Harris Academy Greenwich

Science

Core Chemistry

Revision Pack

Student Name: _____

Teacher Name: _____

Chemistry C1

Revision Checklist

C1.1 The fundamental ideas in chemistry

C1.1.1 Atoms	**a)** All substances are made of atoms. A substance that is made of only one sort of atom is called an element. There are about 100 different elements. Elements are shown in the periodic table. The groups contain elements with similar properties.			
	b) Atoms of each element are represented by a chemical symbol, eg O represents an atom of oxygen, and Na represents an atom of sodium.			
	c) Atoms have a small central nucleus, which is made up of protons and neutrons and around which there are electrons.			
	d) The relative electrical charges are as shown: **Name of particle Charge** Proton +1 Neutron 0 Electron −1			
	e) In an atom, the number of electrons is equal to the number of protons in the nucleus. Atoms have no overall electrical charge.			
	f) All atoms of a particular element have the same number of protons. Atoms of different elements have different numbers of protons.			
	g) The number of protons in an atom of an element is its atomic number. The sum of the protons and neutrons in an atom is its mass number.			
	h) Electrons occupy particular energy levels. Each electron in an atom is at a particular energy level (in a particular shell). The electrons in an atom occupy the lowest available energy levels (innermost available shells). Candidates may answer questions in terms of either energy levels or shells.			
C1.1.2 The periodic table	**a)** Elements in the same group in the periodic table have the same number of electrons in their highest energy level (outer electrons) and this gives them similar chemical properties.			
	b) The elements in Group 0 of the periodic table are called the noble gases. They are unreactive because their atoms have stable arrangements of electrons.			
C1.1.3 Chemical reactions	**a)** When elements react, their atoms join with other atoms to form compounds. This involves giving, taking or sharing electrons to form ions or molecules. Compounds formed from metals and non-metals consist of ions. Compounds formed from non-metals consist of molecules. In molecules the atoms are held together by covalent bonds.			
	b) Chemical reactions can be represented by word equations or by **balanced** symbol equations.			
	c) No atoms are lost or made during a chemical reaction so the mass of the products equals the mass of the reactants.			

C1.2 Limestone and building materials

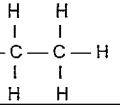
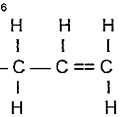
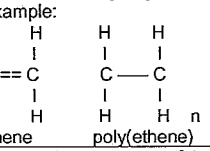
C1.2.1 Calcium carbonate	**a)** Limestone, mainly composed of the compound calcium carbonate ($CaCO_3$), is quarried and can be used as a building material.			
	b) Calcium carbonate can be decomposed by heating (thermal decomposition) to make calcium oxide and carbon dioxide.			
	c) The carbonates of magnesium, copper, zinc, calcium and sodium decompose on heating in a similar way.			
	d) Calcium oxide reacts with water to produce calcium hydroxide, which is an alkali that can be used in the neutralisation of acids.			
	e) A solution of calcium hydroxide in water (limewater) reacts with carbon dioxide to produce calcium carbonate. Limewater is used as a test for carbon dioxide. Carbon dioxide turns limewater cloudy.			
	f) Carbonates react with acids to produce carbon dioxide, a salt and water. Limestone is damaged by acid rain.			
	g) Limestone is heated with clay to make cement. Cement is mixed with sand to make mortar and with sand and aggregate to make concrete.			

C1.3 Metals and their uses

C1.3.1 Extracting metals	**a)** Ores contain enough metal to make it economical to extract the metal. The economics of extraction may change over time.			
	b) Ores are mined and may be concentrated before the metal is extracted and purified.			
	c) Unreactive metals such as gold are found in the Earth as the metal itself but most metals are found as compounds that require chemical reactions to extract the metal.			
	d) Metals that are less reactive than carbon can be extracted from their oxides by reduction with carbon, for example iron oxide is reduced in the blast furnace to make iron.			
	e) Metals that are more reactive than carbon, such as aluminium, are extracted by electrolysis of molten compounds. The use of large amounts of energy in the extraction of these metals makes them expensive.			
	f) Copper can be extracted from copper-rich ores by heating the ores in a furnace (smelting). The copper can be purified by electrolysis. The supply of copper-rich ores is limited.			
	g) New ways of extracting copper from low-grade ores are being researched to limit the environmental impact of traditional mining. Copper can be extracted by phytomining, or by bioleaching.			
	h) Copper can be obtained from solutions of copper salts by electrolysis or by displacement using scrap iron.			
	i) Aluminium and titanium cannot be extracted from their oxides by reduction with carbon. Current methods of extraction are expensive because: ▪ there are many stages in the processes ▪ large amounts of energy are needed.			
	j) We should recycle metals because extracting them uses limited resources and is expensive in terms of energy and effects on the environment.			
C1.3.2 Alloys	**a)** Iron from the blast furnace contains about 96% iron. The impurities make it brittle and so it has limited uses.			
	b) Most iron is converted into steels. Steels are alloys since they are mixtures of iron with carbon. Some steels contain other metals. Alloys can be designed to have properties for specific uses. Low-carbon steels are easily shaped, high-carbon steels are hard, and stainless steels are resistant to corrosion.			
	c) Most metals in everyday use are alloys. Pure copper, gold, iron and aluminium are too soft for many uses and so are mixed with small amounts of similar metals to make them harder for everyday use.			
C1.3.3 Properties and uses of metals	**a)** The elements in the central block of the periodic table are known as transition metals. Like other metals they are good conductors of heat and electricity and can be bent or hammered into shape. They are useful as structural materials and for making things that must allow heat or electricity to pass through them easily.			
	b) Copper has properties that make it useful for electrical wiring and plumbing.			
	c) Low density and resistance to corrosion make aluminium and titanium useful metals.			

C1.4 Crude oil and fuels

C1.4.1 Crude oil	**a)** Crude oil is a mixture of a very large number of compounds.			
	b) A mixture consists of two or more elements or compounds not chemically combined together. The chemical properties of each substance in the mixture are unchanged. It is possible to separate the substances in a mixture by physical methods including distillation.			
	c) Most of the compounds in crude oil consist of molecules made up of hydrogen and carbon atoms only (hydrocarbons). Most of these are saturated hydrocarbons called alkanes, which have the general formula C_nH_{2n+2}.			

C1.4.2 Hydrocarbons	**a)** Alkane molecules can be represented in the following forms: ▪ C_2H_6  ▪			
	b) The many hydrocarbons in crude oil may be separated into fractions, each of which contains molecules with a similar number of carbon atoms, by evaporating the oil and allowing it to condense at a number of different temperatures. This process is fractional distillation.			
	c) Some properties of hydrocarbons depend on the size of their molecules. These properties influence how hydrocarbons are used as fuels.			
C1.4.3 Hydrocarbon fuels	**a)** Most fuels, including coal, contain carbon and/or hydrogen and may also contain some sulfur. The gases released into the atmosphere when a fuel burns may include carbon dioxide, water (vapour), carbon monoxide, sulfur dioxide and oxides of nitrogen. Solid particles (particulates) may also be released.			
	b) The combustion of hydrocarbon fuels releases energy. During combustion the carbon and hydrogen in the fuels are oxidised.			
	c) Sulfur dioxide and oxides of nitrogen cause acid rain, carbon dioxide causes global warming, and solid particles cause global dimming.			
	d) Sulfur can be removed from fuels before they are burned, for example in vehicles. Sulfur dioxide can be removed from the waste gases after combustion, for example in power stations.			
	e) Biofuels, including biodiesel and ethanol, are produced from plant material. There are economic, ethical and environmental issues surrounding their use.			
C1.5 Other useful substances from crude oil				
C1.5.1 Obtaining useful substances from crude oil	**a)** Hydrocarbons can be cracked to produce smaller, more useful molecules. This process involves heating the hydrocarbons to vaporise them. The vapours are either passed over a hot catalyst or mixed with steam and heated to a very high temperature so that thermal decomposition reactions then occur.			
	b) The products of cracking include alkanes and unsaturated hydrocarbons called alkenes. Alkenes have the general formula C_nH_{2n}.			
	c) Unsaturated hydrocarbon molecules can be represented in the following forms: ▪ C_3H_6  ▪			
	d) Alkenes react with bromine water, turning it from orange to colourless.			
	e) Some of the products of cracking are useful as fuels.			
C1.5.2 Polymers	**a)** Alkenes can be used to make polymers such as poly(ethene) and poly(propene). In these reactions, many small molecules (monomers) join together to form very large molecules (polymers). For example:  ethene poly(ethene)			
	b) Polymers have many useful applications and new uses are being developed, for example: new packaging materials, waterproof coatings for fabrics, dental polymers, wound dressings, hydrogels, smart materials (including shape memory polymers).			
	c) Many polymers are not biodegradable, so they are not broken down by microbes and this can lead to problems with waste disposal.			

	d) Plastic bags are being made from polymers and cornstarch so that they break down more easily. Biodegradable plastics made from cornstarch have been developed.			
C1.5.3 Ethanol	**a)** Ethanol can be produced by hydration of ethane with steam in the presence of a catalyst.			
	b) Ethanol can also be produced by fermentation with yeast, using renewable resources. This can be represented by: sugar → carbon dioxide + ethanol			
C1.6 Plant oils and their uses				
C1.6.1 Vegetable oils	**a)** Some fruits, seeds and nuts are rich in oils that can be extracted. The plant material is crushed and the oil removed by pressing or in some cases by distillation. Water and other impurities are removed.			
	b) Vegetable oils are important foods and fuels as they provide a lot of energy. They also provide us with nutrients.			
	c) Vegetable oils have higher boiling points than water and so can be used to cook foods at higher temperatures than by boiling. This produces quicker cooking and different flavours but increases the energy that the food releases when it is eaten.			
C1.6.2 Emulsions	**a)** Oils do not dissolve in water. They can be used to produce emulsions. Emulsions are thicker than oil or water and have many uses that depend on their special properties. They provide better texture, coating ability and appearance, for example in salad dressings, ice creams, cosmetics and paints.			
	b) Emulsifiers have hydrophilic and hydrophobic properties.			
C1.6.3 Saturated and unsaturated oils	**a)** Vegetable oils that are unsaturated contain double carbon–carbon bonds. These can be detected by reacting with bromine water.			
	b) Vegetable oils that are unsaturated can be hardened by reacting them with hydrogen in the presence of a nickel catalyst at about 60 °C. Hydrogen adds to the carbon–carbon double bonds. The hydrogenated oils have higher melting points so they are solids at room temperature, making them useful as spreads and in cakes and pastries.			
C1.7 Changes in the Earth and its atmosphere				
C1.7.1 The Earth's crust	**a)** The Earth consists of a core, mantle and crust, and is surrounded by the atmosphere.			
	b) The Earth's crust and the upper part of the mantle are cracked into a number of large pieces (tectonic plates).			
	c) Convection currents within the Earth's mantle driven by heat released by natural radioactive processes cause the plates to move at relative speeds of a few centimetres per year.			
	d) The movements can be sudden and disastrous. Earthquakes and / or volcanic eruptions occur at the boundaries between tectonic plates.			
C1.7.2 The Earth's atmosphere	**a)** For 200 million years, the proportions of different gases in the atmosphere have been much the same as they are today: ▪ about four-fifths (80 %) nitrogen ▪ about one-fifth (20%) oxygen ▪ small proportions of various other gases, including carbon dioxide, water vapour and noble gases.			
	b) During the first billion years of the Earth's existence there was intense volcanic activity. This activity released the gases that formed the early atmosphere and water vapour that condensed to form the oceans.			
	c) There are several theories about how the atmosphere was formed. One theory suggests that during this period the Earth's atmosphere was mainly carbon dioxide and there would have been little or no oxygen gas (like the atmospheres of Mars and Venus today). There may also have been water vapour and small proportions of methane and ammonia.			

	d) There are many theories as to how life was formed billions of years ago.			
	e) One theory as to how life was formed involves the interaction between hydrocarbons, ammonia and lightning.			
	f) Plants and algae produced the oxygen that is now in the atmosphere.			
	g) Most of the carbon from the carbon dioxide in the air gradually became locked up in sedimentary rocks as carbonates and fossil fuels.			
	h) The oceans also act as a reservoir for carbon dioxide but increased amounts of carbon dioxide absorbed by the oceans has an impact on the marine environment.			
	i) Nowadays the release of carbon dioxide by burning fossil fuels increases the level of carbon dioxide in the atmosphere.			
	j) Air is a mixture of gases with different boiling points and can be fractionally distilled to provide a source of raw materials used in a variety of industrial processes.			

Main topics to revise –

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-
-
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C1 REVISION – CHAPTER 1 – FUNDAMENTAL IDEAS

Draw the symbol for sodium include its atomic mass and atomic number (what do they tell us)

What are the charges and masses of electrons, protons and neutrons

Write down all you know about the periodic table

Balance the following equation:

$Ca + O_2 \longrightarrow CaO$

$Cl_2 + Al \longrightarrow AlCl_3$

How many atoms and elements are there is:

C_2H_5OH ?

Where are electrons and neutrons and protons found in an atom?

Draw the electronic configuration for argon

What is covalent bonding?

Describe how sodium and chlorine bond;

KEY WORDS:

Electron
Proton
Neutron
Shell
Electronic Configuration
Orbit

ASSESSMENT:

C1 REVISION – CHAPTER 2 – ROCKS & BUILDING MATERIALS

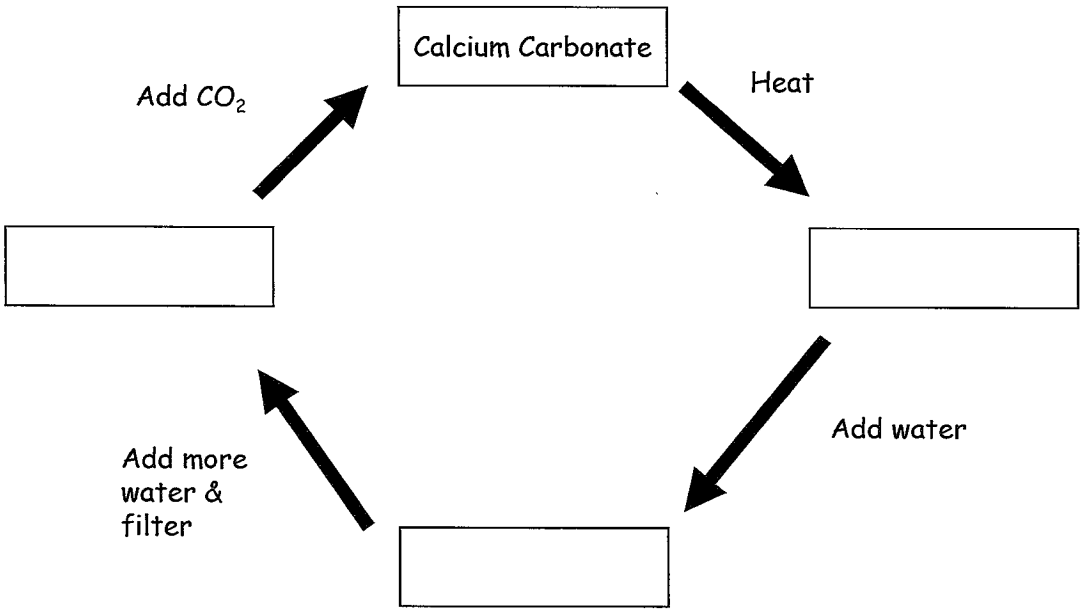
What is the scientific name AND chemical formula for limestone?

What is produced when a carbonate reacts with an acid?

What is thermal decomposition?

Write the word and symbol equation for the thermal decomposition of limestone

Complete the limestone reaction cycle:



What is cement?

What is concrete?

What are the benefits and drawbacks to limestone quarrying?

BENEFITS	DRAWBACKS

KEY WORDS:

CALCIUM CARBONATE
THERMAL DECOMPOSITION
CONCRETE
CEMENT
QUARRYING
LIMESTONE
LIMEWATER

ASSESSMENT:

C1 REVISION – CHAPTER 3 – METALS & THEIR USES

Put these metals in their order of reactivity
Carbon, Magnesium, Copper, Iron & Potassium

Less reactive metals are displaced by carbon. Complete the equation below and then make your own one:

Copper Oxide + Carbon → _____ + _____

→

What is an ore?

How is iron extracted?

What is an alloy?

Name 2 alloys:

Give 2 use AND properties of:

i) Aluminium

ii) Titanium

Explain a bit about each of the ways to extract copper:

Smelting:

Displacement:

Bioleaching

Phytomining

KEY WORDS:

DISPLACEMENT
ORE
BLAST FURNACE
ALLOY
SMELTING
BIOLEACHING
PHYTOMINING

ASSESSMENT:

C1 REVISION – CHAPTER 4 – CRUDE OIL & FUELS

Name the process by which we separate crude oil into useful components:

What property does this process rely on?

What does 'saturated' mean?

Give a problem each pollutant causes:

Carbon Dioxide

Sulphur Dioxide

Carbon Monoxide

Nitrogen Oxide

Particulates

Give the benefits and drawbacks of each alternative fuel

	BENEFITS	DRAWBACKS
BIODIESEL (more detail required for this one!)		
ETHANOL		
HYDROGEN		

Complete the table to summarise alkanes and alkenes:

	ALKANES	ALKENES
Saturated or unsaturated		
General formula		
Name an example		
Draw an example		

KEY WORDS:

ALKANE
ALKENE
SATURATED
FRACTIONAL DISTILLATION
ALTERNATIVE FUEL
POLLUTANT
COMBUSTION

ASSESSMENT:

C1 REVISION – CHAPTER 5 – PRODUCTS FROM OIL

What does 'cracking' mean?

What happens to the following when added to Bromine water:

i) Alkanes

ii) Alkenes

What is 'polymerisation'?

Draw a diagram to demonstrate it:

List 3 problems with plastics:

How are biodegradable plastics made?

What are the problems with them?

Describe how 2 designer polymers work:

Explain the 2 ways ethanol can be produced:

KEY WORDS:

CRACKING
POLYMERISATION
PLASTIC
POLYMER
MONOMER
FERMENTATION
BIODEGRADABLE

ASSESSMENT:

C1 REVISION – CHAPTER 6 – PLANT OILS

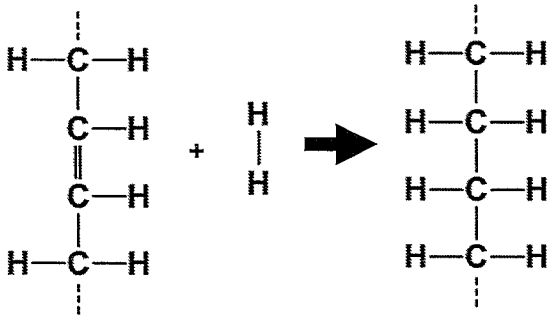
What is the equation for photosynthesis?

Describe the 2 ways to extract plant oils:

Pressing

Distillation

Use the diagram to explain how oils are hardened into spreads (hydrogenation)



Conditions required:

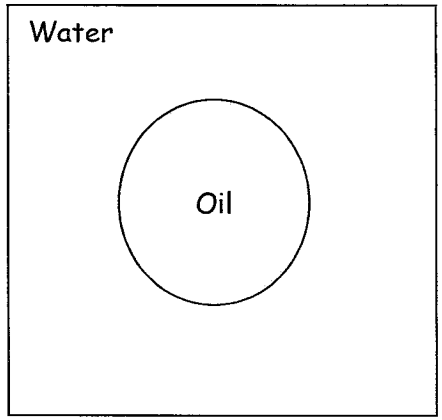
Explain what is happening:

What do emulsifiers do?

Name 2 products that need emulsifiers in them

Name 2 products that ARE emulsifiers

Complete the diagram to demonstrate emulsification:



What does hydrophobic mean?

What does hydrophilic mean?

KEY WORDS:

PRESSING
DISTILLATIOON
HARDENING
HYDROGENATION
EMULSIFIER
HYDROPHOBIC
HYDROPHILIC

ASSESSMENT:

C1 REVISION - CHAPTER 7 - OUR CHANGING PLANET

What are the layers of the Earth?

Complete the table to show the atmosphere of Earth <u>today</u>

Gas	%
Others (inc. Argon)	

What was Earth's atmosphere like in the past?

Explain how it changed to contain oxygen

What is continental drift?

What causes the motion of the plates?

What happens at plate boundaries

What is the carbon cycle?

Why have carbon levels been increasing?

How did life on Earth possibly start? Use the headings below to help you.

Miller-Urey Experiment:

Meteorites

Deep Sea Vents

KEY WORDS:

ATMOSPHERE
CARBON CYCLE
MANTLE
CRUST
CORE
MILLER-UREY

ASSESSMENT:

C1.1 The fundamental Ideas in Chemistry

C1.1.1 Atoms

What is an atom?

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What is an element?

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Indicate where you would find metals and non-metals:

Periodic Table of the Elements

1 H 1.008																	2 He 4.00
3 Li 6.94	4 Be 9.01											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
19 K 39.20	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.0	45 Rh 102.9	46 Pd 106.4	47 Ag 107.8	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.7	52 Te 127.6	53 I 126.9	54 Xe 131.2
55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 180.1	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr 223.0	88 Ra 226.0	89 Ac 227.0	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 Ds (281)	111 Rg (272)	112 Uub (285)	113 Uut (284)	114 Uuq (289)	115 Uup (288)	116 Uuh (292)		

58 Ce 140.1	59 Pr 141.0	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 153.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
90 Th 232.4	91 Pa 231.4	92 U 238.0	93 Np (237)	94 Pu (240)	95 Am (243)	96 Cm (247)	97 Bk (248)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (257)	102 No (259)	103 Lr (262)

Match the name of the element with the symbol

Element	**Symbol**
Oxygen	
Sodium	
	H
	Li
Copper	
Potassium	
	Ar
	Ca

Draw and label the structure of an atom. Ensure that you include the following key words:

Nucleus Protons Neutrons Electrons

Complete the table below

Name of Particle	Charge	Mass
Proton		
Neutron		
Electron		

Explain why atoms have no overall electrical charge.

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What does the atomic number tell you?

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What does the mass number tell you?

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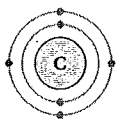
Complete the table

Element	Symbol	Atomic Number	Mass Number	Number of Protons	Number of Neutrons	Number of Electrons
Hydrogen						
	He					
		3				
			9			
				5		

Draw diagrams to show the electronic structure of the elements above. You should use 2 different methods of representing the electron arrangement.

For example:

Carbon



(2,4)

Describe the structure of an atom (6 marks)

C1.1.2 The Periodic Table

Complete the table

Group Number	**Number of Electrons in Outer Energy Level (Shell)**
1	
2	
3	
4	
5	
6	
7	
0	

Using information in the table above, explain why elements in the same group of the periodic table have similar properties

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Label each of the group of the periodic table below. You may colour each group a different colour to show where they are.

Periodic Table of the Elements

1 H 1.008																	2 He 4.00
3 Li 6.94	4 Be 9.01											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
19 K 39.20	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.0	45 Rh 102.9	46 Pd 106.4	47 Ag 107.8	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.7	52 Te 127.6	53 I 126.9	54 Xe 131.2
55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 180.1	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr 223.0	88 Ra 226.0	89 Ac 227.0	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 Ds (281)	111 Rg (272)	112 Uub (285)	113 Uut (284)	114 Uuq (289)	115 Uup (288)	116 Uuh (292)		

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The elements in group 0 (the noble gases) are very unreactive, explain why.

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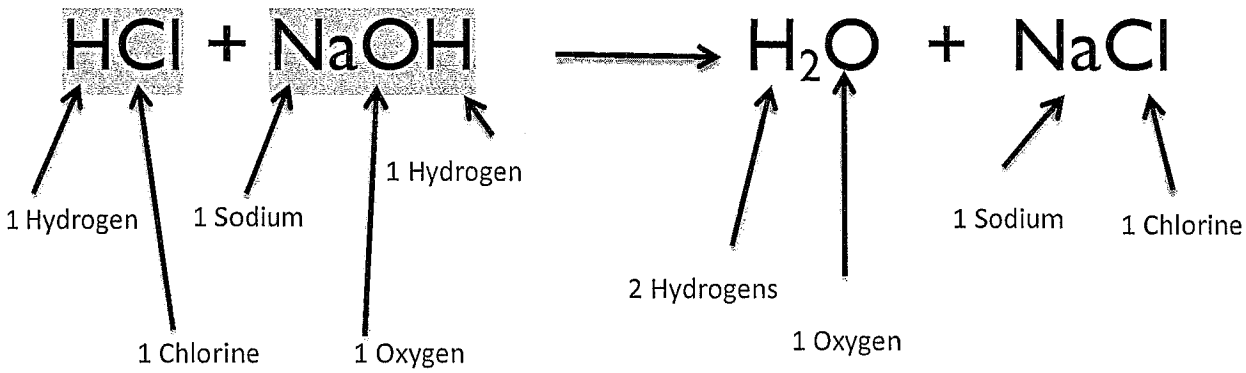
C1.1.3 Chemical Reactions

For each chemical reaction:

a. **Write the word equation**
b. **Colour the reactants in one colour and the products in another**
c. **Identify how many of each element there is in each compound**

Example



Word Equation:

Hydrochloric acid + Sodium Hydroxide ⟶ Water + Sodium Chloride

$$CaCO_3 \longrightarrow CaO + CO_2$$

Word Equation:

_____

$$Zn + H_2SO4 \longrightarrow H_2 + ZnSO_4$$

Word Equation:

$$Mg + HCl \longrightarrow MgCl + H_2$$

Word Equation:

$$PbO + C \longrightarrow Pb + CO_2$$

Word Equation:

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d. ***Extension: Balance the symbol equations (Higher tier only)***

What is a compound?

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What is an ion?

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What type of bonding occurs between:

Metal and non-metals?

.....

Two non-metals?

.....

Complete the table about forming ions:

Metal/Non-metal	**Gain/Loose Electrons?**	**Positive/Negative Ion?**
Metal		
Non-Metal		

Draw a diagram showing the bonding between sodium and chlorine to form sodium chloride.

Draw a diagram to show how hydrogen and chlorine bond together to form HCl.

Complete the table, calculate the mass in each case.

Reactants		**Products**	
Hydrochloric acid 20g	Sodium Hydroxide 20g	Sodium Chloride 10g	Water .....g
Calcium Carbonate .....g		Calcium Oxide 10g	Carbon dioxide 15g
Zinc 10g	Sulfuric Acid .....g	Hydrogen 20g	Zinc Sulfate 10g
Magnesium 12g	Hydrochloric Acid 17g	Hydrogen .....g	Magnesium Chloride 15g
Lead Oxide .....g	Carbon 14g	Carbon Dioxide 23g	Lead 12g

C1.2 Limestone and Building Materials

C1.2.1 Calcium Carbonate

What is limestone made from?

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How do you get limestone out of the ground?

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What is limestone used for?

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What is thermal decomposition?

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Write the word and symbol equations for the thermal decomposition of calcium carbonate.

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What happens to magnesium carbonate, copper carbonate, zinc carbonate and calcium carbonate when they are heated?

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Give a reason why not all of the above reactions could be observed in a classroom?

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Write word and symbol equations to show what happens when calcium oxide reacts with water. What can the product be used for?

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How do you test for the presence of carbon dioxide? Draw a diagram and write a description.

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What is the chemical name and formula for lime water?

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Describe the reaction that occurs when limewater reacts with carbon dioxide.

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What are the products produced when a carbonate reacts with an acid?

- .....
- .....
- .....

What happens to limestone statues when exposed to acid rain?

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.....

Complete the following:

Limestone + Heat + Clay = ...

Cement + Sand = ...

Cement + Sand + Aggregate = ...

Discuss the advantages and disadvantages associate with limestone quarries. You will need to consider environmental, social and economic factors. (6 marks)

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C1.3 Metals and Their Uses

C1.3.1 Extracting Metals

What is an ore?

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Explain why it is possible to find gold in the Earth as a metal.

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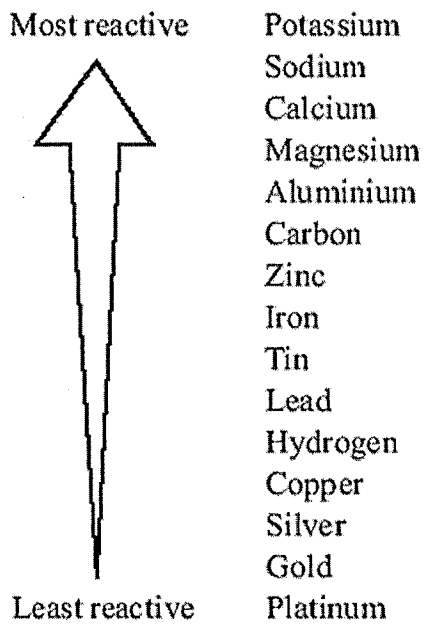
What does the reactivity series show us?



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How can carbon be used to extract a metal from its ore?

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What method do we use to extract more reactive metals such as aluminium?

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Why is aluminium expensive?

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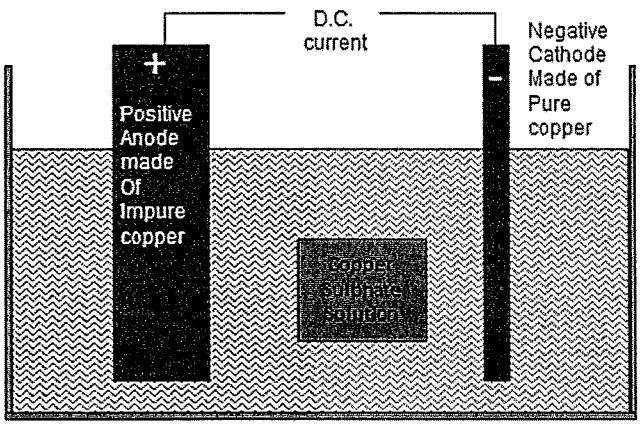
Refining copper



Add the following statements to the correct place on the diagram above

1. Copper atoms lose electrons and become copper ions.
2. The positive ions drift away from the anode
3. **$Cu^{2+} + 2e- \rightarrow Cu$**
4. Positive copper ions drift to the cathode.
5. The cathode is electroplated
6. **$Cu \rightarrow Cu^{2+} + 2e^{-}$**
7. The anode dissolves
8. Copper atoms gain electrons and become copper atoms

Define the following words:

Phytoming

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Bioleaching

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Why are these processes important?

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List methods of extracting copper:

- .....
- .....
- .....
- .....

Why is it important that we recycle metals?

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C1.3.2 Alloys

What impact do impurities have on the properties of iron when it comes from the blast furnace?

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What is steel?

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Complete the table

Properties of high carbon steel	Properties of low carbon steel

Why do we convert copper, gold, iron and aluminium into alloys?

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C1.3.3

Colour in the transition metals

Periodic Table of the Elements

1 H 1.008																	2 He 4.00
3 Li 6.94	4 Be 9.01											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
19 K 39.20	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.0	45 Rh 102.9	46 Pd 106.4	47 Ag 107.8	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.7	52 Te 127.6	53 I 126.9	54 Xe 131.2
55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 180.1	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr 223.0	88 Ra 226.0	89 Ac 227.0	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 Ds (281)	111 Rg (272)	112 Uub (285)	113 Uut (284)	114 Uuq (289)	115 Uup (288)	116 Uuh (292)		

58 Ce 140.1	59 Pr 141.0	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 153.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
90 Th 232.4	91 Pa 231.4	92 U 238.0	93 Np (237)	94 Pu (240)	95 Am (243)	96 Cm (247)	97 Bk (248)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (257)	102 No (259)	103 Lr (262)

List properties of transition metals

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.....

Complete the table

Metal	**Properties**	**Uses**
Copper		
Aluminium		
Titanium		

C1.4 Crude Oil and Fuels

C1.4.1 Crude Oil

What is crude oil?

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Use diagrams to show how crude oil was formed.

What is a mixture?

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What is a hydrocarbon?

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Name a saturated hydrocarbon

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Give the general formula of an alkane

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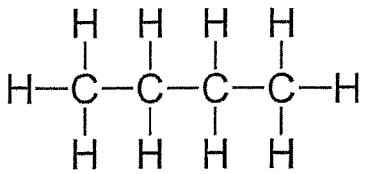
C1.4.2 Hydrocarbons

Complete the following table

Alkane	**Number of Carbons**	**Number of Hydrogens**	**Formula**	**Structure**
	1			
		6		
			C_3H_8	
Butane				
Pentane	5			

What is fractional distillation?

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What method can you use to separate liquids with different boiling points?

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What is a boiling point?

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Draw a diagram of a fractionating column

Where do substances with high boiling points condense in the fractionating column?

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Where do substances with low boiling points condense in the fractionating column?

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Define the following words:

Viscosity

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Flammability

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How does the length of the carbon chain affect the following:

Boiling point

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.....

Viscosity

.....

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Flammability

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C1.4.3 Hydrocarbon Fuels

Complete the following equation for the combustion of hydrocarbons

Hydrocarbon + ... = ...+.....

The following substance can be released when fossil fuels are burnt. Explain where they come from and the impact that they have on the environment

Carbon dioxide

Produced due to

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.....

.....

Impact on the environment

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Sulfur Dioxide

Produced due to

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Impact on the environment

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Carbon Monoxide

Produced due to

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Impact on the environment

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Oxides of Nitrogen

Produced due to

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Impact on the environment

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Particulates

Produced due to

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Impact on the environment

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Describe the causes and effects of acid rain

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Describe the causes and effects of global warming

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Describe the causes and effects of global dimming

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How are biofuels produced?

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C1.5 Other Useful Substances from Crude Oil

C1.5.1 Obtaining useful substances from crude oil

What is cracking and why is it necessary?

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Describe the process of cracking?

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What is the general formula for an alkene?

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What happens when alkenes react with bromine water?

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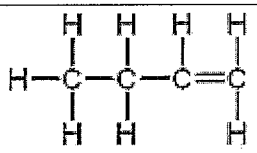
Alkene	Number of Carbons	Number of Hydrogens	Formula	Structure
	1			
		4		
			C_3H_6	
Butene				
Pentene	5			

C1.5.2 Polymers

Draw a diagram representing the process of polymerisation of ethene. Label the following:

Monomer **Polymer** **Ethene** **Poly(ethene)**

Describe the process of polymerisation.

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What uses do we have for polymers?

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Why is it important to recycle polymers?

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C1.5.3 Ethanol

What are the two methods of producing ethanol?

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What are the advantages and disadvantages of each method?

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C1.6 Plant Oils and Their Uses

C1.6.1 Vegetable Oils

What steps are required to extract oils from fruits, seeds and nuts?

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How is olive oil extracted?

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Why are vegetable oils important foods?

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C1.6.3 Emulsions

What is an emulsifier?

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What is an emulsion?

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Why are emulsions useful?

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Higher Tier – What is meant by hydrophobic and hydrophilic?

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C1.6.3 Saturated and Unsaturated Oils

How do you test for the presence of a double bond?

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The presence of a double bond means that oil is Saturated/unsaturated. *(Delete as appropriate)*

Higher Tier – How can unsaturated oils be hardened? Describe the properties of the product.

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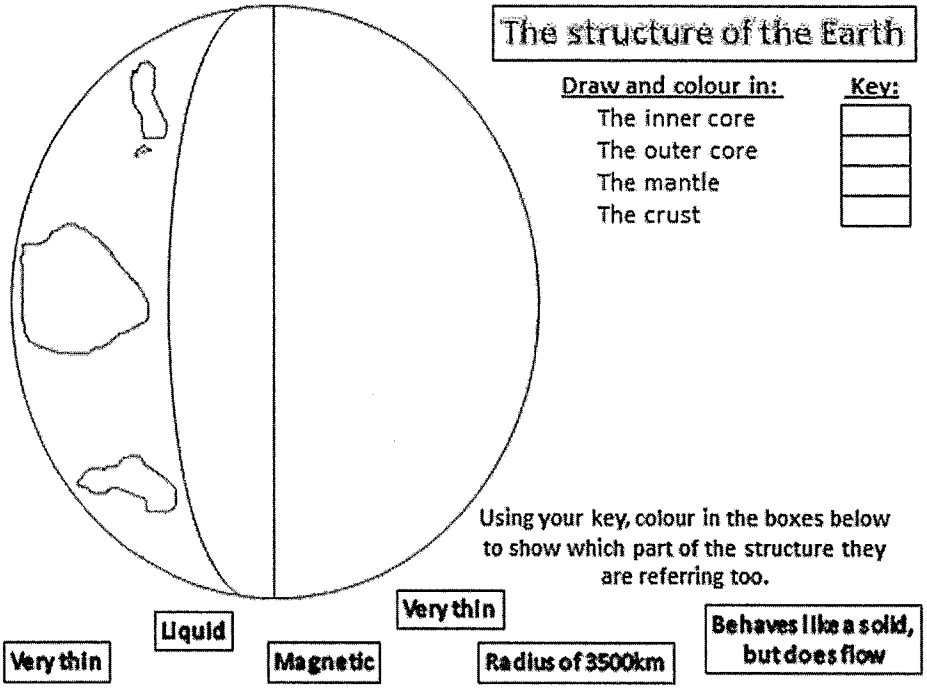
C1.7 Changes in the Earth and its Atmosphere

C1.7.1 The Earth's Crust



How do earthquakes and volcanoes occur?

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Explain why Wegener's theories of crustal movement were not accepted for many years?

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Explain why scientists cannot accurately predict when earthquakes and volcanic eruptions will occur?

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Higher Tier – Describe why we do not know how life was first formed?

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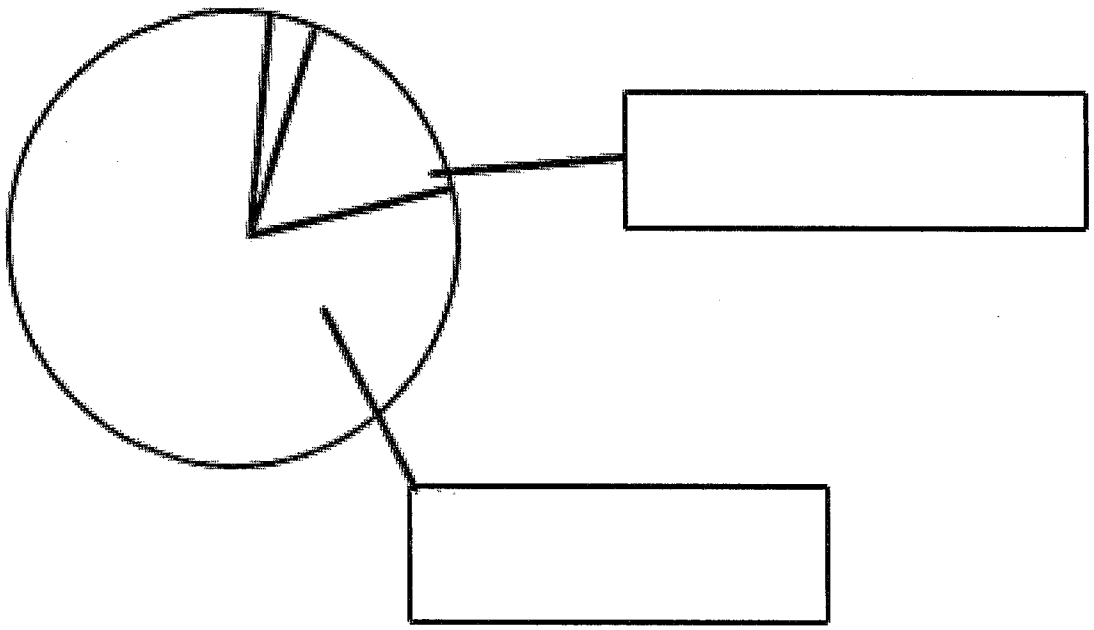
C1.7.2 The Earth's Atmosphere

Label the diagram to show the proportions of different gases in the atmosphere:



What was responsible for the formation of the Earth's early atmosphere and provided the water that formed the oceans?

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What process produced the oxygen that is now in the atmosphere?

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What happened to a lot of the carbon dioxide that was in the air?

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What human activities have caused a change in our atmosphere?

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Higher Tier – What process could be used to separate the mixture of gases that makes up air?

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Self-Assess

The topics that I know in detail are:

-
-
-

The topics that I know but need to do some revision for are:

-
-
-

The topics that I do not understand and need to ask for help with are:

-
-
-

Controlled Assessment Candidate Research Notes

For use with: GCSE Science A Route 1 (4405) GCSE Science A Route 2 (4406)
Additional Science Route 1 (4408) Additional Science Route 2 (4409)
Biology (4401) Chemistry (4402) Physics (4403)

SCA4P ☐ AS4P ☐ BL4P ☐ CH4P ☐ PH4P ☐

Centre number _____ Centre name _____

Candidate's full name _____ Candidate number _____

Investigation Title

_____

ISA number

_____

The only notes the candidate takes into the Controlled Assessment are to be written in the spaces on the back of this sheet.

This sheet should be given to the teacher for checking before it is used in Section 1 of the ISA.

When Section 1 of the ISA has been completed, this sheet should be retained by the teacher for subsequent use with Section 2.

When Section 2 of the ISA has been completed, this sheet should be stapled to it.

Declaration

I confirm that these are the only notes used in the Controlled Assessment.

Teacher signature _____ Candidate signature _____

Date _____

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Hypothesis
Research sources
Method(s)
Equipment
Risk assessment issues
Context: Relating the investigation to the context

http://www.sci-ed-ga.org/modules/materialscience/light/pdf/section_07.pdf

Experiment 1:
The Room Temperature Filament Resistance of Different Wattage Light Bulbs

Purpose:
Determine the relationship between the wattage of a light bulb and the measured value of the filament resistance.

Materials Needed:
1. Ohmmeter - digital auto-ranging preferred, such as the VWR P/N 26983-175
2. 100 W light bulb
3. Optional - other wattage light bulbs

Procedure:
1. Measure the resistance of the filament of the 100 W (or other) light bulb by connecting one of the probes of the ohmmeter to the bottom contact of the bulb and the other probe to the side of the base of the bulb. This will measure the resistance of the filament, which dominates the resistance being measured.
2. Determine the resistance of the filament using the equation relating the wattage of the bulb to the filament resistance.
3. Discuss why the value of the resistance determined experimentally in step 1 differs from that obtained theoretically in step
4. Optional. Repeat steps 1-3 for other wattage bulbs.

Measuring resistance with a voltmeter and an ammeter

Determining resistance from measurements of potential difference (p.d.) and current.

Apparatus and materials

Ammeter, 0 to 1 A, DC
Voltmeter, (0-15 V), DC
Power supply, low voltage, DC
Lamp (12 V, 6 W) in holder
Resistor (approx 15 ohms, 10 watt)
Various other components

Health & Safety and Technical notes

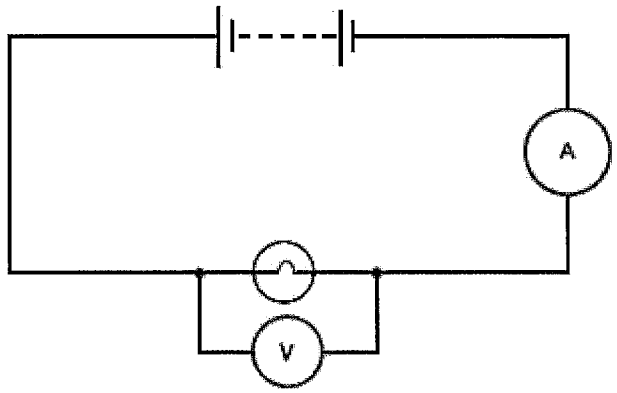
Remind the class that the lamp will get hot, so it should only be moved by handling the lamp holder.

Procedure

a Set up the circuit shown. Turn the power supply up until the p.d. across the lamp is 12V (the normal operating voltage).

b Take readings of the p.d. and current.

c Calculate the resistance of the lamp at its running temperature.



d Now, for several different values of p.d., measure the current through the lamp. Plot a graph of your results; this graph is known as the **voltage-current characteristic** of the lamp.