magnesium
- Pipe-clay triangle
- Bunsen burner
- tongs



Safety.

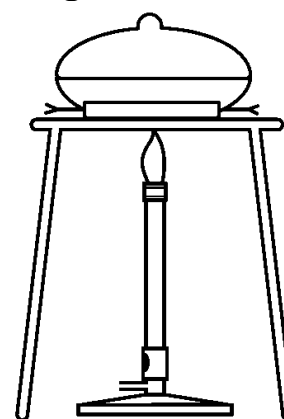
Wear eye protection. Magnesium is flammable.

The crucible will be very hot after heating. Leave it for at least 5 minutes to cool down before weighing.

Demo to the students how to lift the lid with the tongs.

Turn off the Bunsen if the crucible moves or slides over.

Diagram

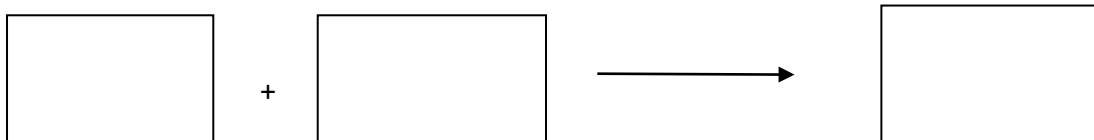


Recording Results

Mass of crucible + lid	
Mass of crucible + lid + magnesium	
Mass of crucible + lid + ash	

Considering your results/conclusion

- 1
 - a What has happened to the mass of the magnesium? Has it gone up or down?
 - b Is your result the same as other groups? How can scientists make their results more reliable?
 - c What was the overall (average) result by checking lots of groups?
 - d Was your prediction correct?
- 2
 - a What has the magnesium reacted with?
 - b What chemical has been formed?
- 3 Write a word equation for the reaction.
- 4 How does this equation help to explain the results from the experiment? Can you draw a diagram of the Mg and O₂ to help explain?



Extension: Evaluation

Suggest why different groups might have got different results. What mistakes might have been made?

Can you suggest improvements to the way the experiment was done to make the results more accurate?

8C 4b Elements and Compounds Questions

1. Look at the five word equations below. The reactants are already written. Write the name of the correct product in each box. Use the list to help you.

iron sulphide

sodium chloride

magnesium oxide

iron oxide

copper chloride

sodium + chlorine	→	
magnesium + oxygen	→	
iron + oxygen ⇒	→	
iron + sulphur	→	
copper + chlorine	→	

2. Fill in the missing words to complete these word equations.

a _____ + oxygen → carbon dioxide

b lead + oxygen → _____ oxide

c copper + oxygen → copper _____

d tin + _____ → tin chloride

e sodium + chlorine → _____

3. Each of the chemicals in the table has a common name as well as a proper chemical name. Fill in the blanks in this table.

Common name Common salt	Chemical name	Elements in the cupboard
water		hydrogen, oxygen
ammonia "rotten egg" gas	nitrogen hydride hydrogen sulphide	



MYP 2: Year 8 Science

Criterion B Assessment – Inquiring and Designing Criterion C Assessment – Processing and Evaluating

UNIT:	Mapping Matter	
ASSESSMENT TITLE:	Investigating the relationship between mass of copper metal reacted and mass of copper oxide produced in a combustion reaction.	
Statement of Inquiry:	By changing matter , we can identify patterns in properties to enable us to make models and use these to invent new kinds of materials and explain the existence of matter.	
Key Concept:	Change	
Related Concepts:	Models and Patterns	
ATL Focus:	Communication skills Collaboration skills Organizational skills	
Key Scientific Vocabulary:		
	Data	Measurement of a parameter that can be quantitative (volume, temperature, pH and so on) or qualitative (colour, shape, texture and so on).
	Dependent variable	The variable in which values are measured in the experiment.
	Prediction	Give an expected result of an upcoming action or event.
	Hypothesis	A tentative explanation for an observation or phenomenon that requires experimental confirmation; can take the form of a question or a statement.
	Independent variable	The variable that is selected and manipulated by the investigator in an experiment.
	Qualitative data	Refers to non-numerical data or information that is difficult to measure in a numerical way.
	Quantitative data	Refers to numerical measurements of the variables associated with the investigation.
	Validity of the method	Refers to whether the method allows for the collection of sufficient valid data to answer the question. This includes factors such as whether the measuring instrument measures what it is supposed to measure, the conditions of the experiment and the manipulation of variables (fair testing).

Command Terms:		
	Design	Produce a plan, simulation or model.
	Evaluate	Make an appraisal by weighing up the strengths and limitations.
	Interpret	Use knowledge and understanding to recognize trends and draw conclusions from given information
	Analyze	Break down in order to bring out the essential elements or structure. To identify parts and relationships, and to interpret information to reach conclusions.

Assignment Instructions (GRASPS)

Goal	You are required to determine the <i>relationship between the mass of copper metal and the mass of copper oxide</i> which is produced as a result of a combustion reaction. In addition you are tasked with determining the amount of oxygen gas that reacts with each mass of copper metal used in the combustion reactions.
Role	You are a senior science researcher who has been asked to investigate how mass changes as elements react to produce compounds.
Audience	You will complete a scientific report on the findings of your investigation and submit it to the Head Scientist (your teacher!) for inspection.
Situation	You will work collaboratively in groups of twos or threes. You are required to design an organized practical investigation that will assist you in addressing the goal above. You may refer to the practical work that has been completed already in the Mapping Matter unit. You must then perform the practical you have designed so that you can collect results that will help you determine the relationship between the mass of copper metal combusted and the mass of copper oxide produced. You will be given the following chemicals and equipment to conduct your investigation: Copper powder, pipe triangle, tripod stand, crucible and lid, Bunsen burner and heat proof mat, tongs, spatula, electric balance.

Product	A scientific report should be completed to include a design, analysis and evaluation section. This report will be an electronic document that will be submitted via Google classroom for marking and will communicate the science of your investigation. You teacher will advise you of the due date for the report.
Success Criteria for Assessment	The final scientific report MUST include (see MYP Practical Report Checklist for Students in your booklet): - Title - Research Question - Background information - Hypothesis - Variables - Apparatus - Method - Safety considerations - Results table - Observations - Calculations - Graph - Conclusion - Strengths and Weaknesses - Improvements

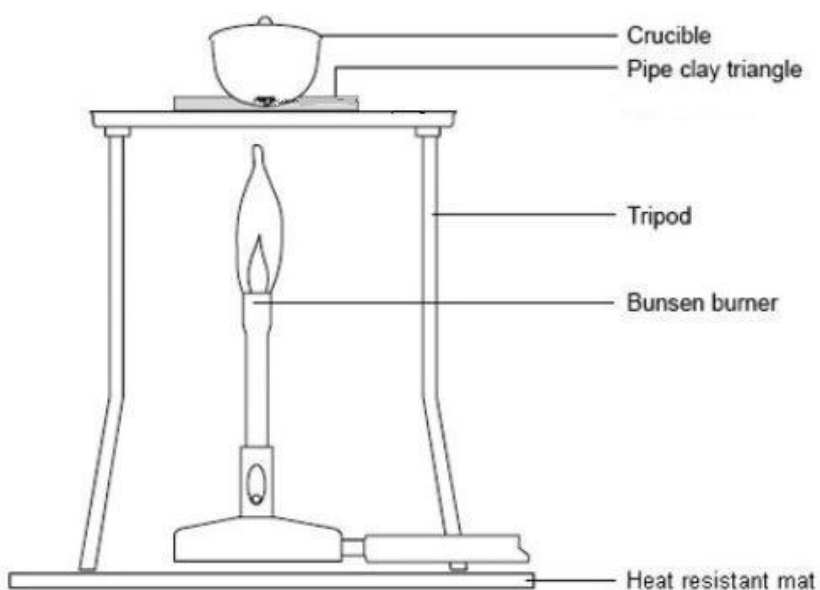
Additional Information

You will submit your final product as a **Google doc practical report** by the due date which your science teacher sets for you.

The top three scientific reports will be chosen for an **MYP exhibition in June** to showcase the good science investigated in the Mapping Matter unit.

The following **equipment will be provided to you for a basic set up** for the practical you design, which you may enhance scientifically:

- Copper powder
- Crucibles
- Pipe triangles
- Heat proof mat and tripods
- Electronic balance
- Tongs
- Spatula
- Bunsen burner



Level Descriptors and Task Specific Clarifications for Criterion B:

Level	Level Descriptor	Task Specific Clarification
0	The student does not reach a standard described by any of the descriptors below.	- None of the task specific clarifications listed have been addressed in the scientific report, or no report has been submitted.
1-2	The student is able to: i. select a problem or question to be tested by a scientific investigation ii. select a testable prediction iii. state a variable iv. design a method with limited success.	- A research question is stated that indicates the problem being investigated but the question is not focused. - One variable is stated correctly - A method is written but it does not allow for necessary data to be collected, such as mass values. - No safety consideration is given, or what is written is inaccurate in parts.
3-4	The student is able to: i. state a problem or question to be tested by a scientific investigation ii. outline a testable prediction iii. outline how to manipulate the variables, and state how data will be collected iv. design a safe method in which he or she selects materials and equipment.	- A research question is simply stated with a basic prediction, e.g. what will happen the mass of copper on heating. - In your method you have simply stated how you will collect most data. However, your apparatus does not completely match your method. - Variables are stated, but not discussed.
5-6	The student is able to: i. outline a problem or question to be tested by a scientific investigation ii. outline and explain a testable hypothesis using scientific reasoning iii. outline how to manipulate the variables, and outline how sufficient relevant data will be collected iv. design a complete and safe method in which he or she selects appropriate materials and equipment.	- Your research question identifies the independent and dependent variable, and outlines the method you will use - You have outlined a possible hypothesis for this investigation with regard to mass changes to copper powder when heated - You have stated how you will measure your control, independent and dependent variables - You have selected a step by step method which indicates what results you will record.
7-8	The student is able to: i. describe a problem or question to be tested by a scientific investigation ii. outline and explain a testable hypothesis using correct scientific reasoning	- Your research question clearly identifies the independent and dependent variable, references mass relationship of reactants and products. - Your background research references the Law of Conservation of mass, and how it is utilized

	iii. describe how to manipulate the variables, and describe how sufficient, relevant data will be collected iv. Design a logical, complete and safe method in which he or she selects appropriate materials and equipment.	in this investigation. You should refer to the elements and compounds involved in the reaction - A hypothesis should be written and your prediction explained. - All variables are described in detail – named, how they will be measured / controlled, and why control variables must be monitored. - Method gives a detailed stepwise account of how practical is conducted, with a fully labeled diagram and precautions related to any safety issues discussed.
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Level Descriptors and Task Specific Clarifications for Criterion C:

Level	Level Descriptor	Task Specific Clarification
0	The student does not reach a standard described by any of the descriptors below.	- None of the task specific clarifications listed have been addressed in the scientific report, or no report has been submitted.
1-2	The student is able to: i. collect and present data in numerical and/or visual forms ii. Accurately interpret data iii. state the validity of a hypothesis with limited reference to a scientific investigation. iv. state the validity of the method with limited reference to a scientific investigation. v. state limited improvements or extensions to the method.	- Some observations and data have been recorded but can only lead to a partial conclusion that does not address the research question. - No graph of data is drawn. - Little or no reference made to the research question and hypothesis. - Statements are made regarding validity and reliability but contain errors with regard to accuracy.

3-4	The student is able to: i. correctly collect and present data in numerical and/or visual forms ii. accurately interpret data and describe results iii. state the validity of a hypothesis based on the outcome of a scientific investigation iv. state the validity of the method based on the outcome of a scientific investigation v. state improvements or extensions to the method that would benefit the scientific investigation.	- Although the recorded results are presented accurately, some errors are present. However the data will allow for a conclusion to be drawn. - Graph is drawn but with errors and no interpretation of the trend stated. - Conclusion stated, but no discussion of science behind conclusion statements. - One - two weaknesses and improvements are stated but with limited discussion.
5-6	The student is able to: i. correctly collect, organize and present data in numerical and/or visual forms ii. accurately interpret data and describe results using scientific reasoning iii. outline the validity of a hypothesis based on the outcome of a scientific investigation iv. outline the validity of the method based on the outcome of a scientific investigation v. outline improvements or extensions to the method that would benefit the scientific investigation.	- Raw data is recorded accurately in a mainly organized data table, with errors limited to just one. - Averages are calculated accurately, and a graph is drawn with accurate but limited interpretation of the trend observed. - An outline on the validity and reliability of results is given - at least two reasons are provided.
7-8	The student is able to: i. correctly collect, organize, transform and present data in numerical and/ or visual forms ii. accurately interpret data and describe results using correct scientific reasoning iii. discuss the validity of a hypothesis based on the outcome of a scientific investigation iv. discuss the validity of the method based on the outcome of a scientific investigation v. describe improvements or extensions to the method that would benefit the scientific investigation.	- All raw and processed data is presented in a logical results table, with observations recorded in detail. - A fully accurate graph of data is drawn and detailed comments on observed trends are outlined. - Conclusion discusses the science of the investigation and links that to trends observed and the original hypothesis stated related to the Law of Conservation of Mass. - Detailed discussion on the reliability of results and validity of the experimental method – these should be realistic scientific discussions only. - Scientific improvements and extensions are described.

MYP Practical Report Checklist - Student

Before you submit your practical report to your teacher you must use the checklist below to ensure all parts of your report have been completed.

	Section	What you need to do	Completed Y/N
DESIGN (MYP Criterion B: Inquiring and Designing)	Title	Give a name to the experiment you are conducting	
	Research Question	The research question should be clear, concise , and include the independent variable and the dependent variable.	
	Background Information	You should give the science theory behind your investigation, and it should include scientific terminology. This should be presented as a short scientific paragraph .	
	Hypothesis	What do you predict will happen in your experiment and why ?	
	Variables	Independent Variable - what will you change and how will you change it? Dependent Variable - what will you measure and how will you measure it? Control Variables - what are they? How and why are they controlled?	
	Apparatus	Have you completed a diagram of assembled equipment that shows how to successfully collect data? Have you used a ruler and pencil to do this? Have you labeled all the chemicals and equipment in your diagram?	
	Method	Have you written your method in the following format: - Stepwise - Logical order of steps in investigation - Used correct names for chemical and equipment - Provided detailed account of the steps in the method - Describe how you will change the independent variable - Describe how control variables are monitored	

	Safety	Discuss any safety issues with chemicals or equipment being used, and describe what precautions should be taken to ensure you conduct the investigation safely.	
RESULTS and CONCLUSION (MYP Criterion C: Processing and Evaluating)	Results Table	A table of results must include: - Headings - Units - Repeats - Averages	
	Observations	Record detailed observations: - At start of experiment - During experiment - At end of experiment Observations can include colour change, bubbles, heat etc.	
	Calculations	Calculate averages of repeats. Show formula for calculation Show working out for calculations Give final answer to calculation with correct units .	
	Graph	Draw a graph to include the following; - Heading, labels with units on each axis - Suitable scales that occupy minimum $\frac{3}{4}$ of each axis - Plot all points accurately - Draw a curve or straight line of best fit that ignores points that do not fit the pattern. - Discuss trends or patterns observed in graph.	
	Conclusion	Summarize what your results show. Does this support your prediction/hypothesis ? Explain your results using scientific knowledge ?	
	Evaluation	Discuss the reliability of your results . Discuss the validity of the method you used.	
	Improvements	Suggest improvements to the scientific method and describe how they can reduce or eliminate errors	



MYP Science Practical Report Template

Name:	Form:
-------	-------

UNIT:	Mapping Matter
Statement of Inquiry:	By changing matter , we can identify patterns in properties to enable us to make models and use these to invent new kinds of materials and explain the existence of matter.
Key Concept:	Change
Related Concepts:	Models and Patterns
Investigation Title:	Investigating the relationship between mass of copper metal reacted and mass of copper oxide produced in a combustion reaction

Criterion B - Inquiring and Designing

Research Question

(What are you trying to find out? Include)

Background Scientific Information and Hypothesis

(Conduct additional research on the chemical reaction and write a scientific introduction)

(What do you think will happen to the mass and why? Give a scientific explanation)

Variables

Independent <i>(What will change and how will you change it? Give values (numbers))</i>	
Dependent <i>(What will you measure to gather results?)</i>	
Control <i>(What variables will you keep the same to make it a fair test, and why? How will you keep the variables constant?)</i>	

Apparatus Set-up

(Draw a labelled diagram of the assembled apparatus that you will use. Write the name of any equipment not shown in the diagram)

Method

(Write a step by step account of how you conduct your experiment – the method must be DETAILED). Add as many steps as you need to.

- 1.
- 2.
- 3.
- 4.
- 5.

Safety

(How will you make sure your experiment is safe?)

Reliability

(What will you do to ensure your results are reliable?)

Criterion C - Processing and Evaluating**Results**

(Organise your results in a table with clear headings. Calculate averages.)

Observations

Graphing Results

You should draw a graph of your results and attach it to this report.

Analysis of Graph

(What did your results show? Are there any trends or patterns in your results? Can you give an example of a pattern or trend from your results? Are there any anomalies in your results?)

Conclusion and Evaluation

Scientific Conclusion and Explanation of Results

(Summarize what your results show. How well does this support your hypothesis? Explain your results using scientific knowledge!)

Evaluation of Scientific Method and Results

(How reliable were your results? How well did your investigation answer the research question? What went well with your method?)

(Write about 3 problems or parts of your investigation that could have been done better?)

Issue with justification	Suggested SCIENTIFIC Improvement

Bibliography:

8C 8a Is there a Reaction?

Carry out the experiments described below.
In each case, you should:

- look carefully at what happens and write down your **observations**
- decide if a chemical reaction has taken place
- see if any changes are **reversed** when you stop heating or leave the tube to stand
- decide if a **chemical reaction** has taken place
- record your results in the table on **Worksheet 5b**.

Method – experiment 1

Place two spatulas of sugar (sucrose) in a test tube. Heat the tube gently. Leave the hot tube in a rack to cool down.

Method – experiment 2

Fill a test tube about one-quarter full with copper sulphate solution. Add ammonia solution drop by drop to the copper sulphate until the tube is about three-quarters full.

Method – experiment 3

Half fill a test tube with dilute hydrochloric acid. Measure the temperature of the acid. Add a spatula of magnesium carbonate. Leave the tube to stand. Measure the temperature when the reaction has finished.

Method – experiment 4

Put about 2 cm depth of sodium carbonate solution into a test tube. Add an equal volume of iron chloride solution.

Method – experiment 5

Put two spatulas of wax in a test tube and heat carefully with a Bunsen flame using a test tube holder. When a change has taken place, leave the test tube to cool on the heatproof mat.

Method – experiment 6

Put about 3 cm depth of water into a test tube. Measure the temperature of the water. Put a spatula of anhydrous copper sulphate into another tube. Make sure that this tube is dry. Pour the water into the second tube. Watch what happens and measure the temperature of the solution.

Method – experiment 7

Add 2 spatulas of potassium chloride to water. Put a stopper in the top and shake.

Materials required

- Bunsen
- Heatproof mat
- Test tube rack
- Thermometer
- Test tube holder
- Test tubes
- Chemicals
- Eye protection



Safety.

Make sure you are wearing **eye protection** for all these experiments. Be especially **careful** with the **hydrochloric acid and ammonia solution**. Heat gently.

Key words

Precipitate
Chemical reaction
Physical change
Reversible
Irreversible
Reactant
Product

8C 8b Is there a Reaction? Providing Evidence

Chemicals	What happened? Ensure you provide DETAIL in your description.	Is there a chemical reaction? (✓ or ✗)
copper sulphate and sodium hydroxide	A blue solid formed in the tube. It looked like jelly. The liquid lost its colour.	✓
heating sugar		
copper sulphate and ammonia		
hydrochloric acid and magnesium carbonate		
sodium carbonate and iron chloride		
heating wax		
water and anhydrous copper sulphate		
Water and potassium chloride		

Conclusion: Write 3 observations that tell you if a **chemical change** has taken place:

- 1.
- 2.
- 3.



Assignment Instructions (GRASPS)

Goal	Produce an ICT presentation information about 2 gases (one element and one compound). Highlight the scientific properties, sources and pollution problems associated.
Role	You are a parent concerned about the health impacts of air pollution.
Audience	The school community.
Situation	You are campaigning for ways to reduce air pollution to improve health.
Product	Collaborative ICT presentation (powerpoint/video/prezzie/animation)
Success Criteria for Assessment	You will collaborate in groups to produce a scientific presentation including specific facts about your chosen gases (application of knowledge). In addition data, diagrams and models relating to the polluting properties of these gases must be included (implications). This should be linked to impact on human health. (See FURTHER GUIDANCE BELOW)

Other Information:

- You MUST provide a Bibliography and cite all your sources.

Further Guidance:

Choose **TWO** of the following gases: Make sure one is an **Element** and one is a **Compound**.

Gases found in normal air:

- 1) Oxygen (Element)
- 2) Carbon dioxide (Compound)
- 3) Nitrogen (Element)
- 4) Argon (Element)
- 5) Noble gases
(helium, neon, argon, krypton, xenon)

Other gases:

- 6) Hydrogen (Element)
- 7) Methane (or natural gas)
- 8) Ammonia (Compound)
- 9) Chlorine (Element)
- 10) Sulphur dioxide (Compound)
- 11) Ozone (Element)
- 12) Carbon monoxide (Compound)
- 13) Nitrogen oxide (Compound)

You need to work in a small **team** of 3, 4 or 5. The maximum time for your presentation is **5 minutes**.

Prepare an **ICT presentation** on your 2 chosen gases and try to compare their properties.

Make sure your team is well **organised** everyone in your team knows what they should be doing and when it needs to be done.

Discuss and make sure you **listen** to other points of view.

Research the gas chosen. Consider some of the following as you conduct your research:

- ***What is the gas used for and why does it have these uses?***
- ***Where is the gas found or how is it made?***
- ***How is the gas extracted? (may be more difficult to find out!)***
- ***Does this gas cause any pollution problems in the atmosphere?***
- ***Does this gas affect human health?***
- ***Any other interesting facts!***

Make sure you **organise** your presentation into relevant sections.

eg Factual information, diagrams, air pollution data (measurements), health implications.

- ❖ Use pictures /diagrams /short videos/links to help explain.
- ❖ Try to use APA (version 7) in your presentation notes when presenting facts.
- ❖ Include a bibliography.
- ❖ If a member of your group needs help, make sure that you try and give them some **support** and encouragement.
- ❖ You will be required to **reflect on the inquiry process** on completion of your presentations.

8C 9c - Gas Group Research Notes

Student Names	
---------------	--

Names of our two gases		
Element or Compound?		

Gas 1:.....

Chemical symbol/formula	
Use of this gas	
Reason for this gas' use	
How is this gas obtained/extracted/produced by humans?	
What are the atmospheric pollution problems produced by this gas, if there are any?	
What are the effects of this gas on human health?	
Other information	

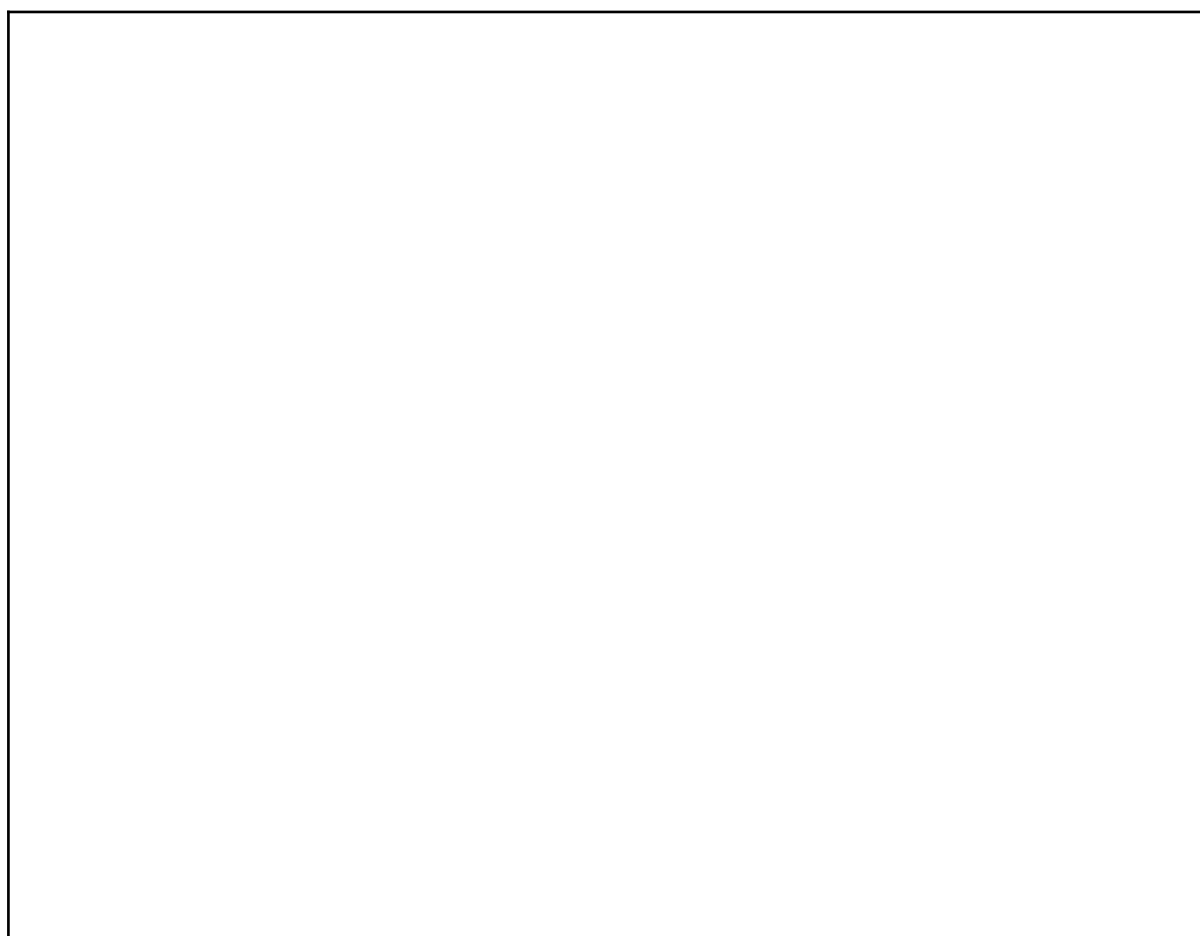
Insert useful pictures/diagrams/health data below:

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Gas 2:.....

Chemical symbol/formula	
Use of this gas	
Reason for this gas' use	
How is this gas obtained/extracted/produced by humans?	
What are the atmospheric pollution problems produced by this gas, if there are any?	
What are the effects of this gas on human health?	
Other information	

Insert useful pictures/diagrams/health data below:





MYP 2: Year 8 Science
Criterion D Assessment - Reflecting the Impacts of Science
Student Feedback Sheet

Student Name	
Date	
Assignment Title	Elements and Compounds Collaborative Research Project
Level Awarded	

Level Descriptors and Task Specific Clarifications for Criterion D:

Level	Level Descriptor	Task Specific Clarification
0	The student does not reach a standard described by any of the descriptors below.	You have not completed these tasks.
1-2	The student is able to, with limited success : i. State the ways in which science is used to address a specific problem or issue ii. State the implications of using science to solve a specific problem or issue, interacting with a factor iii. Apply scientific language to communicate understanding iv. document sources.	The student is able to with limited success: i. state an example of an element that is a gas AND a compound that is a gas. ii. state the properties of these gases iii. apply limited scientific language to describe elements and compounds iv. document 1 source/clearly used a source
3-4	The student is able to: i. Outline the ways in which science is used to address a specific problem or issue ii. Outline the implications of using science to solve a specific problem or issue, interacting with a factor iii. Sometimes apply scientific language to communicate understanding iv. Sometimes document sources correctly.	The student is able to: i. state the differences between your chosen gases ii. state the source, properties, uses and pollution/health problems associated with these gases iii. sometimes apply scientific data/language/diagrams models to communicate your ideas iv. sometimes document sources correctly.
5-6	The student is able to: i. Summarize the ways in which science is used to address a specific problem or issue. ii. Describe the implications of using science to solve a specific problem or issue, interacting with a factor. iii. Usually apply scientific language to communicate understanding clearly and precisely . iv. Usually document sources correctly.	The student is able to: i. outline the differences between your chosen gases and explain how these relate to their properties ii. outline the source, properties, uses and pollution/health problems associated with these gases. iii. usually apply scientific language data/diagrams/models to communicate understanding clearly and precisely iv document sources correctly.

7-8	The student is able to: i. Describe the ways in which science is applied and used to address a specific problem or issue ii. describe and summarize the implications of using science and its application to solve a specific problem or issue, interacting with a factor iii. consistently apply scientific language to communicate understanding clearly and precisely iv. document sources completely	The student is able to: i. summarize the differences between your chosen gases and explain how these relate to their properties ii. describe and summarize the source, properties, uses and health/ pollution problems plus any interesting data/ facts associated with these gases. iii. consistently apply scientific language to communicate understanding clearly and precisely iv. document at least 5 sources completely
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Suggestions for Improvement:**Student Reflection:**

8C 11a Investigating Solubility

Aim: Know some substances are soluble in water and some are insoluble. The meaning of the terms **mixture, dissolving, solution, solute, solvent, soluble, insoluble, clear, colourless, cloudy, transparent**

Method (part 1):

1. Fill 7 test tubes 1/3 full of water.
2. Place ½ spatula of solid in a test tube.
3. Put a bung in the test tube and carefully shake.
4. Describe what the mixture looks like. Try to use some of the descriptive words above.
5. Decide if the substance is **soluble** or **insoluble** and records result below

Materials required

- 7 test tubes
- Beaker of water
- Glass rod
- Samples of salt, sand, sugar, chalk, flour, copper sulphate, coffee
- Filter funnels and paper.
- Evaporating dishes
- 0.5M copper sulphate solution (1 litre).
- A sand and water mixture (1 litre).

Safety.

Wear safety glasses

Copper sulphate is toxic – do not touch.

Substance	Observation	Soluble or Insoluble
Salt		
Sugar		
Sand		
flour		
copper sulphate		
coffee		
chalk		

You are now going to separate 2 of these mixtures; one which is soluble and one which is insoluble.

Separation Technique A

1. Take 30 cm³ of the mixture of sand and water in a small beaker.
2. Set up a filter funnel and filter paper.
3. Pour the mixture through the funnel into a small conical flask. Complete the table with your observations.

Separation Technique B

4. Take 25cm³ of the copper sulphate solution and put this in an evaporating dish.
5. Heat this carefully using a medium Bunsen flame on a tripod and gauze.
6. If the solution starts to 'spit' remove the heating and let it cool slowly. Complete your observations in the table.

Mixture	Observations during separation
Sand and water	
Copper sulphate solution	

Conclusion:

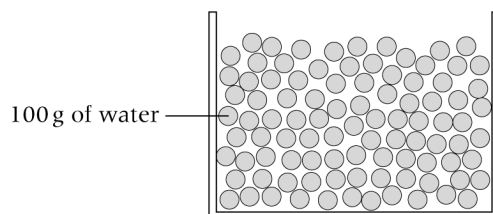
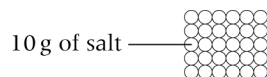
Part 1: In terms of particles, explain why you think some solids dissolve in water and other solids are insoluble.

Part 2: In terms of particles, try and explain why filtering helps to separate insoluble solids from water.

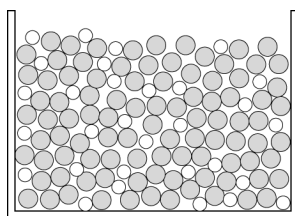
Why does evaporation help separate soluble particles from water?

8C 11b Particles and Dissolving

- 1 Fill in the gaps in these sentences using words from the box. Each word may be used once, more than once, or not at all.



The particles in _____ are held together in a _____ arrangement. The _____ in water can move around.



When the salt _____, the salt _____ are not held together any more. They _____ with the _____ particles to form a _____.

The mass of the solution will be _____ g.

If we had dissolved 20 g of salt in the water, the _____ of the solution would have been _____ g.

100	110	120	130	dissolves	fixed	mix
particles	salt	solute	solution	water	mass	

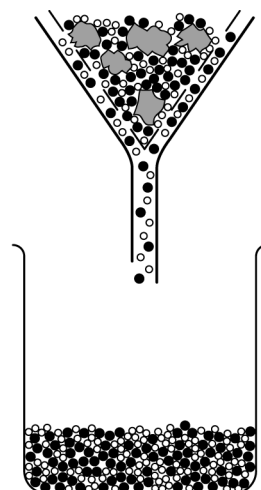
2

Key

○ = _____

● = _____

☼ = _____



This diagram shows a mixture of sand and salty water being filtered. Fill in the key and the gaps in these sentences using words from the box. You may need to use some words more than once.

You can use _____ paper to separate _____ from salty water.

The sand grains are too _____ to go through the tiny _____ in the filter paper. The filter will not _____ the particles of salt, because they are very _____. They will fit through the gaps in the filter _____.

big filter gaps paper salt sand small trap water

3



Explain how you could prove that the salt was still in the water.

Extension: Research and explain how you could separate the following mixtures

a) Iron from a mixture of metals.

b) Gasoline from a mixture of crude oils.

8C 12a Making Pure Salt from Rock salt

Aim: Know how to obtain pure salt from rock salt. Know that a dissolved solid can be obtained from a liquid by **evaporation** and that an insoluble solid can be separated by **filtration**.

When salt is mined it comes out of the ground as rock salt. Rock salt is a mixture of solid rock and salt. You can make pure salt from rock salt in the laboratory.

Method

1. Crush some rock salt using the **mortar and pestle**.
2. Put the crushed rock salt into a **beaker** and add about 25cm³ of water. Stir using a glass rod until the salt *dissolves*.
3. Carefully **filter** the mixture. The liquid that comes through the **filter paper** should be *clear*.
4. Put the liquid in an **evaporating basin** and heat it as shown by your teacher until about half the water evaporates.
5. You can tell the point of crystallization when either small amounts of solid appear around the edge of the liquid, or the salt starts to 'spit' and 'crackle'
6. Allow to cool and *crystallize*, the crystals that form in the **evaporating basin** should be pure salt.

Materials required

- Rock salt
- Mortar & pestle
- Beaker
- Glass rod
- Filter funnel
- Filter paper
- Conical flask
- Evaporating basin
- Tripod
- Gauze
- Heat proof mat
- Bunsen



Safety.

Always wear eye protection when heating and using chemicals

Analysis & Evaluation of your Results and Method:

1. Explain why you **crushed** the rock salt in step 1?
2. What happened to the salt in the rock salt when you added water?
3. When you **filtered** the mixture, what was left on the **filter paper**? Why did it not go through the paper?
4. Why didn't filtering remove the salt from the water?
5. Why did the water **evaporate** in step 5 but the salt didn't?

6. Draw neat diagrams for each of the 4 stages in the process. (*remember pencil, ruler and diagrams must be in 2D*)

1) Crushing

2) Dissolving

3) Filtering

4) Evaporating

7. What shape and colour were the salt crystals? Draw or take a photo of the shape of the crystals.

8. How could you have made sure that more of the salt dissolved?

Extension:

Find out how you could test the purity of the water or the salt produced.

8C 13a Distillation of an Ink Solution

Aim: Know that **distillation** can be used to separate a liquid from anything dissolved in it.
Know that distillation is **evaporation** followed by **condensation**.
Know how to explain distillation using the idea of particles.

Introduction

Distillation can be used to separate a *liquid from a mixture of a liquid and a dissolved solid*. For example, distillation can be used to get pure water from salt solution or inky solution.

To separate the mixture, you must first heat it so that the liquid **evaporates**. You need to collect the vapour or gas and cool it back down so that it **condenses** back to liquid.

Materials required

- Tripod
- Gauze
- Anti-bumping granules
- Conical flask
- Delivery tube
- Test tube
- Beaker
- Ice and water
- Inky solution
- Clamp stand.



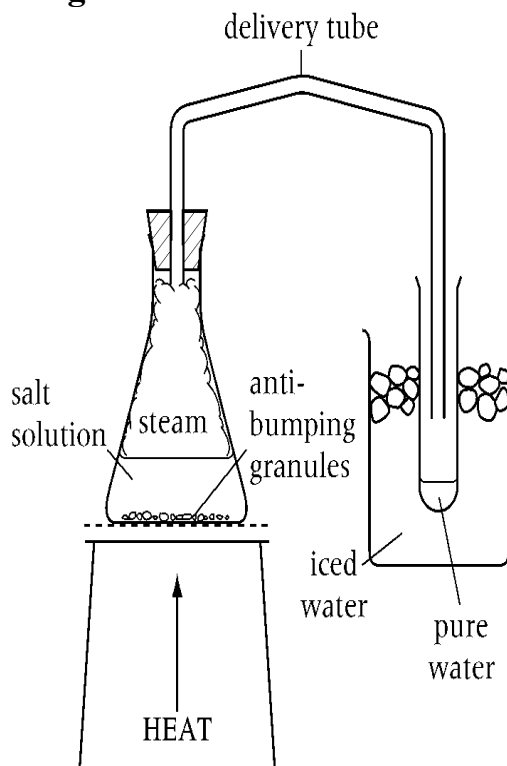
Safety.

Wear goggles. Clamp the conical flask so it doesn't fall over.

Method

1. Put some anti-bumping granules into the bottom of the flask. These help small bubbles of steam to form as the water boils.
2. Pour about 50 cm³ of the inky solution into the flask. Carefully put the delivery tube into the top of the flask. Make sure that you push the *bung* when you fit it into the flask. *Do not* push the delivery tube as it may break and cut you.
3. Put the flask on a tripod and gauze over a Bunsen burner, but do not light the Bunsen yet.
4. **Clamp the flask**, to prevent it from falling over.
5. Put the free end of the delivery tube into a test tube and then put the test tube into a beaker containing iced water.
6. Light the Bunsen burner and heat the flask gently using a medium flame.
7. Make sure that you turn off the Bunsen before the flask boils dry.

Diagram

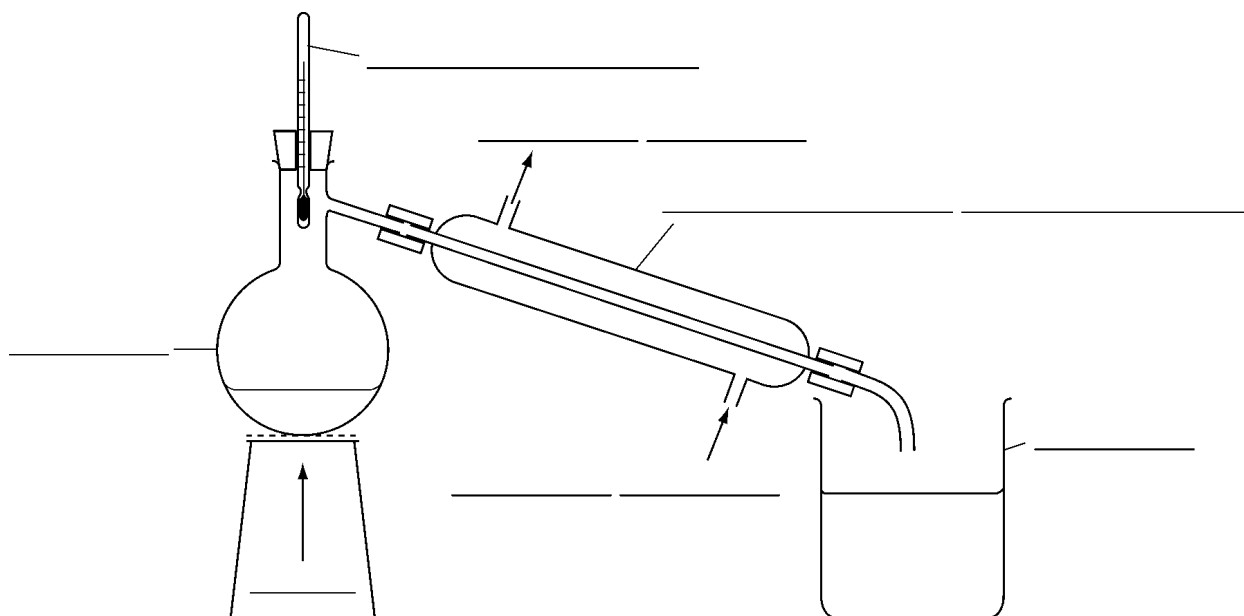


Analysis

- 1 Which part of the solution evaporates?
2. What happens in the delivery tube? Why?
3. How could you make this process better?
4. How could you test if the water you collected is pure
- 5 Which of the following things could be obtained by distillation?
 - a sugar from sugar solution b salt from salt solution
 - c water from salt solution d water from copper sulphate solution
 - e alcohol from wine f drinking water from sea water
 - g salt from rock salt h water from potassium nitrate solution

Simple Distillation:

1. Label the parts of the distillation apparatus shown below, using words from the box.



2. Add a label for the 'distillate'

beaker flask heat Liebig condenser thermometer water in water out

Extension: Describe clearly the journey of a water particle when it is distilled from a mixture of inky water. (Include the words **evaporates, condenses, heated, cooled, particles.**)

8C 14a Paper Chromatography

Aim: Describe what chromatography is and what it can be used for. Describe how to carry out chromatography of coloured substances. Explain how chromatography works.

Introduction

Chromatography is a way of analysing (separating) different coloured inks or dyes.

There are two ways to carry out **chromatography**. One method uses a piece of filter paper and the other uses a rectangular piece of chromatography paper. The second method is useful because it allows two different chemicals to be compared with each other at the same time.

Materials required

- Filter paper
- Chromatography paper
- 100ml beaker
- 400ml beaker
- 2 paper clip
- Scissors
- Felt pens or food dyes
- Access to hairdryer

Method 1

1 Put a dot of ink or dye in the middle of a piece of filter paper. (*Hint: It is better to put a couple of small dots of the same ink on top of each other, rather than to put one large dot, so take care!*)

2 Cut two straight lines from the edge of the paper, almost to the centre. Be careful not to let the two cuts join up!

You should now have a piece of paper like this

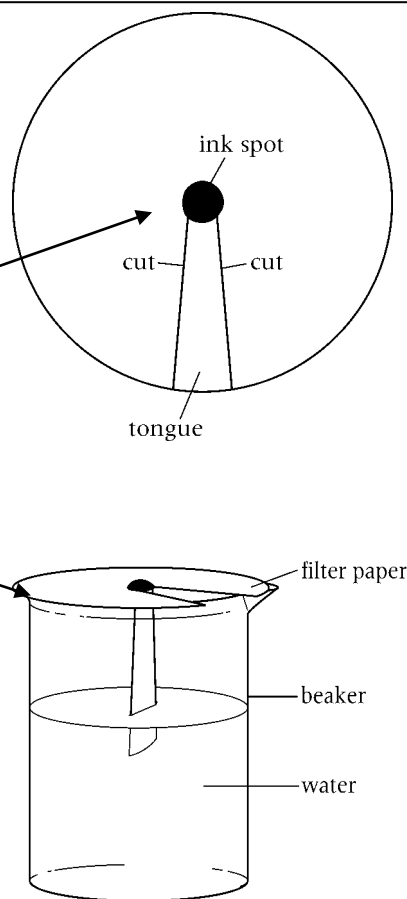
3 Half fill a small beaker with water.

4 Place the filter paper on top of the beaker so that the tongue sits in the water, like this

5 Leave the beaker in a safe place for about 5 minutes, checking it occasionally to see what is happening.

*The water will soak up the tongue and spread out across the filter paper, **dissolving** the dyes in the ink and carrying them with it. The more **soluble** the dye, the further it will travel.*

6 When the water is almost at the edge of the paper, lift the paper off the beaker and leave it to dry for a few minutes or dry it with a hair dryer.



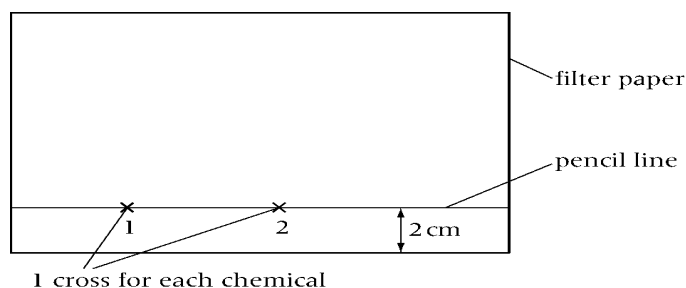
Results:

Colour of ink	Order of colours observed

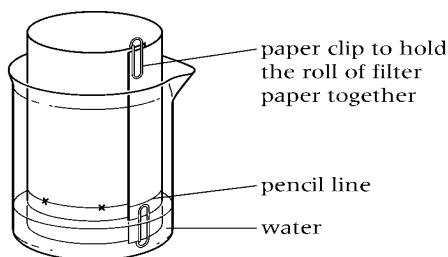
Stick in an example or take a photo of one of your chromatograms.

Method 2

- 1 **Using a pencil**, draw a straight line across the filter paper, 2 cm up from the bottom. Draw one **pencil** cross on the line for each ink you want to investigate, and number the crosses. Leave about 2cm between crosses.
Your paper should look like this:



- 2 Place a small dot of the first ink to be investigated on one of the crosses. When it is dry, place a second small dot of this ink on top of the first.
- 3 Now repeat step 2 for the other ink you wish to use.
- 4 Put about 1 cm depth of water in the bottom of the large beaker.
- 5 When the spots of ink on the filter paper have dried, roll the paper up, clip it with paper clips, and place it into the beaker, with your dots at the bottom. The dots of ink should **not** be in the water.



- 6 Leave the water to soak up the paper until the water has nearly reached the top. Remove the filter paper from the beaker and hang it up to dry. **Mark with a pencil how far the water moved.**
- 7 Put a dot with a pencil in the middle of each coloured spot you observe.
- 8 Measure the distance moved from the pencil line to each spot.

Results

Colour of ink	Water (mm)	Spot 1 (mm)	Spot 2 (mm)	Spot 3 (mm)

Analysis:

1. Which ink contained the most colours? Which contained the least? Are they pure colours or mixtures? How can you tell?
2. Which colour was MOST soluble? How do you know? Were any of the inks you tried insoluble? How do you know?
3. Why did you use a pencil to draw the line and the crosses? Why is it important to put this pencil line above the level of the water?
4. **Extension:** Retention factor = distance moved by colour / distance moved by water. Calculate the retention factor for each colour. Explain how this can be used to identify which colours are the same in different ink samples. Find out how you could change this practical for substances that don't dissolve in water.

8C 14b Using Chromatography in Forensic Science

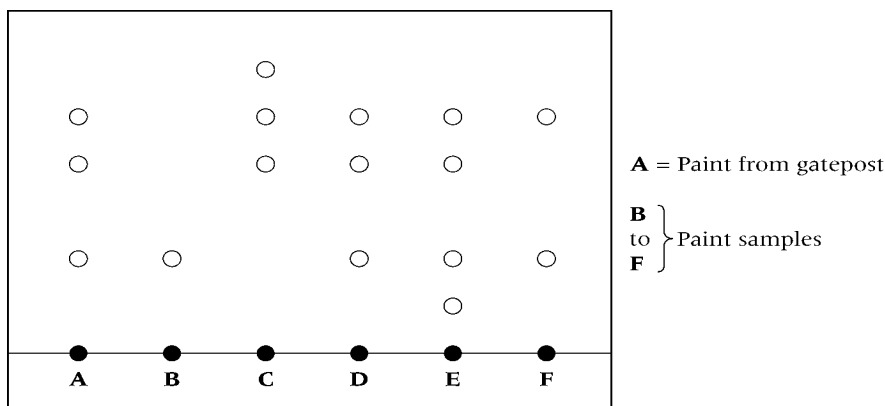
WHO SCRAPED THE GATEPOST?

Police were called to 10 Manor Road because there had been a burglary. There were some bits of red paint on the gatepost, and the police suspect that the robbers' car or van scraped against the gatepost when they were making their getaway.

A forensic science laboratory was asked to find out what make of car the burglars had used. Different car manufacturers use different mixtures of colours in their paint. The scientists used chromatography to find out the make of the getaway vehicle.



These are the results of the tests:



- 1 The scientists did not use water as a solvent when they carried out their tests. Why not?
- 2 Which manufacturer (or manufacturers) used one pure colour in their red paint?
- 3 Which manufacturer (or manufacturers) used a mixture of only two colours?
- 4 Which manufacturer (or manufacturers) used a mixture of three colours?
- 5 Which manufacturer uses the same paint as the paint from the gatepost?
- 6 Why is important that the level of the solvent starts below the level of the paint samples?

Extension: What is a 'Retention Factor' and how would using these make the analysis of these paints more accurate?

8C 15a Thermal Decomposition & Electrolysis

Aim : To decide if unknown solid X is an **element** or a **compound** by carrying out chemical reactions on it.

Information

An **element** is a substance which cannot be split into anything simpler by chemical reactions.

A **compound** is a substance which can be broken into simpler substances by chemical reactions.

Possible chemical reactions used to break substances into simpler parts are **thermal decomposition** and **electrolysis**.

Materials required

- 100cm³ beaker
- Dilute sulphuric acid
- Green powder X
- Power pack or battery pack
- Connecting wires
- Spatula
- 2 electrodes
- Test tube
- Bunsen burner



Safety.

Wear eye protection for all tests

Sulphuric acid is an irritant.

Take care when using electricity.

Do not let the electrodes touch.

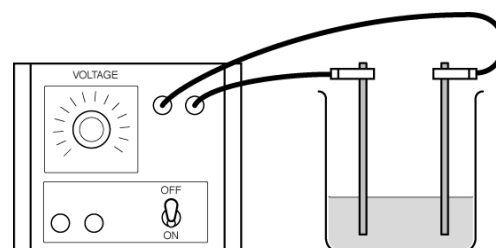
Connect just for 30 secs.

Test 1 : Thermal decomposition

1. Take a test tube and add 3 spatulas of the green powder X.
2. Place the test tube on a balance and write down the mass of the tube and the powder.
3. Heat the tube over a moderate Bunsen flame for two or three minutes. Write down your observations.
4. Allow the tube to cool and measure its mass again.
Has the mass gone up, down or stayed the same?

Test 2 : Reaction with Acids and Electrolysis

1. Take a 100cm³ beaker and fill it about 1/3 full of dilute sulphuric acid.
2. Add two or three spatulas of green powder X and describe what happens.
3. Now set up the circuit as shown in the diagram. Use the solution in the beaker that you have just made.
4. Adjust the power pack to 6V. Switch on for 30 seconds and observe what happens at the each of the carbon rods (electrodes).
5. Turn off the power pack.



Results**Test 1**

Mass of tube + green powder before heating	
Mass of tube + powder after heating	
Observations during heating	
Mass increase or decrease?	

Test 2

Observation on adding acid	
Observations at electrodes when conducting	Positive (red): Negative (black):

Analysis

- 1) Test 1: does the evidence show that the green powder X is likely to be an element, a **compound** or could it be either? Explain your decision.

- 2) Test 1: Give a word equation to describe Test 1.

- 3) Test 1: Why was there a change in mass of green powder X during Test 1?

- 4) Test 1: **Thermal decomposition**: Does an element split up when you heat them? eg. Would a piece of copper split up?

- 5) Test 2: **Reaction with Acids**: (Do elements or compounds, or both react with acids? Can you think of an element that reacts with acid? eg. If you add a piece of magnesium to some acid does it react?

- 6) Test 2: **Electrolysis**: (Do elements or compounds split up when electricity is passed through them? Would a piece of copper split up? Is this an element or a compound?)

Conclusion: In your own words, describe what you think the difference between **elements** and **compounds** is.

Extension: What do you think conservation of mass means?

Extension: Test 2: Write a word equation for the Green powder reacting with the sulphuric acid.

Extension: Test 2: Why did the negative electrode become a copper colour? What in the solution was attracted to the negative electrode?

Extension: What metals are extracted from their ore by electrolysis?

8C 16a Elements and Compounds Review

Aim: Know some of the properties of elements and of compounds.

Fill in the gaps in the table below.

Name of compound and chemical formula	Description of the compound	Name of the elements in the compound	Description of the elements
water H_2O		hydrogen	Gas which burns with a pop.
			Gas which makes things burn brighter.
common salt (sodium chloride) NaCl			Soft grey metal that reacts easily with air and water.
			Poisonous green gas used in swimming pools to kill bacteria.
calcium carbonate CaCO_3			Grey metal that reacts with water.
			Black solid that is found inside pencils.
		oxygen	
	Gas that turns limewater milky and that we breathe out.		
Sulphur dioxide SO_2	A poisonous gas that can dissolve in water making an acid.		A yellow solid that is often found round volcanoes

8C 16b Word Equations Review

Aim: Know the meaning of the words reactant and product.
Know how to write word equations for chemical reactions

1 In each of these equations, say if the underlined chemical is a reactant or a product.

a copper sulphate + sodium hydroxide → copper hydroxide + sodium sulphate

b lead nitrate + magnesium iodide → lead iodide + magnesium nitrate

c copper + potassium → copper + potassium
sulphate carbonate carbonate sulphate

2 Complete the word equations for these reactions.

a iron chloride + sodium hydroxide →

b sodium carbonate + calcium chloride →

c lead nitrate + potassium bromide →

d silver nitrate + magnesium chloride →

3 What chemicals do the letters represent in these equations?

magnesium + copper sulphate → _____ **a** _____ sulphate + copper

magnesium + _____ **b** _____ chloride → _____ **c** _____ chloride + zinc

iron + silver nitrate → _____ **d** _____ + _____ **e** _____ nitrate

copper + _____ **f** _____ **g** _____ → _____ **h** _____ nitrate + silver

_____ **i** _____ + _____ **j** _____ nitrate → iron _____ **k** _____ + copper

8C 16c Reflection on Inquiry

Aim: Reflect on the Knowledge and Skills acquired in the Mapping Matter Unit through Inquiry

Questions asked	Answers found, and how we found them	Any further questions?
Factual - <i>What is an atom?</i> - <i>What is a pure substance?</i> - <i>What is an impure substance?</i>		
Conceptual - <i>How can patterns in properties be used to organize elements?</i> - <i>What kinds of chemical reactions can take place?</i> - <i>How can we represent chemical change?</i> - <i>How do we exploit properties of chemicals?</i>		
Debatable - <i>To what extent can science be used to fix the problems created by science?</i>		
Reflection on ALT (approaches to learning) used: - <i>Communication</i> - <i>Collaboration</i> - <i>Organisation</i> - <i>Research</i> - <i>Critical Thinking</i> - <i>Creative Thinking</i>		

8C 16d Chemical Compounds Names & Formulae (extension)

1. Read and highlight the key points in the following information:

The *name* of a chemical compound tells us about the elements that it is made from. The simplest compounds are made of only two elements. The names of these compounds have two parts. The first part is often a metal element, and the second part is usually a non-metal, with the ending '**-ide**'. An example is magnesium oxide.

Many compounds are made of three or more elements. Often, one of these elements is oxygen. The names of many of these compounds have an '**-ate**' ending, for example copper sulphate (CuSO₄).

The *formula* of the compound tells us:

- which elements are in the compound
- the *proportions* of each element present.

In copper sulphate there are four atoms of oxygen and one atom of sulphur for each one of copper.

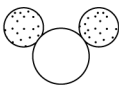
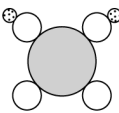
2. The table shows the names and chemical formulae of a number of compounds. Fill in the blank spaces.

Name of compound	Chemical formula	Number of elements in the compound	Names of elements in the compound
magnesium oxide	MgO	2	magnesium, oxygen
potassium oxide	K ₂ O		
	CuBr ₂		copper, bromine
sodium nitrate	NaNO ₃		
	FeS		
	FeSO ₄		
	CaCO ₃		

Information

Sometimes more than one compound is made from the same elements. For example, there are several different types of nitrogen oxide. When this happens, the number of a particular type of atom is shown by using '**mono-**' (one), '**di-**' (two) or '**tri-**' (three). For example, the compound with the formula NO is called nitrogen monoxide, and NO₂ is nitrogen dioxide.

- 2 The table below shows some information about chemical compounds and formulae. Complete the table.

Name of compound	Particle diagram	Chemical formula	Number of different elements in the compound	Number of atoms in a molecule
water		H ₂ O	2	3
carbon dioxide				
		CO		
sulphuric acid		H ₂ SO ₄		
		SO ₂		
		SO ₃		