Abraham Darby Academy

KS3 Chemistry | Elements/atoms

Knowledge series | Study Booklet | 2017

Key terms

- **Acid:** A substance with particular chemical properties including turning blue litmus paper red, neutralising alkalis, and dissolving some metals.
- **Alkali:** A substance with particular chemical properties including turning red litmus paper blue and neutralising or effervescing with acids.
- **Base:** A substance that will neutralise an acid, but does not dissolve in water.
- **pH value:** A measure of acidity or alkalinity of water soluble substances (pH stands for 'potential of Hydrogen').
- **Atom:** The smallest particle of a chemical element that can exist.
- **Element:** Each of more than one hundred substances that cannot be chemically interconverted or broken down into simpler substances and are primary constituents of matter.
- **Compound:** A thing that is composed of two or more separate elements.
- **Endothermic reaction:** A chemical reaction that is accompanied by the absorption of heat.
- **Exothermic reaction:** A chemical reaction that is accompanied by the release of heat.
- **Mixture:** A mixture is made from different substances that are not chemically joined.
- **Nucleus:** The positively charged central core of an atom, consisting of protons and neutrons and containing the vast majority of its mass.
- **Electron:** A stable subatomic particle with a charge of negative electricity, found in all atoms and acting as the primary carrier of electricity in solids.
- **Oxidation:** The gain of oxygen by a substance. For example, magnesium ($M_{g)}$ is oxidised when it reacts with oxygen (O_2) to form Magnesium Oxide (M_gO).

Tasks: Fill in the missing element letters for these sections of the Periodic Table.

				5 10.81 Boron	6 12.01 C Carbon	7 14.01 Nitrogen	8 15.999 O Oxygen	9 18.998 Fluorine	10 20.18 Neon
				13 26.98 Aluminum	14 28.09 Silicon	15 30.97 Phosphorus	16 32.06 S Sulfur	17 35.45 Chlorine	18 39.95 Argon
27 58.93 Cobalt	28 58.70 Ni Nickel	29 63.55 Copper	30 65.37 Zn Zinc	31 69.72 Gallium	32 72.59 Germanium	33 74.92 Arsenic	34 78.96 Se Selenium	35 79.90 Bromine	36 83.80 Krypton
45 102.91 Rhodium	46 106.40 Pd Palladium	47 107.87 Silver	48 112.41 Cd Cadmium	49 114.82 Indium	50 118.69 Tin	51 121.75 Antimony	52 127.60 Tellurium	53 126.90 I Iodine	54 131.30 Xenon
77 192.22 Ir Iridium	78 195.09 Platinum	79 196.97 Au Gold	80 200.59 Mercury	81 204.37 Thallium	82 207.19 Pb Lead	83 208.98 Bismuth	84 (209) Po Polonium	85 (210) Astatine	86 (222) Radon
109 (266) Meitnerium	110 (271)	111 (272)	112 (277)	(113)	114 (285)	(115)	116 (289)	(117)	118 (293)

Task: Use the words in bold at the bottom of the page to fill in the gaps in the sentences below.

Elements join togehter by _____ reactions to form _____.

Compounds have different _____ to the elements that formed them.

In a chemical reaction new _____are formed and energy is taken in (_____) or given out (_____). It is also difficult to _____a chemical reaction.

substances, properties, reverse, compounds, chemical, endothermic, and **exothermic.**

Task: Revise your knowledge of the Periodic Table key terms, by answering the nine questions below. Underline the correct answer for each question.

1. Which of the following is the symbol for copper?

C Ca Co Cu

2. Which of the following is the symbol for sodium?

Na S Sd So

3. In the periodic table, what is a period?

A horizontal row A vertical column The left hand side The middle block

4. Which of the following is the name for group 8 in the periodic table?

Alkali metals Alkaline earth metals Halogens Noble gases

5. Which of the following is the name for group 7 in the periodic table?

Alkali metals Alkaline earth metals Halogens Noble gases

6. Which of the following is the name for group 1 in the periodic table?

Alkali metals Alkaline earth metals Halogens Noble gases

7. Which of the following is the name for group 2 in the periodic table?

Alkali metals Alkaline earth metals Halogens Noble gases

8. Which of the following elements is a metal?

Magnesium Nitrogen Helium Phosphorus

9. What is listed in the Periodic Table?

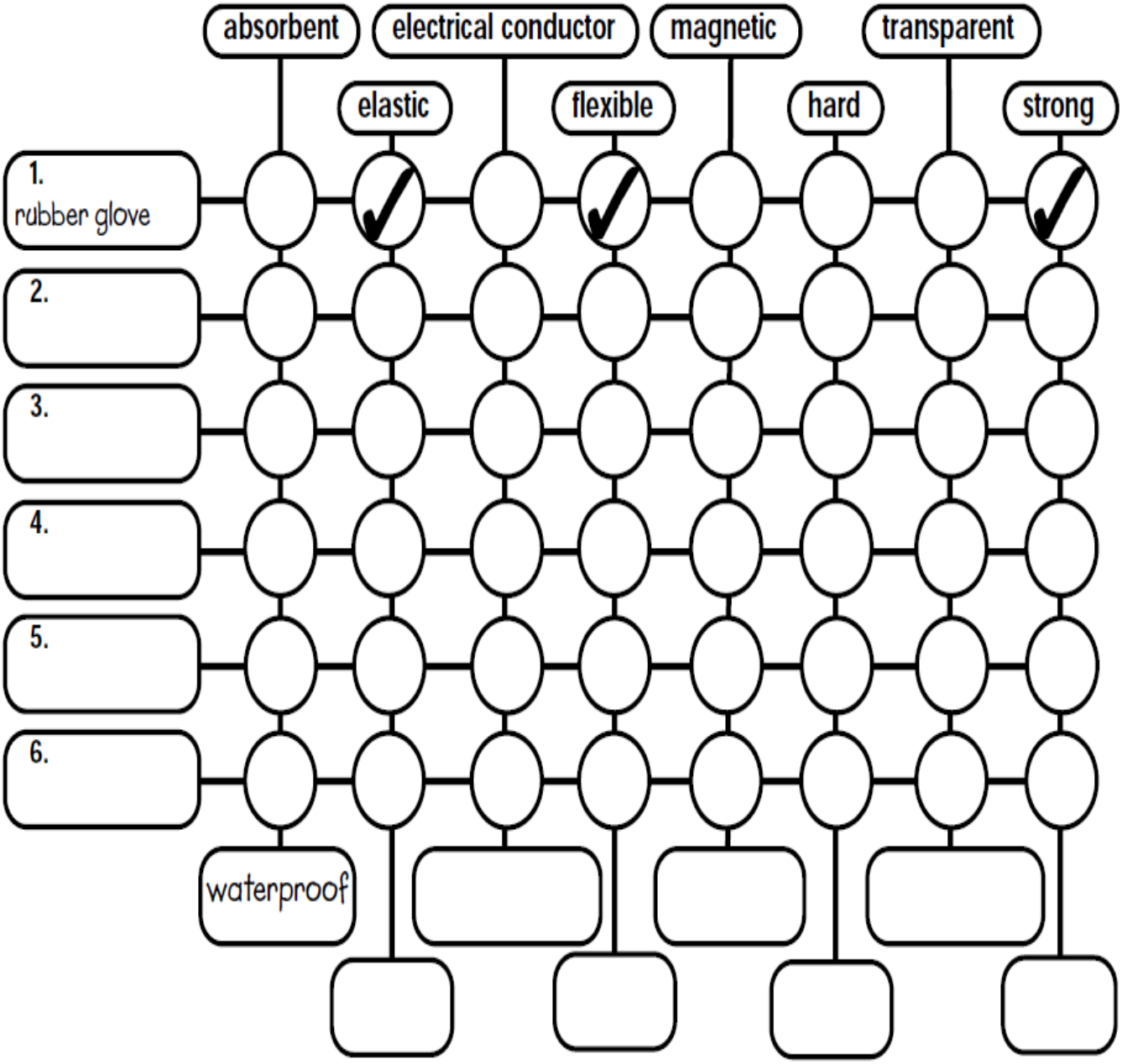
Compounds Elements Gases Metals

Task: Sort the following list into elements and non-elements:

Soap, wax, water, sulphuric acid, vinegar, sulphur, magnesium, salt, carbon dioxide, carbon monoxide, calcium, calcium carbonate, chalk, soil, iron, steel, carbon, aluminium, fluoride, potassium, rubber, manganese, phosphorus, tin, concrete, gold, chloride, blood, brass.

elements	non-elements

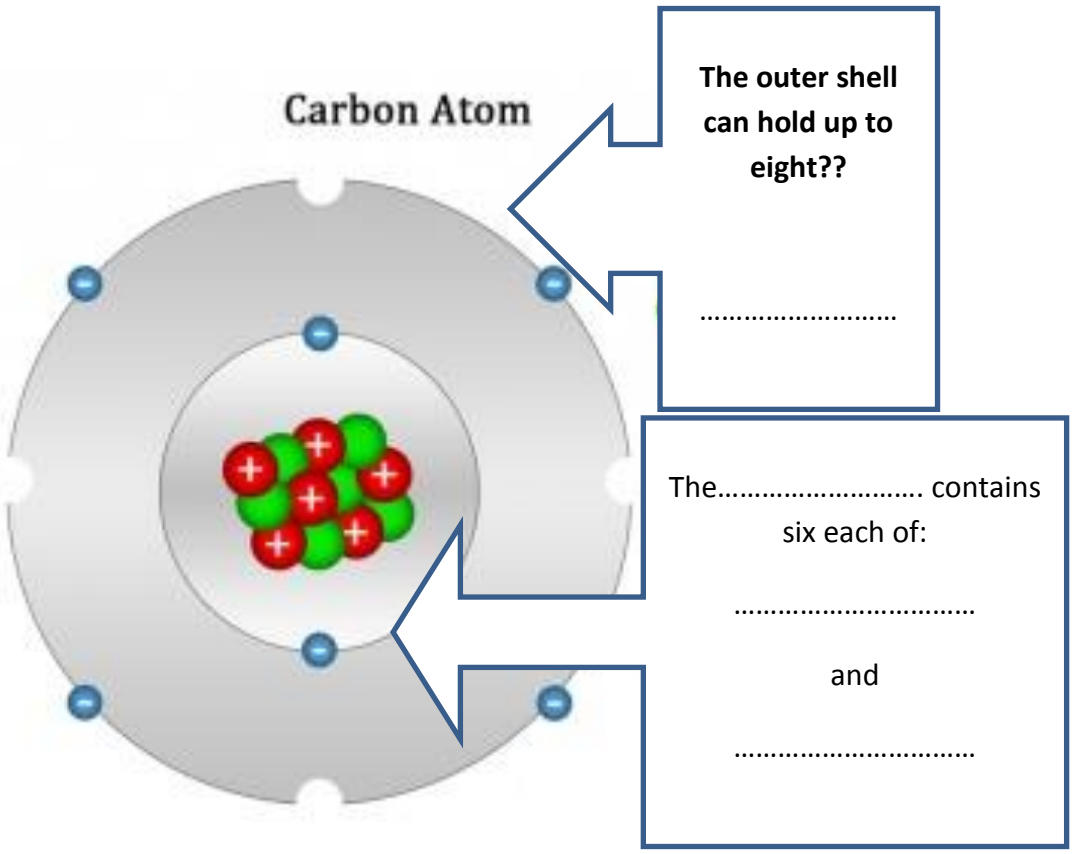
Tasks: List five objects that are made from different materials (e.g. rubber glove). List all your objects in the left column. On the bottom row, list the opposite properties to those in the top row, i.e. waterproof is opposite to absorbent. Tick the words that describe your objects.



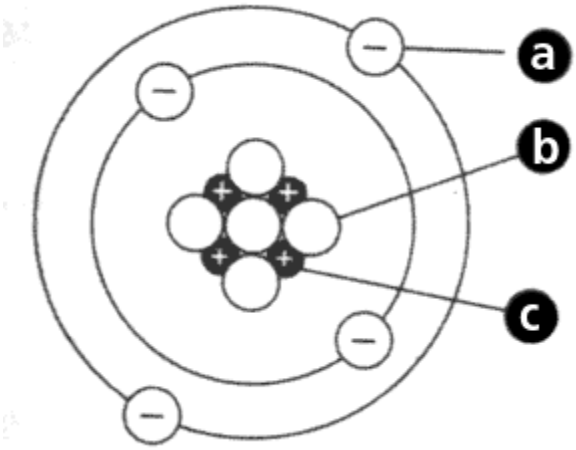
Task: Fill in the blanks in the five statements below.

- An element is a _____ substance that cannot be reduced into anything simpler.
- Everything on earth is made up from many different _____.
- An _____ is the smallest part of an element.
- Each element contains only _____ type of atom.
- Atoms have a _____ at its centre, with _____ floating/moving around it.

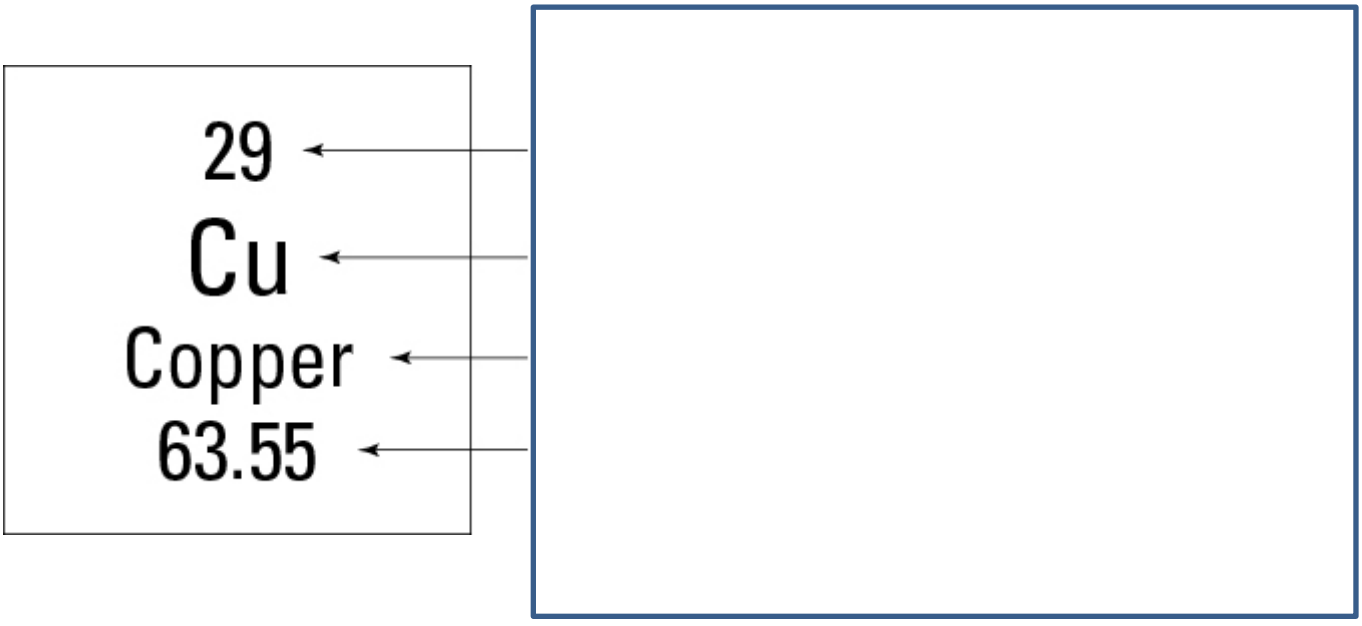
Task: label the parts of the carbon atom diagram below.



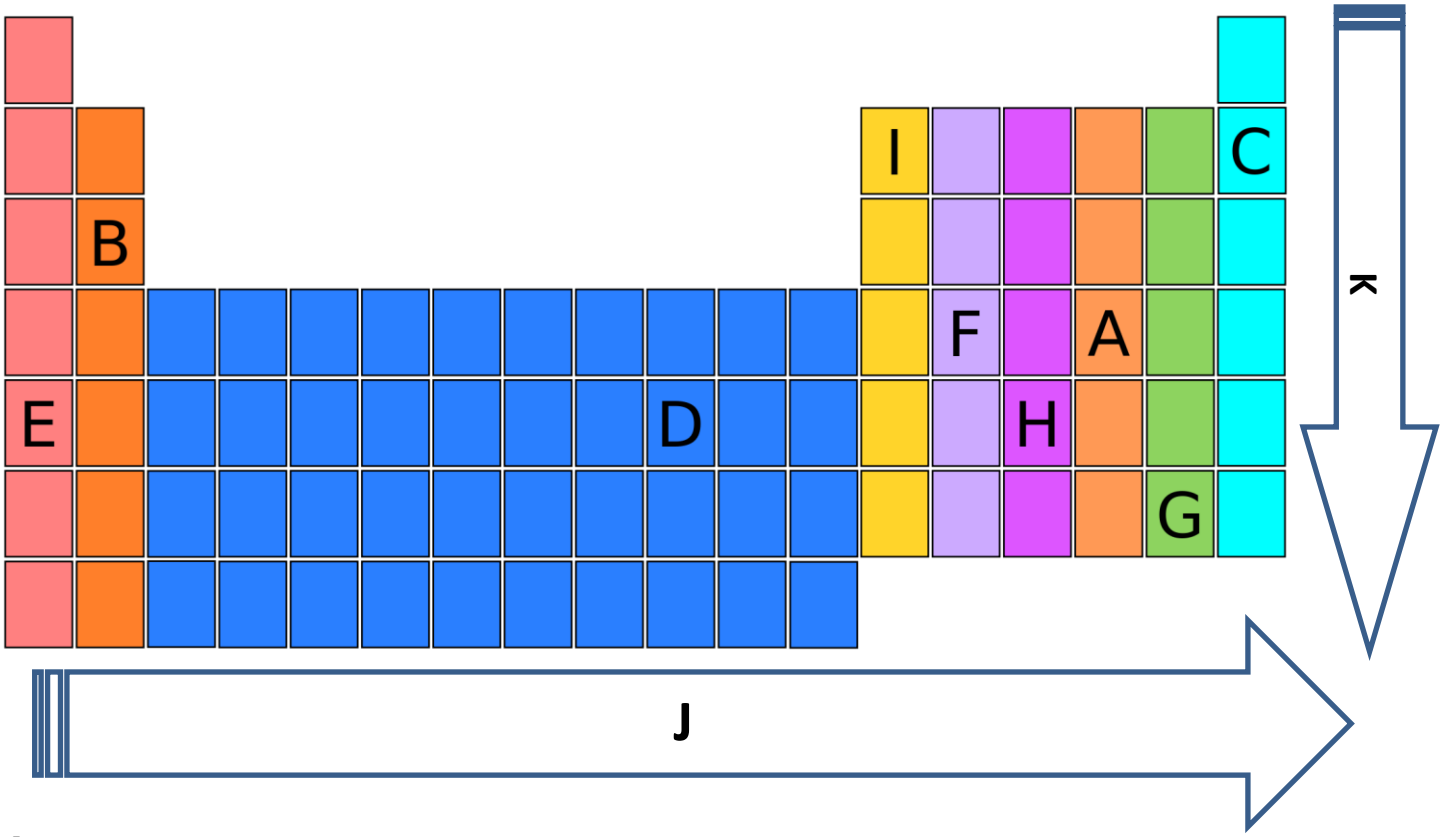
Task: In any typical elemental configuration there exists three primary "components". Label the common name for the three parts: a, b and c.



Task: Label these four parts of the element Copper. You can refer to the Periodic Table for other examples of this labelling of the elements.



Task: List all the major groups of the periodic table, labelled from A – I, below. Label the correct terminology for the rows (K), and columns (J).



A: _____

B: _____

C: _____

D: _____

E: _____

F: _____

G: _____

H: _____

I: _____

J: _____

K: _____

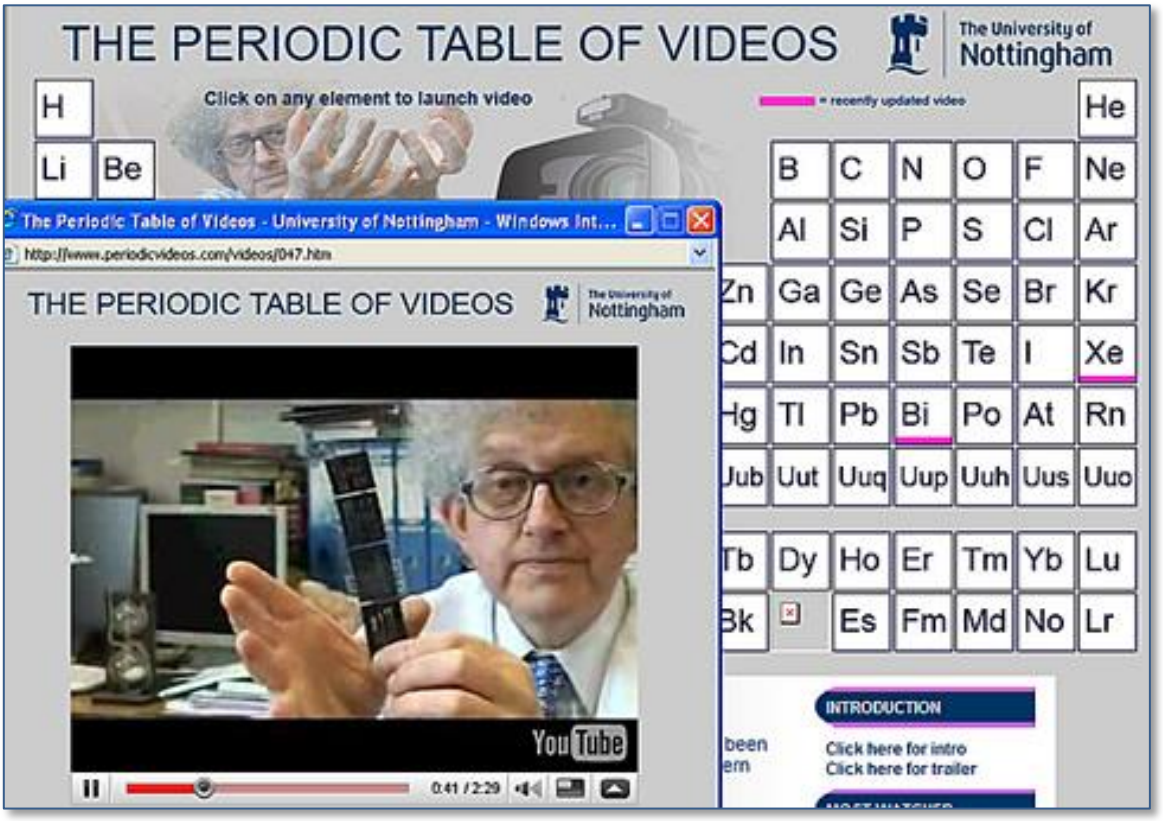
Task: Draw a line to match each term with its definition.

Term		Definition
mixture		contains only one type of atom
element		two substances that can be separated
compound		the simplest particle of matter
atom		two or more elements chemically bonded together

Task: Write a step by step plan that you could use to determine whether a solid substance is both a metal and is also magnetic.

Task: Got to the University of Nottingham website (cosmolearning) and watch four videos from the QR (Periodic) table below. After watching the videos; name and then list two unique properties of each of the four elements you have chosen to watch.

https://cosmolearning.org/documentaries/the-periodic-table-of-videos-1612/

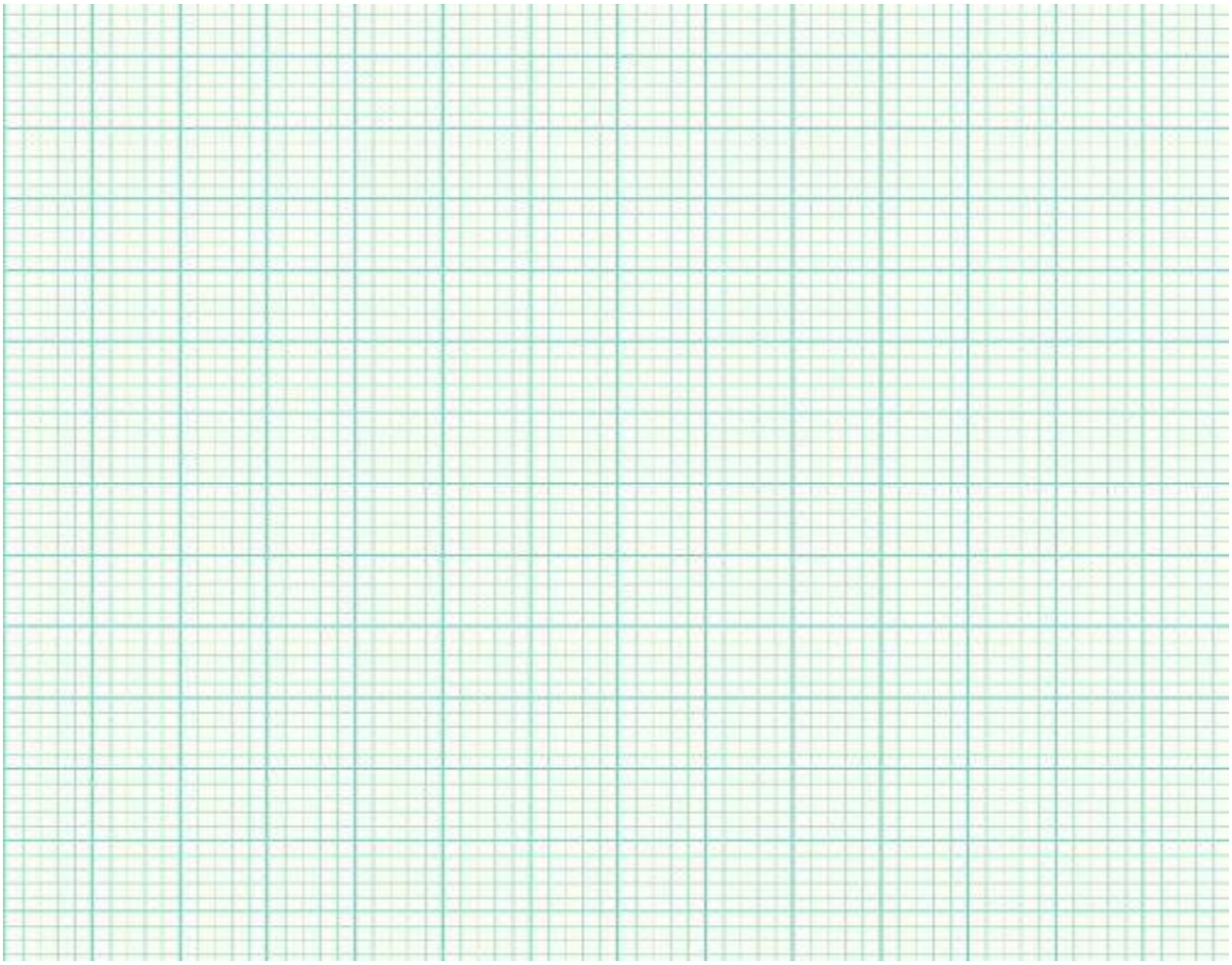


	Property one	Property two
Element 1….		
Element 2….		
Element 3….		
Element 4….		

Scene: During an investigation a chemist adds a mass of magnesium powder to a copper sulphate solution. He records the final temperature of the solution after each reaction. His results are shown in the table below.

Mass of magnesium powder (g)	Final temperature (°C)
0	19
0.5	21
1.0	24
1.5	26
2.0	28
2.5	29

Task: Draw a line graph to show the results. Add and label all axes correctly.



Task: Rock salt is a fine mixture of sand and salt particles. They can be separated using well proven methods.

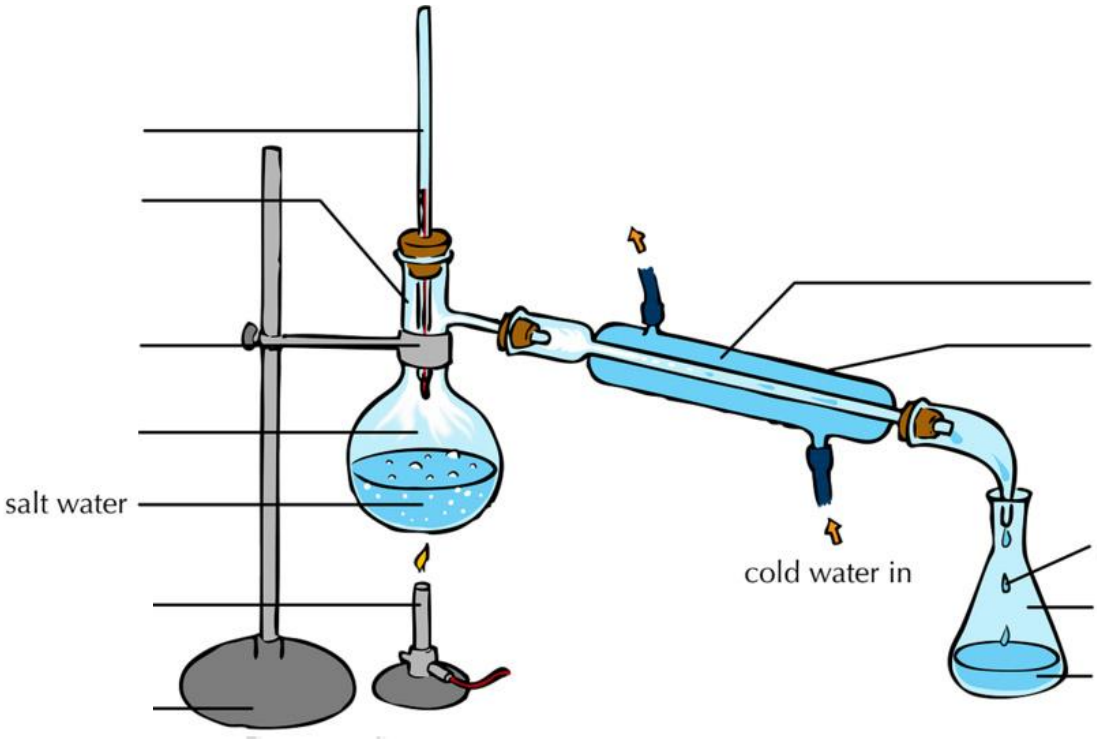
1. Draw and label a diagram of the typical laboratory equipment you would use for this separation process.
2. Explain how a pure sample of salt can be obtained from rock salt in a laboratory.

Diagram:

Explanation (include the type of separation process)**:**

Scene: You are a laboratory assistant who needs to monitor a standard extraction process already in place. You are expected to know about the standard equipment and the process occurring.

Task: Explain what is occurring here, and what the name of the primary process is. Label <u>all</u> of the equipment in the experiment.



Task: Answer the seven questions below.

1. **Describe how the pH scale is related to how acidic or alkaline a solution is.**

2. **Give the name of a compound that contains two elements joined together.**

3. **Calculate the answer to the following question. Underline your answer.**

A chemist burns 0.8 g of iron in oxygen. The iron reacts to form 1.1 g of iron oxide. Calculate the mass of oxygen that reacted with the iron.

1.9g 1.7 g 1.8 g 0.3 g

4. **Copper is used to make electrical wires. Give two properties of copper that allow it to be used for electrical wires.**

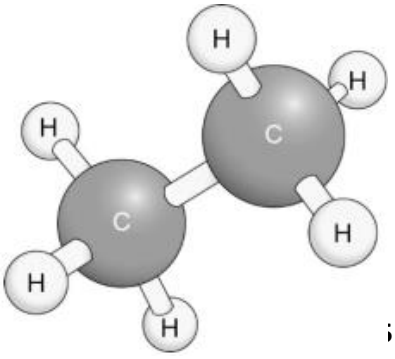
Property 1 _____

Property 2 _____

5. **Why don't we use wood to make electronic equipment?**

6. **Imagine a substance that is a red, shiny solid at room temperature, with a melting point of 115 °C. It is brittle and a poor conductor of heat. State whether this substance is a metal or a non-metal. Give a reason for your answer.**

7. **This model represents ethane.**

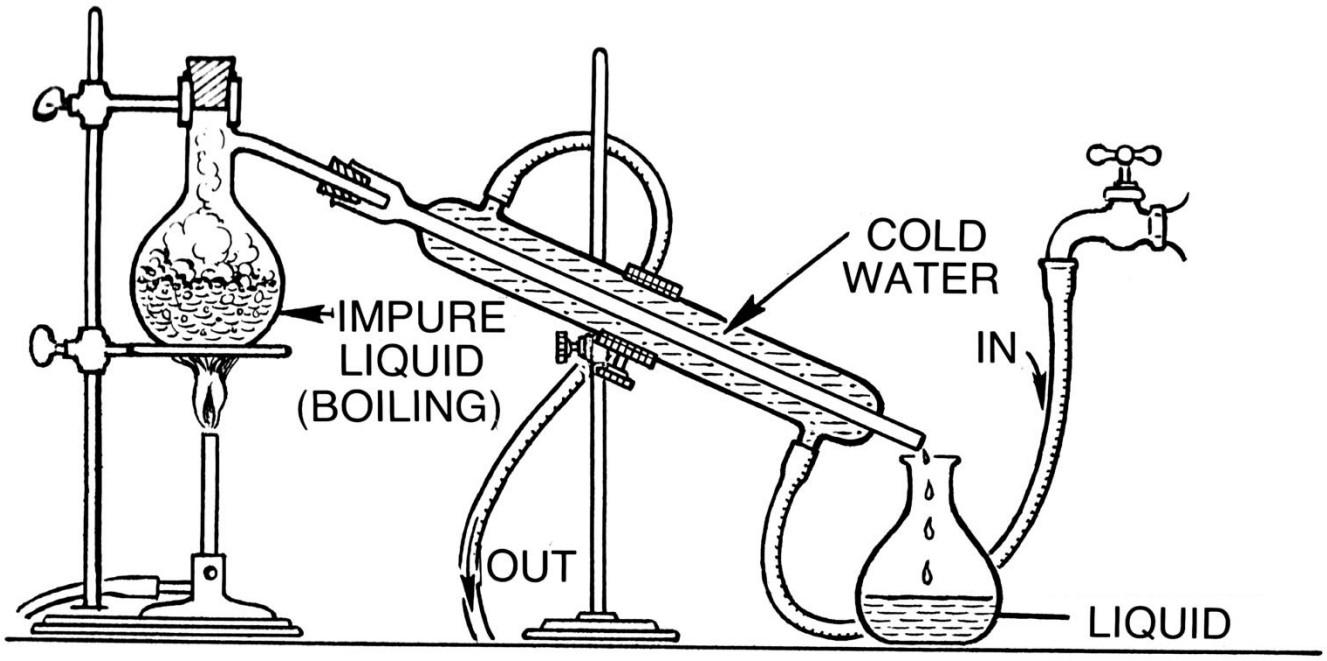


Write the formula for ethane in the space above.

Scene: You are an assistant brewer who needs to monitor a standard process that occurs to all the alcohol brewed onsite.

Tasks:

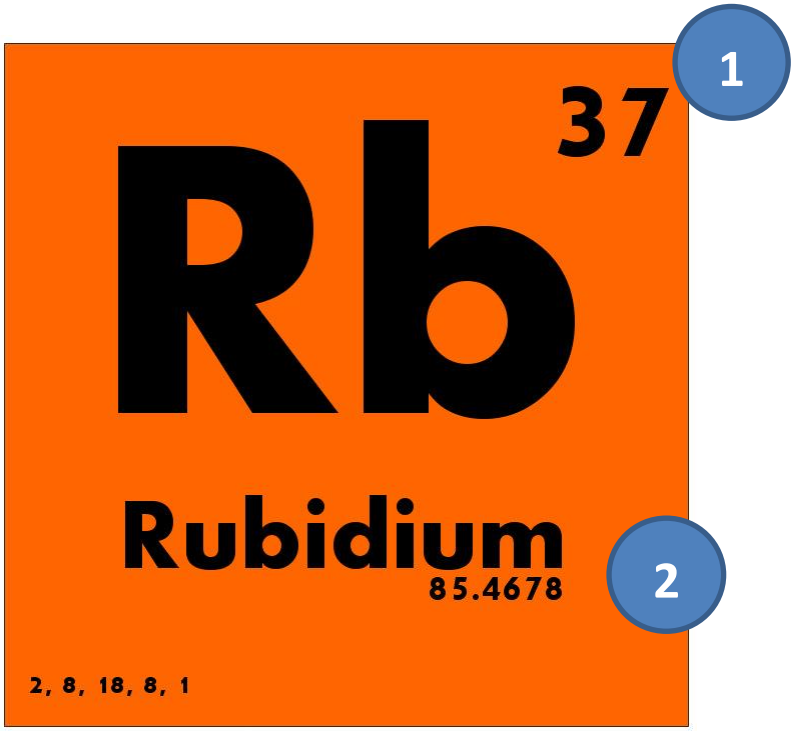
- Explain what experiment is occurring here, including the name of this primary process.
- Draw arrows to show how & where the "liquid" travels.
- Explain why the processed liquid could undergo this procedure two or three times, before consumption?



Scene: Your local plumber has come in to fit a new boiler and replacement radiators. He uses solder and a blowtorch to permanently "join" the copper pipes, all around the house.

Task: Explain what the solder could be used for, and why he needs to use such high heat on the solder and pipes to join them? Explain why copper pipe is used for most similar household plumbing jobs.

Task: Explain what the two labelled numbers represents in the element Rubidium image below.



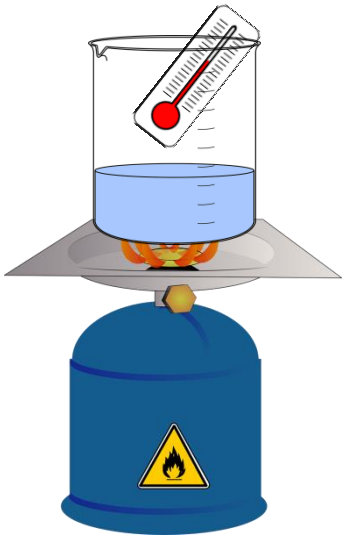
1._____

2. _____

Task: Draw the electron configuration for the element Rubidium – in the space below.

Scene: You are researching the most efficient fuel to take on a long camping expedition. The object of the research is to determine which fuel burns the best - when heating water/food. Therefore which would be the best one to pack for the camp.

Task: Design an experiment to allow you to measure the heat efficiency of two potential fuels; liquid paraffin or paraffin/wax tablets. Also explain what a variable is, and what variables exist in this experiment.



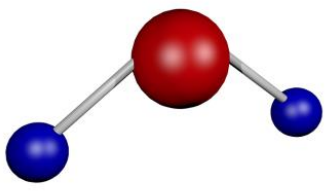
Tasks: Fill in the box underneath each element to state whether it is a gas, liquid or solid at room temperature. Give two examples of common uses of each element in the box next to that element.

Scene: Water is a compound as each water molecule contains one oxygen and two hydrogen atoms joined together. Tap water is a mixture as it contains other harmless elements in tiny amounts (called trace elements).

Task: Complete the labelling of these tap water trace elements and corresponding symbols in the table below.

Symbol	**Element**	**Element**	**Symbol**
	manganese		Fl
As			Fe
	boron	mercury	
Cd			Ni
	chloride	selenium	
Cu		antimony	
Pb			Na

Task: Write out the chemical formula for water and label the diagram below to indicate what elements make up this compound.



Task: Fill in the blanks for each of these statements below:

The process of **d**_____ allows you to smell freshly baked bread in a supermarket, even when you are far from the bakery aisle.

E_____ are the simplest substances in nature.

The smallest part of an element is called an **a**_____

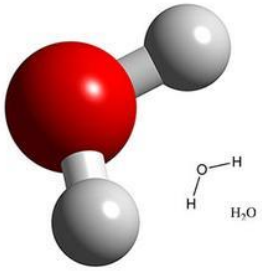
An **e**_____ contains only one type of atom - e.g. the **e**_____ aluminium contains only aluminium atoms.

A **c**_____ contains two or more elements chemically bonded together.

A **m**_____ contains different elements or compounds **m**_____ together (not bonded together), i.e. a bag of sweets.

D_____ is another way to make a mixture. Particles of different substances mix together during **d**_____, and happens swiftly in liquids and gasses.

This image typically illustrates a _____



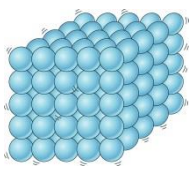
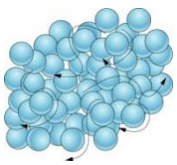
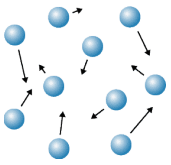
This image typically illustrates a water _____

Change of state. Solids, liquids and gases can change state between each other by simply heating or cooling them.

Task: Complete (fill the gaps) the changing states table below.

Starting state	Finishing state	Process
	liquid	Melting
solid	gas	
liquid		freezing
	gas	evaporation
gas	liquid	

Task: Label what each state the three particle diagrams below illustrate, and then write down <u>four</u> major properties of each state.

Properties: 1) 2) 3) 4)	**Properties:** 1) 2) 3) 4)	**Properties:** 1) 2) 3) 4)
State: 	**State:** 	**State:** 

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