

Learning Objectives for revision session

CHAPTER 1: FUNDAMENTAL IDEAS

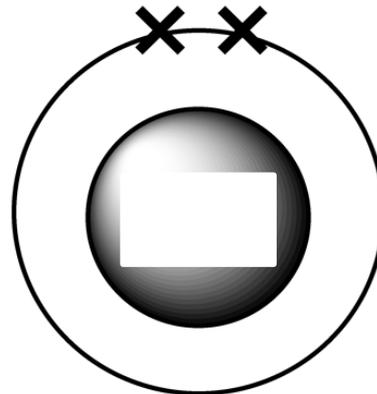
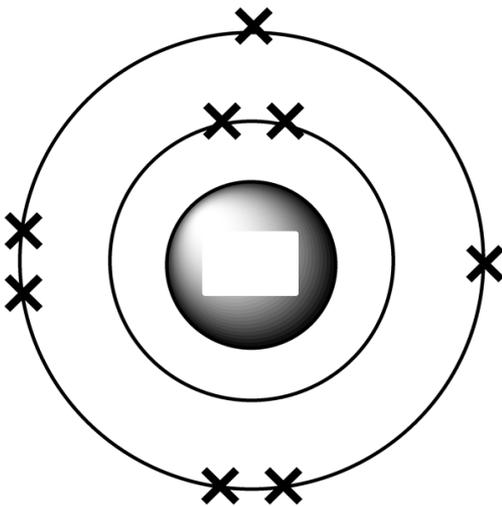
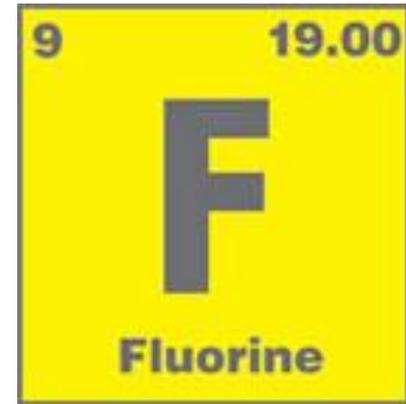
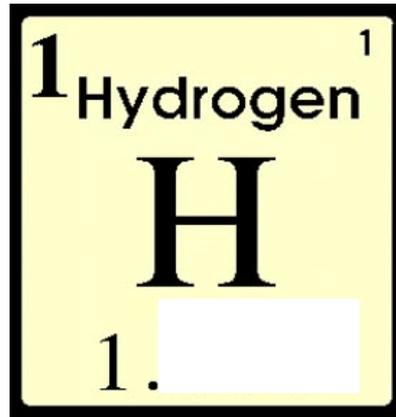
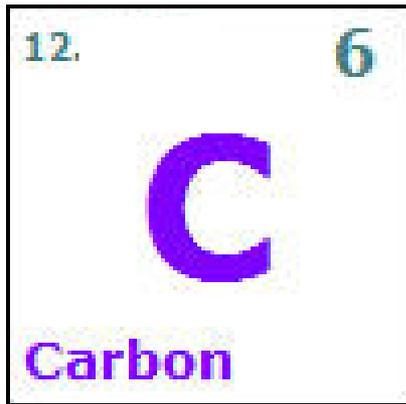
1. Be confident with the periodic table
2. Know what elements are made from
3. Know what a compound is
4. Know how to draw and label an atom
5. Recognise the difference between atomic mass and atomic number
6. Balance equations successfully (H)
7. Know the difference between ionic, covalent and metallic bonds (H)
8. Know what conservation of mass is

Look at your periodic tables

Title: chapter 1- fundamental ideas

1. What is the periodic table? Table of all known elements
2. What do we call group 1 elements? Alkali metals
3. What do we call group 2 elements? Alkaline Earth metals
4. What do we call the elements between group Transition metals
5. What do we call the elements in group 7? halogens
6. What do we call group 8/0 elements? Noble gases
7. Chlorine and fluorine are in group 7. What does that tell you about the two elements?
They both have 7 electrons in their outer shell.
They have similar properties

Atomic number and atomic mass



1. Write down the what the atomic number and atomic mass is
2. Write down the numbers of protons, neutrons and electrons for each element
3. Look at the last two. What elements are they?

Ionic, covalent and metallic bonding

- Ionic- metal and non-metal
- Covalent- non-metals
- Metallic- only metal

CaO

CH₄

MgCl₂

NaCl

Balancing equations

Question: why are atoms neutral?

- They have the same number of protons (positive) and electrons (negative) so they balance each other out and are neutral.

Atoms are made up of three main particles.

(a) Complete the table to show the names and charges of the particles in an atom.

Name of particle	Charge
proton	+
Neutron	0
electron	-1

(2)

Use the periodic table on the Data Sheet to help you answer these questions.

(b) Why are lithium and sodium in the Group 1 of the periodic table?

Same number of electrons in their outer shell

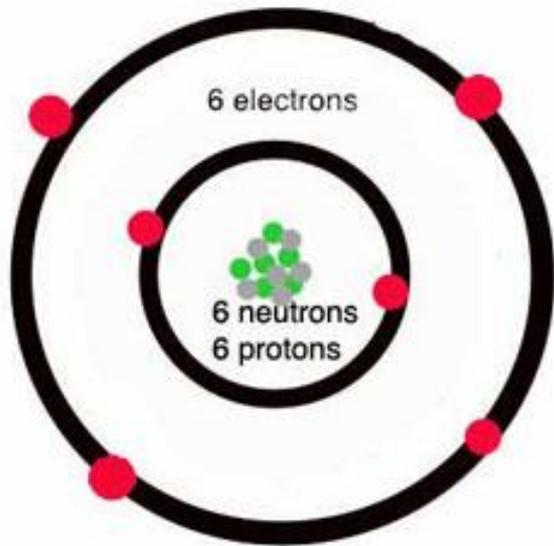
OR

They have similar properties

(1)

Carbon is an important element in maintaining life.

(a) Draw and label a diagram of an atom of carbon. Include the correct names of the particles.



Look at carbon on the periodic table.

It has:

6 electrons

6 protons and

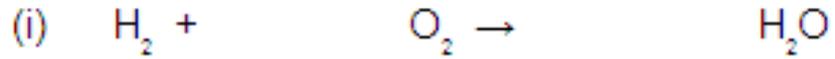
$12 - 6 = 6$ neutrons

The neutrons and protons go in the middle (in the nucleus)
This makes the mass number.

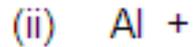
The electrons go in the outside, and have to be arranged properly. 2 in the first shell and 4 in the other
($2 + 4 = 6$)

(4)

(a) Balance these chemical equations.



(1)



(1)

(b) Briefly explain why

a) (i) $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$ *both circled correct

for 1 mark

1

(ii) $4\text{Al} + 3\text{O}_2 \rightarrow 2\text{Al}_2\text{O}_3$ all circled correct for 1 mark

1

(b) *idea that:*

must end up with the same number of atoms as at the start

any 2 each

otherwise matter is shown to be lost/gained

for 1 mark

won't show correct amount of each element/compound

2

... a reaction.

(2)

(Total 4 marks)

Atoms are made up of three main particles called protons, neutrons and electrons.

Use the periodic table on the data sheet to help you to answer these questions.

(a) Sodium is in Group 1 of the periodic table.

(i) Why are potassium and sodium in the same Group of the periodic table?

1 electron in outer shell OR
Similar properties

(1)

(ii) How many protons are in an atom of sodium? ...

Look on the periodic table. It has an atomic number of 11. So 11 is the answer

(1)

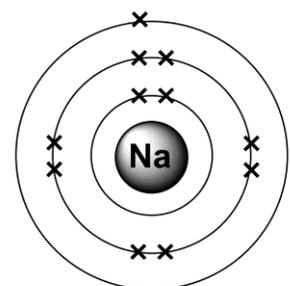
(iii) The atomic number of sodium is 11.

How many neutrons are in an atom of sodium with mass number 23?

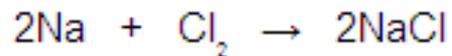
23-11= number of neutrons= 12

(1)

(iv) Each sodium atom has 11 electrons. Complete the electronic structure of sodium.



(a) The chemical equation for a reaction of sodium is shown below.



Describe this reaction of sodium in terms of the names of the substances and the numbers of the atoms involved.

1 mark- 2 sodium atoms **reacts** with 2 chlorine atoms. They are both the **reactants**

1 mark- sodium chloride is the **product**

1 mark- sodium chloride is a **compound** as sodium is **bonded** to chlorine

.....

.....

(3)

Limestone has been called the Earth's most useful rock.

(a) Limestone contains calcium carbonate, CaCO_3 .

(i) Complete the table to show the number of atoms of each element in the formula of calcium carbonate.

Calcium has been done for you.

Element	Number of atoms in the formula CaCO_3
Calcium, Ca	1
Carbon, C	1
Oxygen, O	3

(2)

(i) Argon is an *element*.

What is an *element*?

Something that is made up of the SAME atoms
Argon element is made up of argon atoms

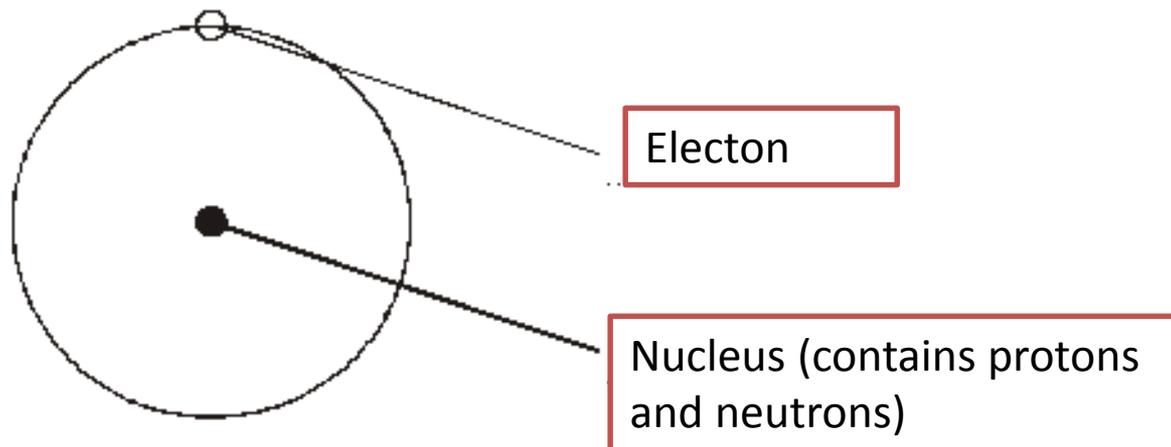
(1)

Hydrogen is an element.

(a) The diagram shows the parts of a hydrogen atom.

Use words from the box to label the diagram.

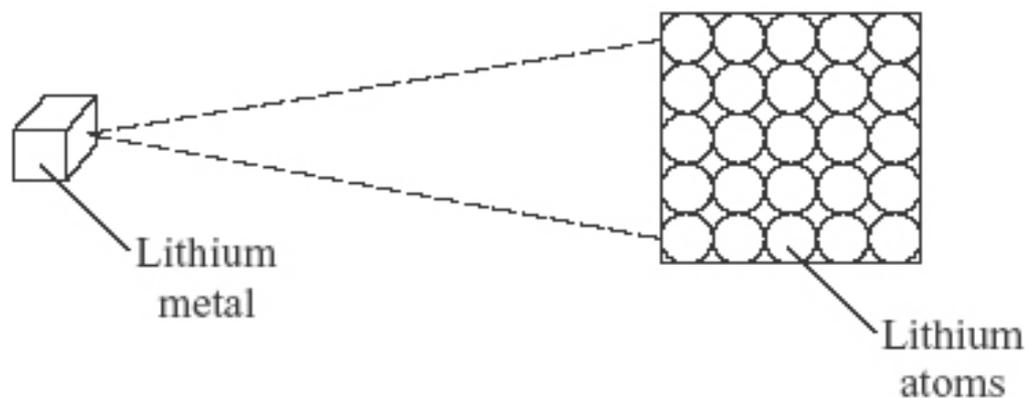
electron	group	nucleus	symbol
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(2)

Lithium metal is used in alkaline batteries.

(a) The diagram shows the atoms in lithium metal.

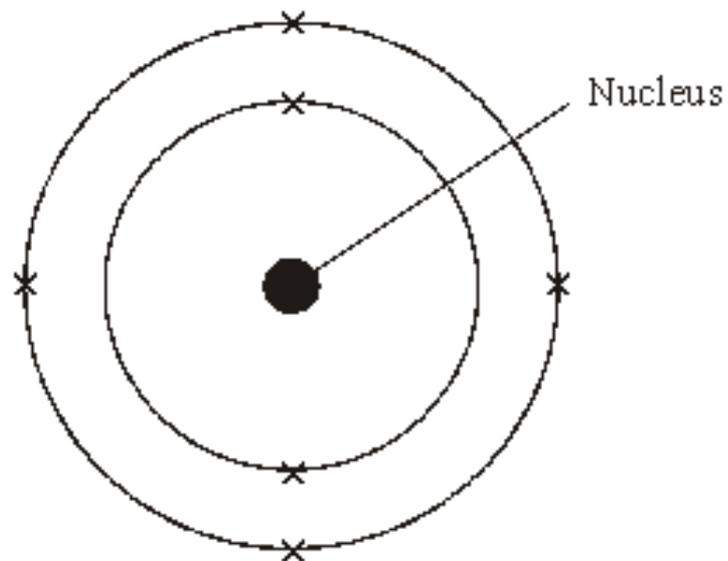


Why is lithium metal described as an element?

It is made up of only one type of atom- lithium atoms

(1)

The diagram represents the electronic structure of an atom of an element.



The periodic table on the Data Sheet may help you with this question.

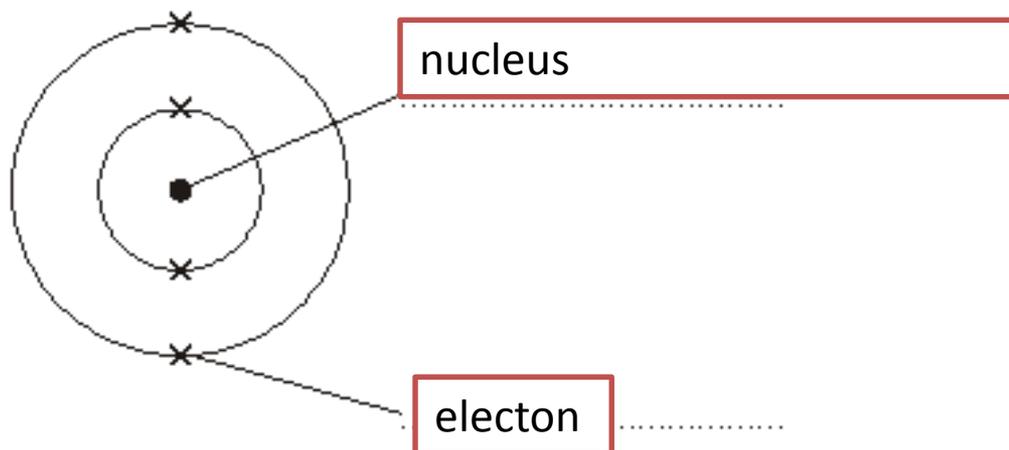
(a) Name this element.

Carbon as it has 6 electrons.

(1)

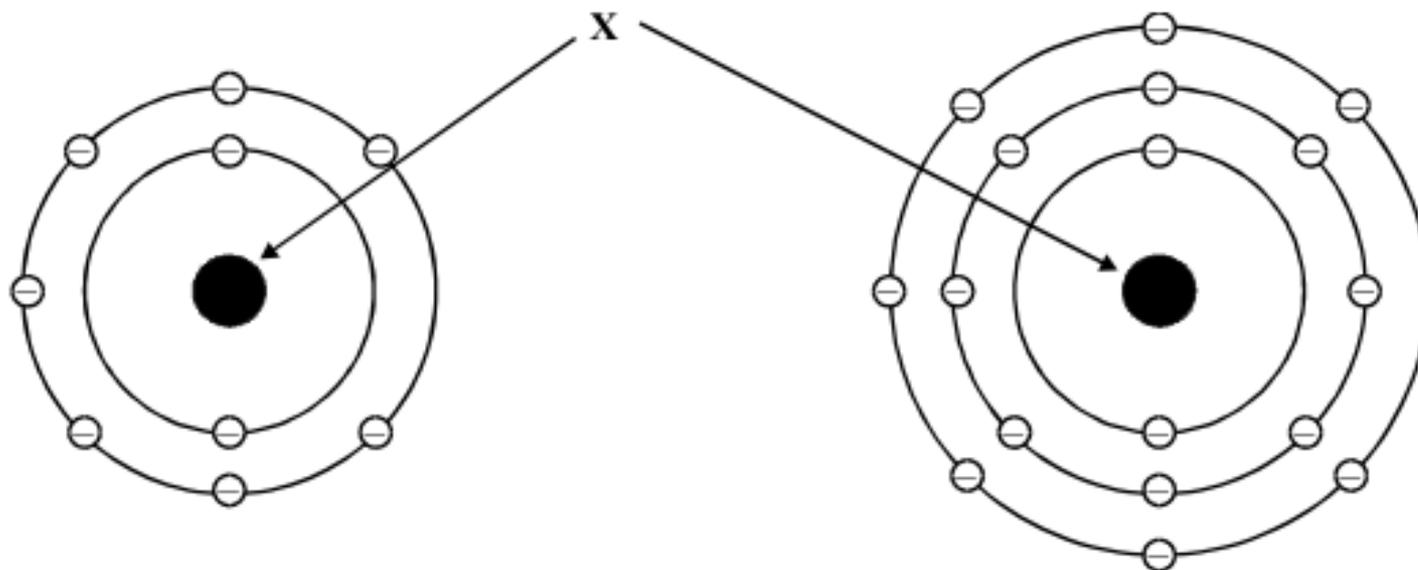
- (a) The diagram represents an atom of beryllium. Use words from the box to label the diagram.

electron **ion** **isotope** **molecule** **nucleus**



(2)

The diagrams show the electronic arrangement of the atoms of two elements.



- (i) Name the part of the atoms labelled X.

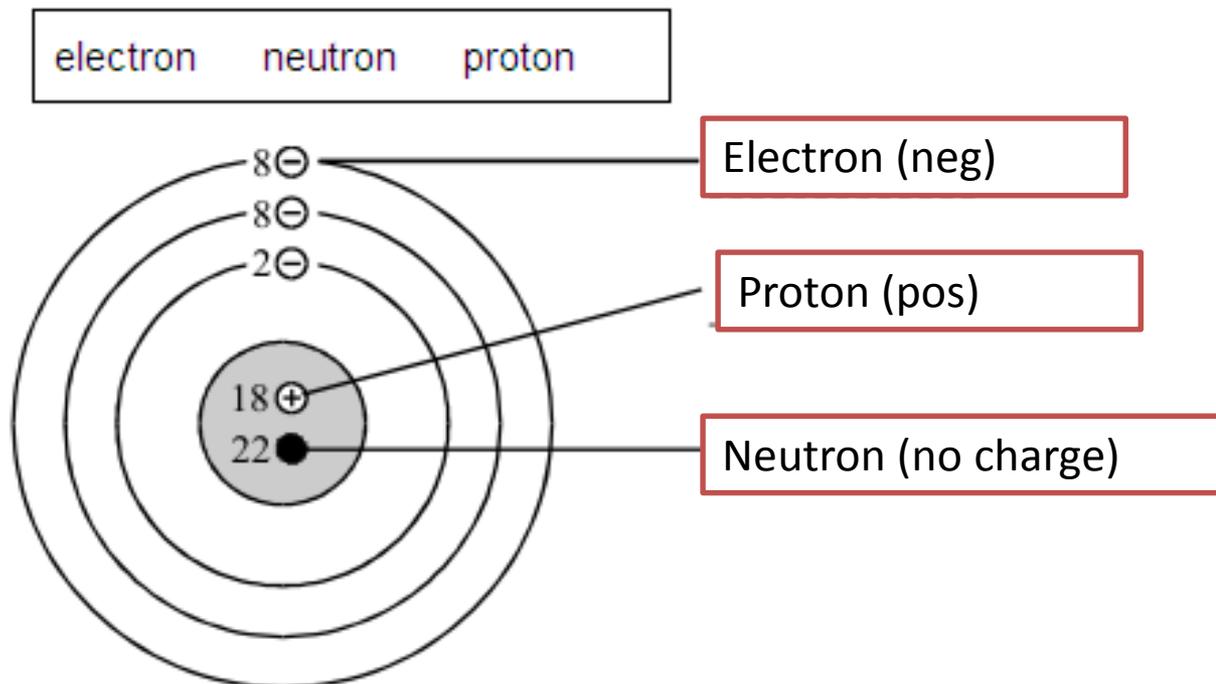
nucleus

(1)

- (ii) Why are these two elements in the same group of the Periodic Table?

You can't say they have similar properties even though they do. As the question is asking you to look at them....so looking at them, the answer must be that they have the same number of electrons in their outer shell

- (a) (i) An argon atom has the structure shown. Use the words in the box to label the particles in the atom. Each word should only be used **once**.

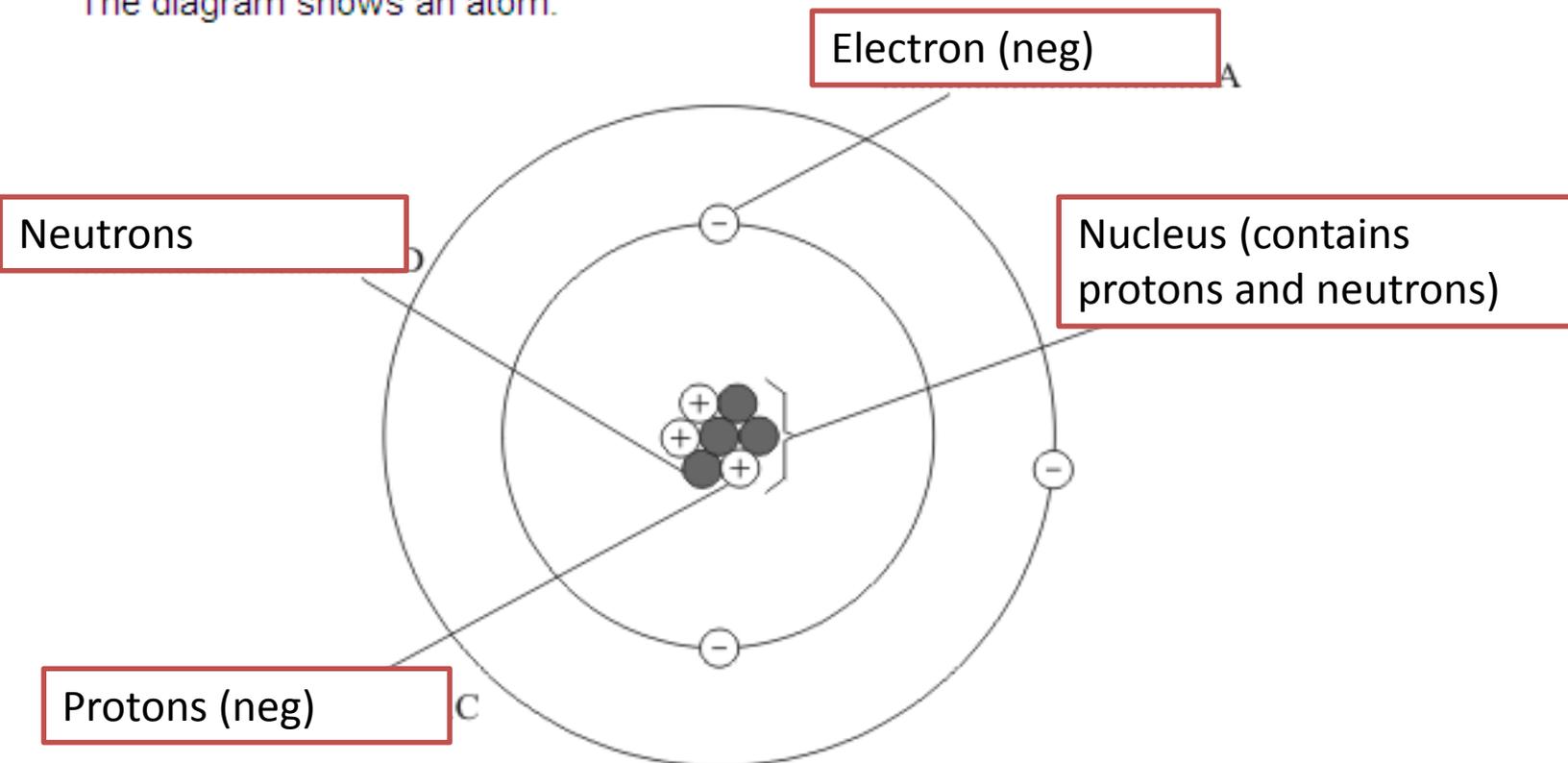


(2)

- (ii) Argon is unreactive. Why?

Full number of electrons in outer shell. ANY ELECTRON IN GROUP 8 HAS A FULL NUMBER OF ELECTRTONS IN THEIR OUTER SHELL

The diagram shows an atom.



(a) On the diagram, write the names of structures **A**, **B**, **C** and **D**.

(4)

(b) To which Group of the periodic table does this atom belong?

It has one electron in its outer shell. So it must be group 1! (EXTRA-
There are 3 electrons altogether so it must be the element lithium)

Learning Objectives for revision session

CHAPTER 2: ROCKS AND BUILDING MATERIALS

1. Recognise what a carbonate is
2. Know the word and chemical equation for the breakdown of limestone
3. Be able to describe the limestone cycle
4. Know the test for carbon dioxide (and what happens!)
5. Know how to make cement, concrete, mortar and glass using calcium carbonate
6. Longer answer question: limestone issues

Write down the advantages and disadvantages of limestone quarrying

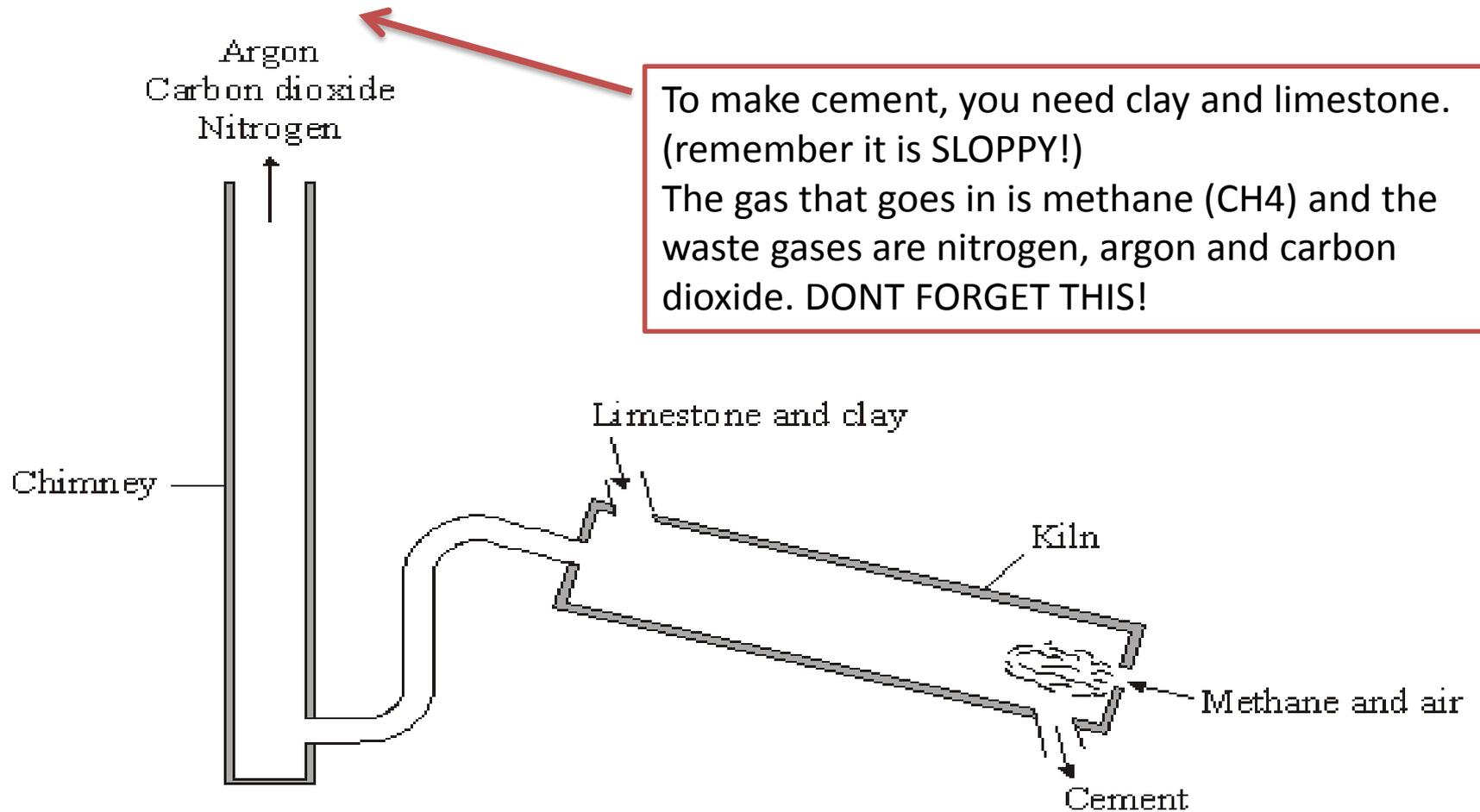
- Before you start writing, always do a 30 second quick table like this. Examiners like this. And it helps you remember things when writing....

Advantages	Disadvantages
Old quarries turned into parks	Noise pollution
Jobs so helps the economy	Traffic
New roads	Dust means greater chance of occupational diseases such as asthma
Better roads means more tourists which helps support local shops	Destroys habitats
Use the limestone for buildings or use the limestone to make GLASS, CEMENT, CONCRETE OR MORTAR	Reduces quality of life

How to remember how glass, cement, concrete and mortar are made

Substance	How I remember it	How it is made
Glass	L, S, S (the letters from glass)	Limestone, sand, sodium carbonate
Cement	It's sloppy	Clay (sloppy) and limestone
Concrete	Its hard- C, C, S	Cement (contains the limestone), crushed rock (also called aggregate) and sand
Mortar	Its like concrete but it's softer, so doesn't contain crushed rock	Cement and sand (and some water!)

(b) At a cement works, limestone is mixed with clay and heated in a kiln.



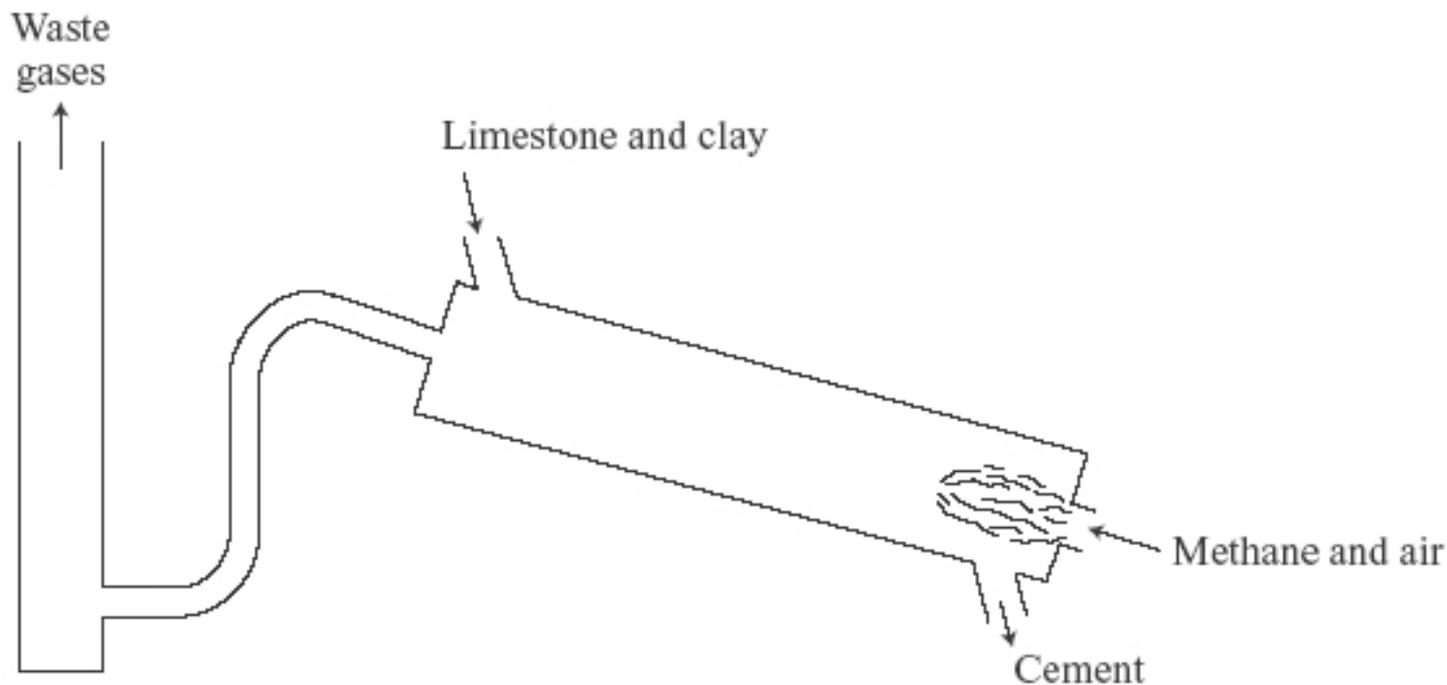
To make cement, you need clay and limestone. (remember it is SLOPPY!)
The gas that goes in is methane (CH_4) and the waste gases are nitrogen, argon and carbon dioxide. DONT FORGET THIS!

Use the information in the diagram to answer these questions.

(i) Name the fuel that is used to heat the limestone and clay.

Methane

(a) Limestone is used to make cement in a rotary kiln.

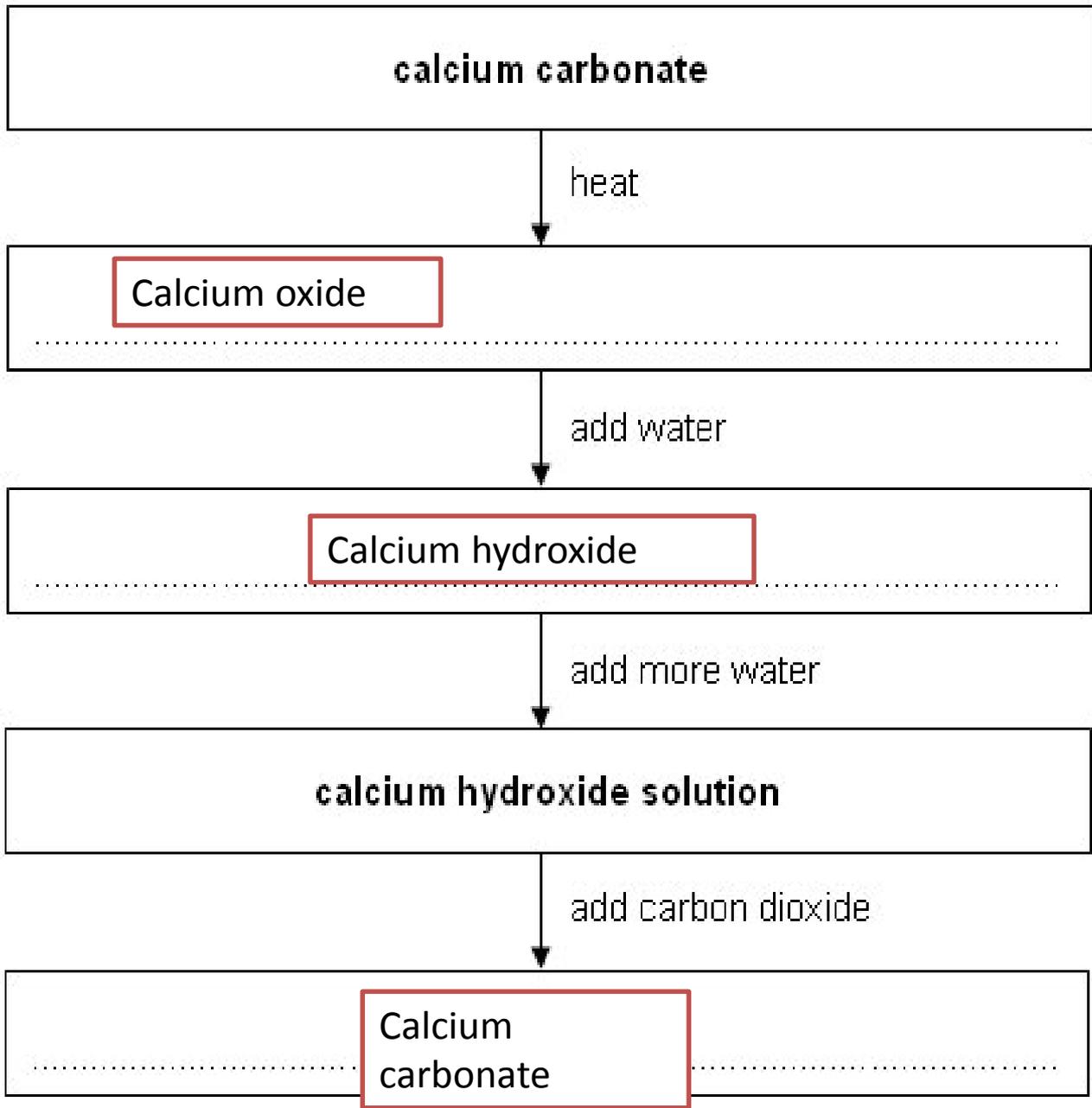


Use the information in the diagram to name the **two** main waste gases from this rotary kiln.

1

2

- a) any **two** from:
- nitrogen
 - carbon dioxide
 - water (vapour) / steam
- accept formulae N / N₂
accept formula CO₂
ignore CO
accept formula H₂O



Suggest why the new cement works might reduce carbon dioxide emissions.

Carbon dioxide is
a greenhouse
gas

So it causes
climate change
called GLOBAL
WARMING

(1)

- (a) Limestone is a hard rock that is used as a building material.
Limestone was used by the Egyptians to make plaster.

Reaction 1 – calcium carbonate, CaCO_3 , was decomposed by heating limestone



Reaction 2 – water was added to the solid produced to make slaked lime



Reaction 3 – a mixture of slaked lime and water was used as plaster. After the plaster had set it became even harder with age



- (i) Name the solid formed when calcium carbonate decomposed.

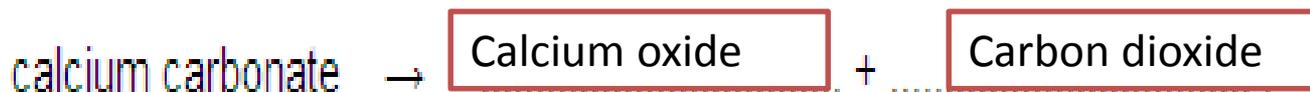
..... Calcium oxide

(1)

Limestone is mainly calcium carbonate.

(a) Quicklime is produced by heating limestone.

(i) Complete the word equation for this reaction by writing the chemical name of the solid and the gas produced.



(2)

(ii) What is the name for this type of chemical reaction?

(1)

Limestone contains calcium carbonate.

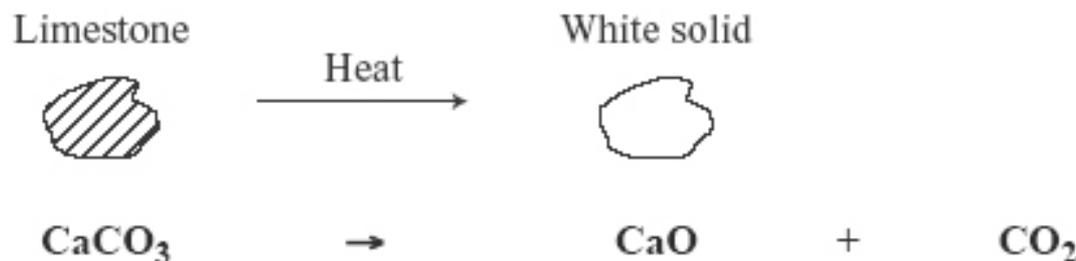
(a) Calcium carbonate has the formula CaCO_3 .

Complete the sentence by writing in the correct numbers.

The formula of calcium carbonate is made up of 1 calcium atom, carbon atom(s) and oxygen atom(s).

(2)

(b) When limestone is heated it forms two other compounds.



(i) State **one** safety precaution that you should take when heating limestone.

Remember in a safety precaution you say the risk and what you would do...e.g. Heat can burn, so use tongs to handle the products, or wear goggles or a mask

(1)

Complete each sentence by choosing the correct words from the box.

clay	limestone	salt	slaked lime	water
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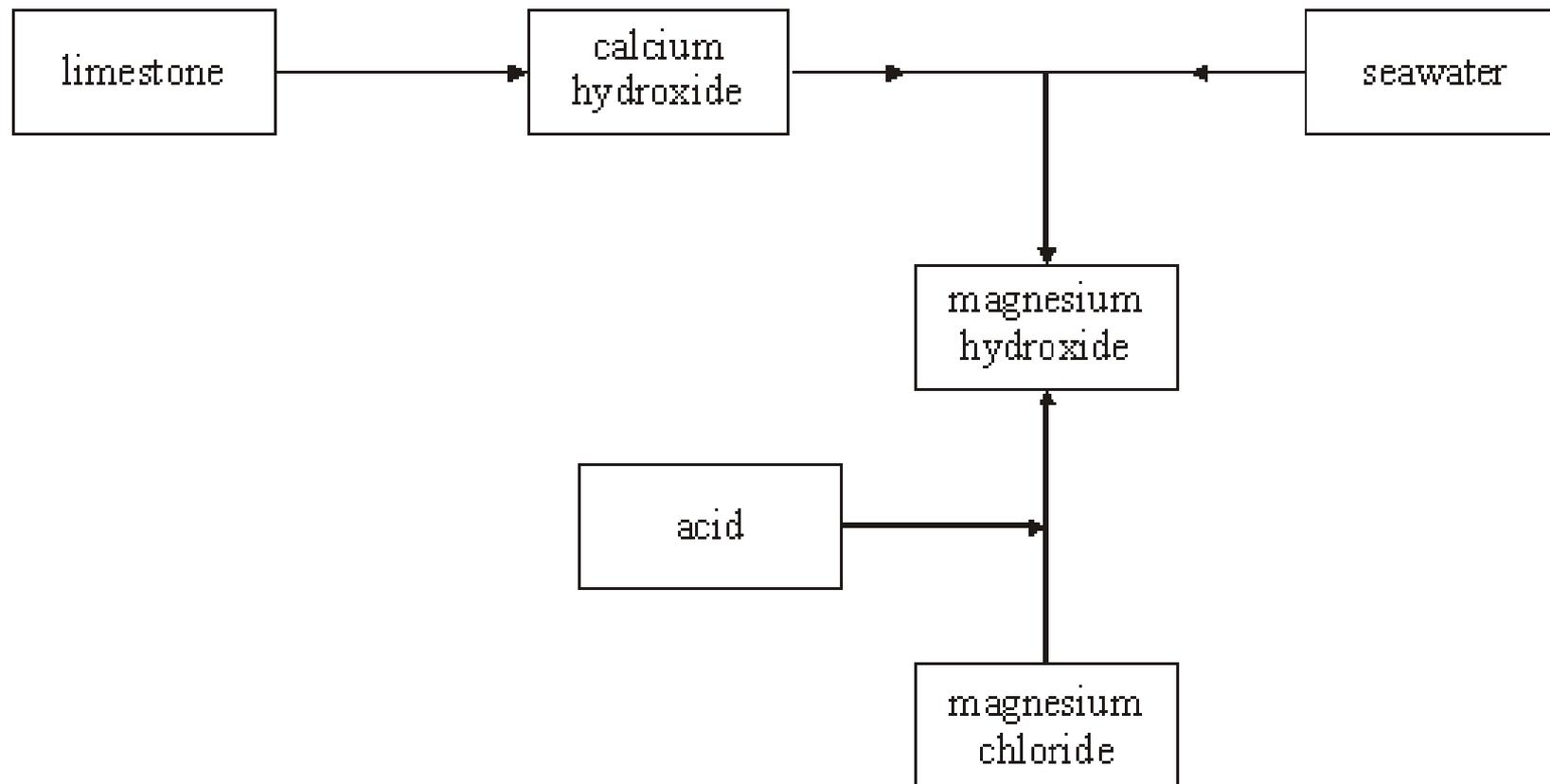
Cement is made by heating..... and in a rotary kiln.

To make concrete, the contents of the bag of readi-to-mix concrete must be mixed with

.....

(Total 3 marks)

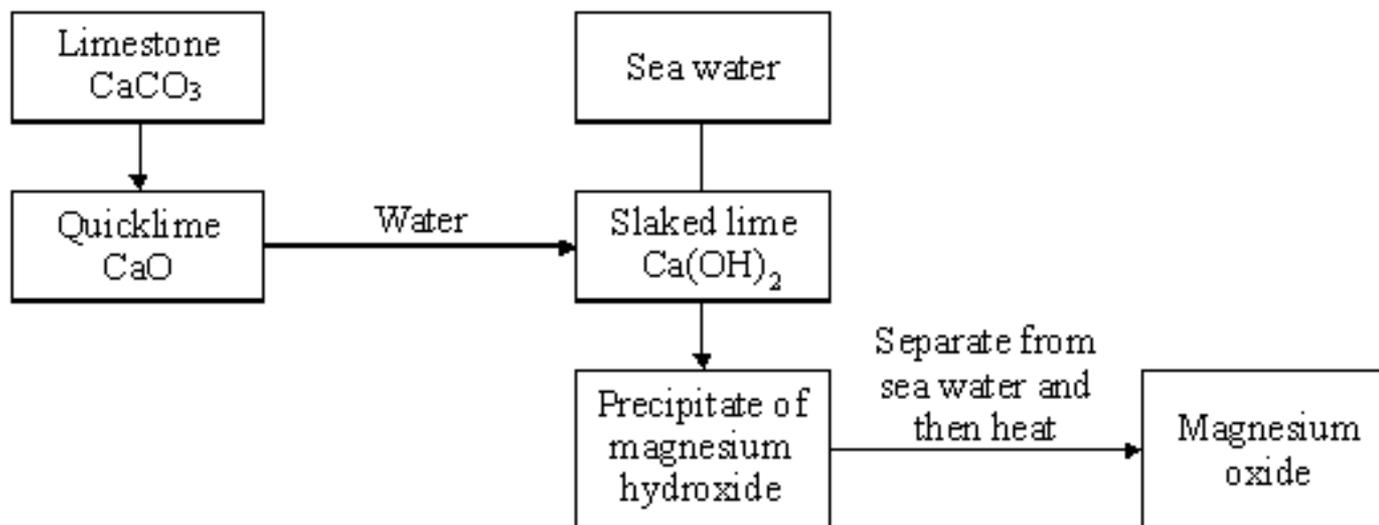
Magnesium chloride is a useful salt.
The flow diagram shows how it can be made.



(i) Describe how calcium hydroxide can be made from limestone.

Heat limestone to make calcium oxide. If you then add water, you will make calcium hydroxide

Sea water contains magnesium ions. Magnesium oxide can be obtained from sea water using the following process.



(a) State the chemical name for limestone.

NAME not chemical formula. So the answer is calcium carbonate

(1)

(b) Write a word equation for the action of heat on limestone.

limestone → quicklime + carbon dioxide

(2)

Or

Calcium carbonate → calcium oxide + carbon dioxide

(a) The *thermal decomposition* of calcium carbonate makes a white solid and carbon dioxide.

(i) Name a naturally occurring form of calcium carbonate.

Limestone

(1)

(ii) What does *thermal decomposition* mean?

2 marks so

A chemical reaction where you **BREAK DOWN** using **HEAT**

(2)

(iii) Suggest and explain the purpose of the coal.

to burn / react with air / oxygen

1

release energy / heat / exothermic /
keeps temperature high

Coal takes in carbon dioxide

(iv) Write a word equation for the thermal decomposition of calcium carbonate.

Calcium
carbonate

→

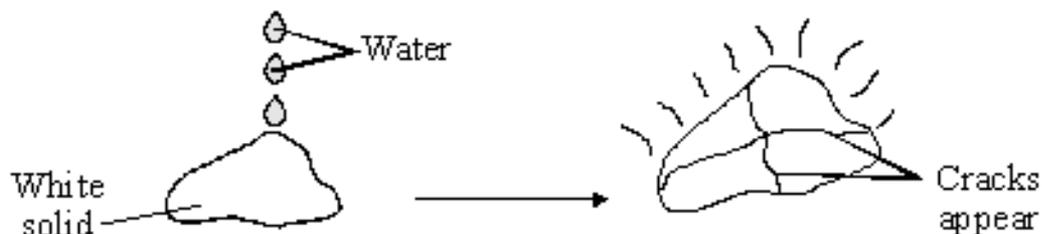
Calcium oxide

+

Carbon dioxide

(2)

(b) The diagrams show what happens when drops of cold water are added to the white solid formed by heating calcium carbonate.



(ii) What type of chemical reaction takes place?

Hydration (adding water)

(1)

(ii) Give the chemical name of the solid formed. Give a use of this solid.

Name ... Calcium hydroxide/slaked lime

Use

mortar / neutralise acidity in soil / neutralise
acid lake water / soften
hard water / to make cement
not in agriculture
not to make lime water

(2)

Learning Objectives for revision session

CHAPTER 3: METALS AND THEIR USES

1. Know what the reactivity series is
2. Recognise what reactivity means
3. Know the definition of an ore
4. Know what an alloy is
5. Explain why alloys are stronger than pure metals
6. Describe the alloys steel, brass and bronze
7. Explain the uses of aluminium and titanium
8. Be able to explain how we can extract copper
9. Know what transition metals can be used for
10. Longer answer question: metallic issues (extraction)
11. Longer answer question: metallic issues (metals in construction)

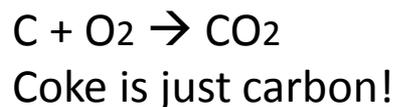
Key points you might have missed

- Metals are mostly found on the earth's crust
- An ore is a rock that contains enough metal to make it worth extracting
- There are different extraction methods depending on the reactivity of the metal
- Alloys are mixtures of metals and they are stronger than pure metals as they are not arranged in layers so don't slide over each other.
- Steel is an alloy that contains a lot of the element iron.
- Brass and bronze are alloys that contain copper.
- Iron and steel can rust 😞
- Aluminium and titanium are pure metals. They form oxide layers which makes them resist corrosion (resist rusting).
- Copper can be extracted by: smelting (heating the copper and then it undergoes electrolysis), phytomining (P for plants) or bioleaching (B for bacteria).
- Displacement reactions are when a more reactive metal takes over a less reactive metal. E.g. Copper oxide + aluminium → copper + aluminium oxide...because the aluminium is more reactive, it take the oxygen.
- Iron is cheap.
- COKE is just another name for carbon
- Smart alloys go back to their normal shape

Most metals are extracted from ores, which are mined from the Earth's crust.

In a blast furnace coke is heated in air to form carbon dioxide.

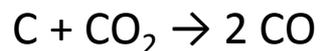
- (a) (i) Give the symbol equation for this reaction.



(1)

- (ii) The carbon dioxide then reacts with more coke.

Write a balanced symbol equation for this reaction.



(2)

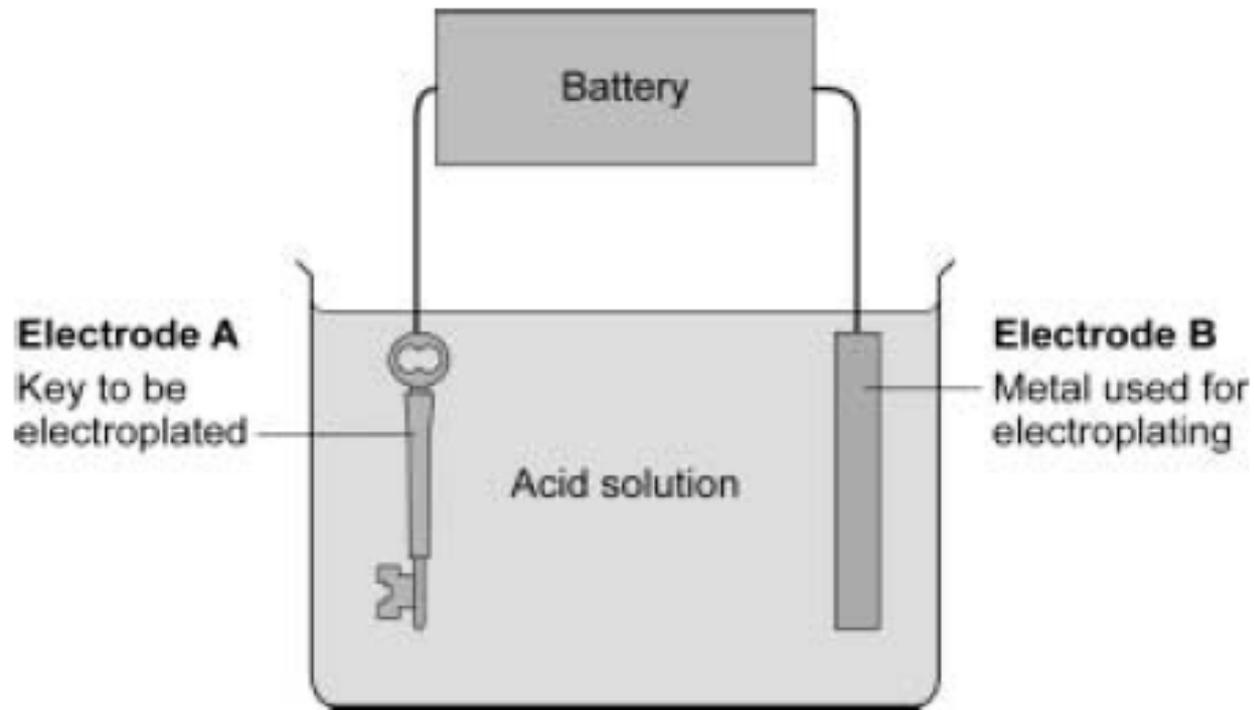
- (b) The chemical equation shows a reaction that occurs when iron is produced.



- (i) Balance the equation above by writing the correct numbers in the spaces in the equation.

(2)

The diagram shows how a key can be electroplated. The key and the metal used for electroplating are used as the electrodes.



(a) Name electrodes **A** and **B**.

A ..

B ..

(2)

Copper is found in the Earth's crust as an ore containing copper sulfide. Large areas of land, where this ore was once quarried, are contaminated with low percentages of copper sulfide. Copper would be too expensive to extract from this contaminated land using the traditional method of quarrying and then heating in a furnace.

- (a) Extracting copper from this land by the traditional method would have a major environmental impact.

Give **two** reasons why.

The traditional method of extracting copper is called quarrying and then smelting.

The ore is copper sulfide (so it contains sulphur).

Smelting requires heating the ore. So if you heat the ore, you will produce sulphur dioxide as oxygen from the air would react with the sulphur in the ore.

(b)

Two environmental impacts-

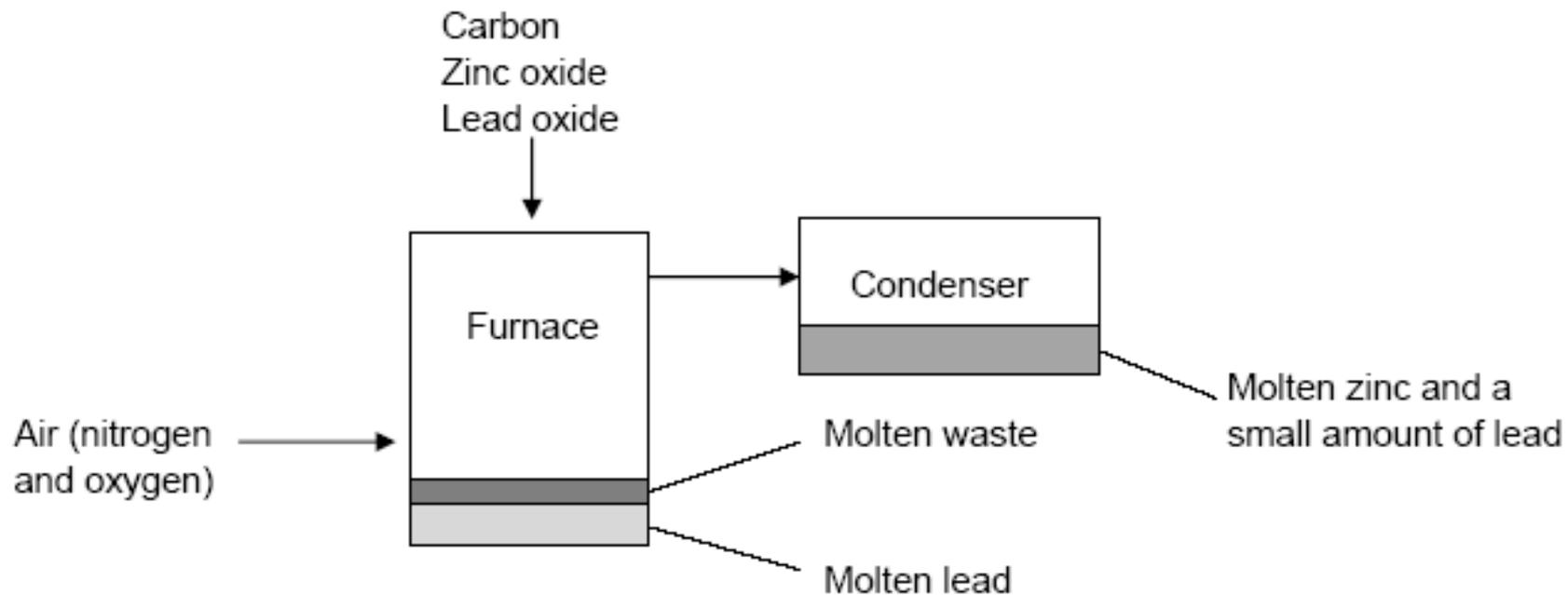
- 1. acid rain from the sulphur dioxide**
- 2. Large amounts of solid waste from quarrying**

Remember these, especially the second one as it comes up quite often- quarrying produces a lot of solid waste which is an environmental problem.

(2)

sulfide is
er

Nearly all zinc is obtained from ores that also contain lead. The metals zinc and lead can be extracted by reducing their oxides using carbon.



(a) Complete the following sentence.

Zinc oxide is reduced by carbon, which takes away to leave zinc metal.

(1)

Copper is found in the Earth's crust as an ore containing copper sulfide. Large areas of land, where this ore was once quarried, are contaminated with low percentages of copper sulfide. Copper would be too expensive to extract from this contaminated land using the traditional method of quarrying and then heating in a furnace.

- (a) The percentage of copper ore in the contaminated land is low.
- (i) It would be too expensive to extract from this land by the traditional method.

Explain why.

The key word is expensive. It would be expensive as you would need a lot of ENERGY to extract just a little bit of copper. OR you could say it requires a lot of work to extract just a tiny bit.

(1)

- (ii) Extracting copper from this land by the traditional method would have a major environmental impact.

Give **one** reason why.

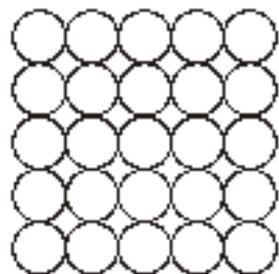
Told you- this question comes up again and again....

Traditional method is quarrying....**so lots of solid waste** is the answer.

(1)

Iron is the main structural metal used in the world.

(a) The diagram represents the particles in iron, Fe.



Draw a ring around the correct word in the box to complete the sentence.

Iron is described as an element because all the

atoms

compounds

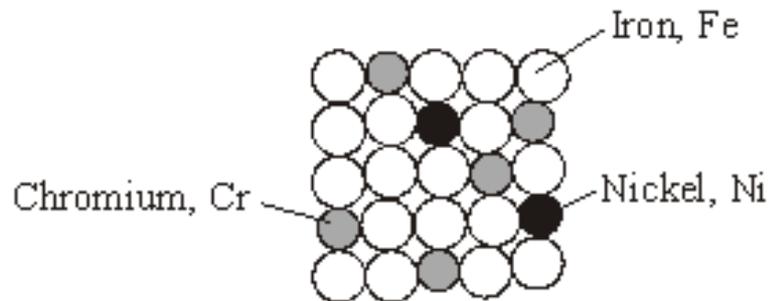
metals

are the same.

(1)

(b) Stainless steel is mostly iron.

The diagram represents the particles in stainless steel.



Use the correct words from the box to complete the sentences about alloys.

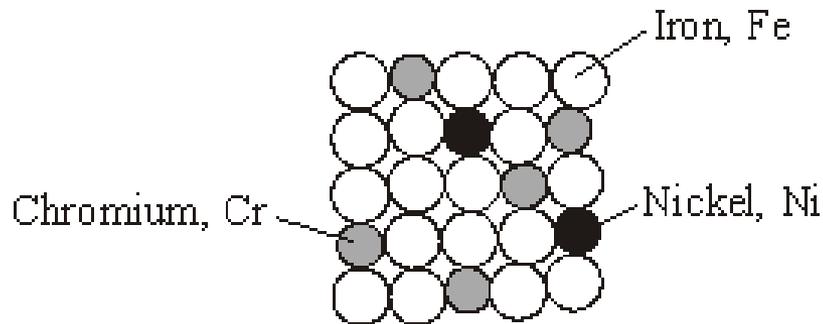
metal mixture molecule polymer smart structure

Stainless steel is an alloy because it is a **mixture** of iron, chromium and nickel.

An alloy is made up of more than one type of **metal**.

Stainless steel alloys are harder than iron because the different sized atoms added

The diagram below represents the particles in stainless steel.



Particle diagram of stainless steel

(a) Use the particle diagram to complete the percentages of metals

The first one has been done for you.

Element	Percentage (%)
Iron, Fe	72
Chromium, Cr	20%
Nickel, Ni	8%

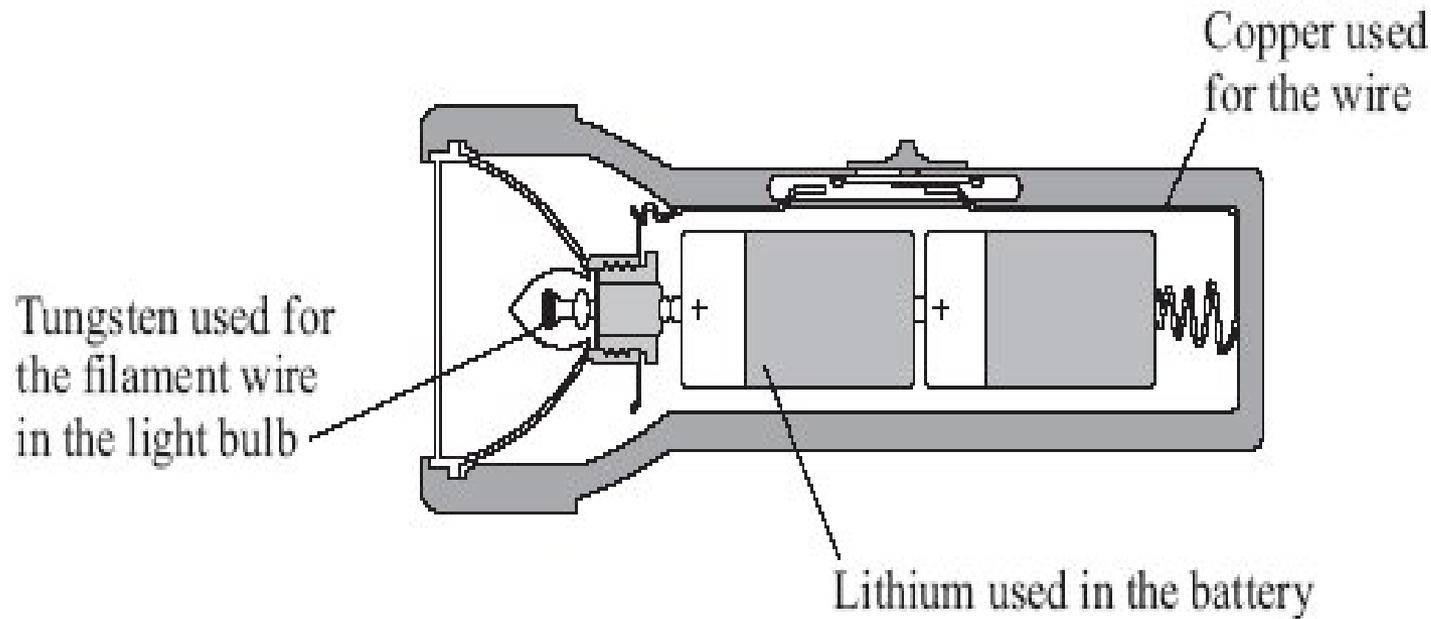
There are 25 dots.
Iron dots = 18. so
 $18/25 = 0.72 \times 100 = 72\%$

Chromium dots = 5.
So $5/25 = 0.2 \times 100 = 20\%$

Nickel dots = 2/25 =
 $0.08 \times 100 = 8\%$

Check by adding them
all up. It should make
100%

The diagram shows a circuit that is used in a torch. Electrons flow through this circuit.



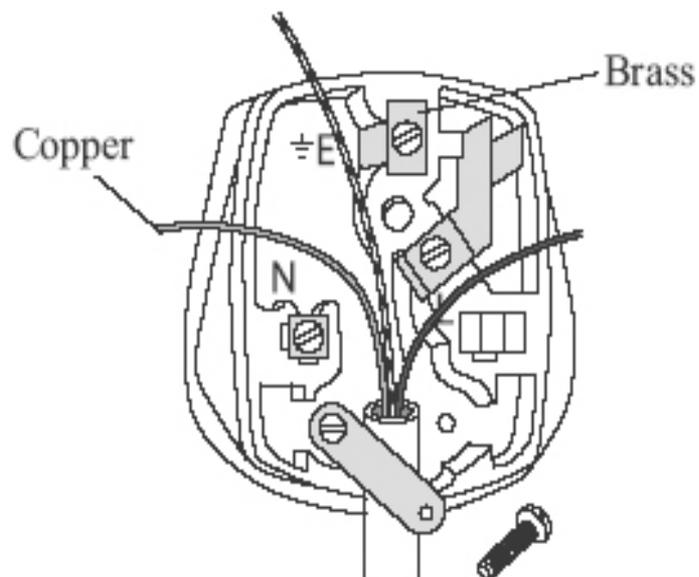
(a) Why is copper used for the wire?

Copper is a good conductor of electricity

(1)

Copper metal is used for electric wires.

An alloy of copper, called brass, is used for pins and terminals of electric plugs.



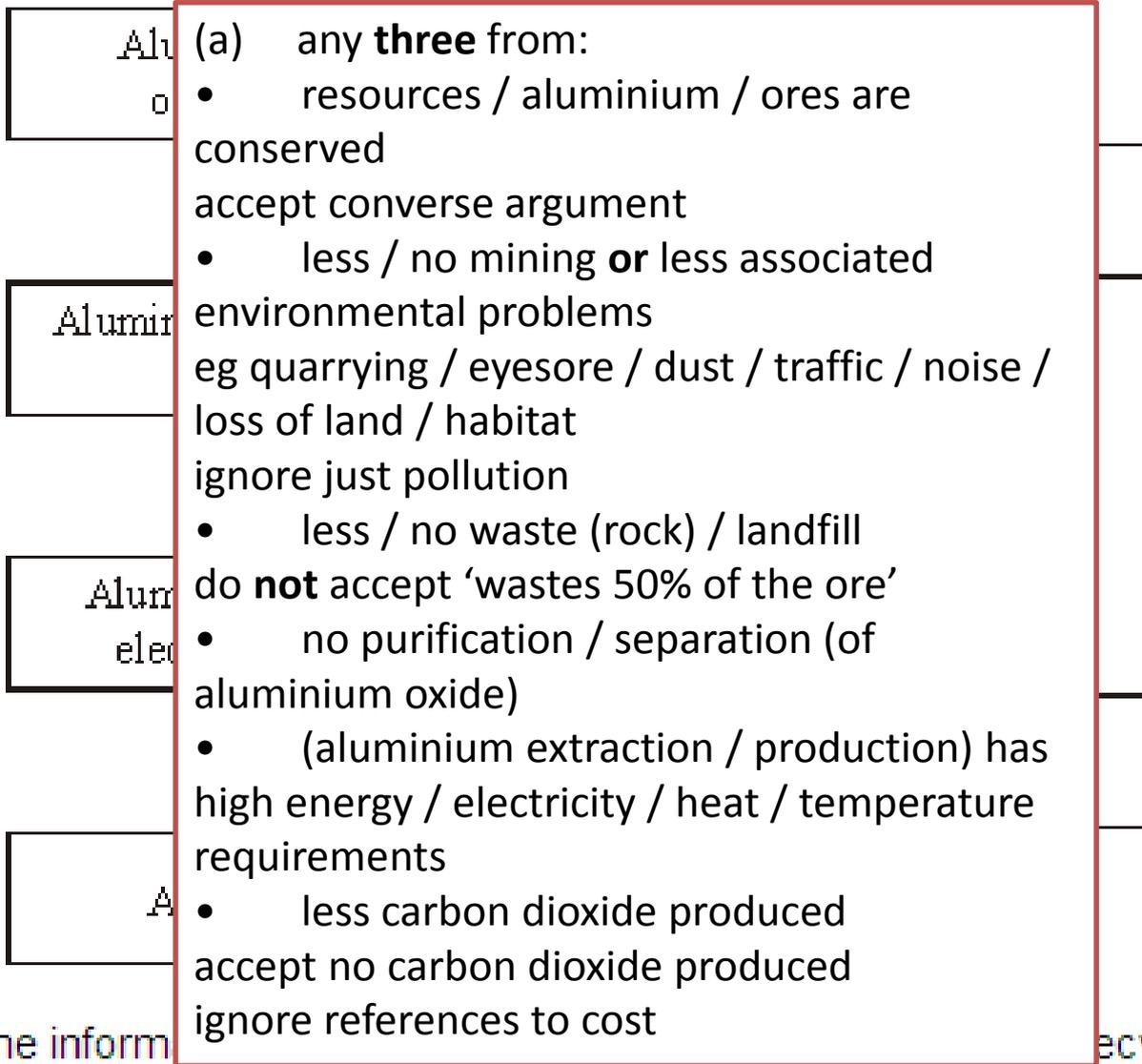
(a) Copper metal is relatively soft and flexible.

Give another reason why copper is used for electric wires.

Good
conductor of
electricity

(1)

The main steps in the extraction of aluminium are shown in the flow chart.



(a) Use the inform

Metals and their alloys have many uses.

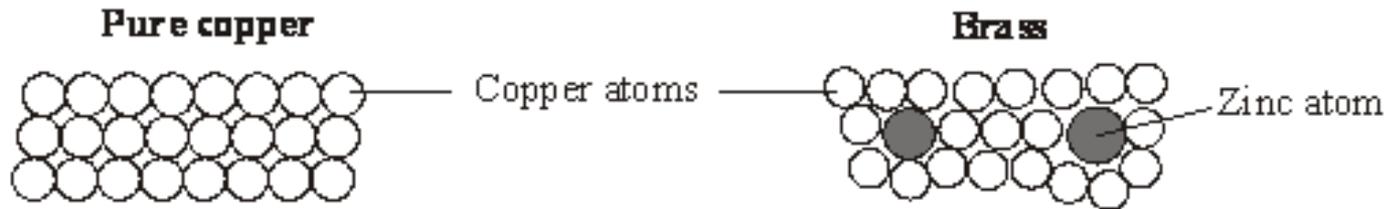
- (a) Dentists use a smart alloy to make braces that gently push teeth into the right position.

What is meant by a *smart alloy*?

It can go back to its original shape

(1)

- (b) Pure copper is made up of layers of copper atoms. Brass is an *alloy* of copper and zinc.



Why are the physical properties of brass different from the physical properties of pure copper?

Brass is an alloy- it contains a mixture of metals.
Therefore, it is not arranged in layers (as the atoms are different sizes) so the atoms don't slide over each other. Therefore, they don't bend so easily, making it stronger

Many everyday items are made from iron.

(a) Haematite is an *ore* of iron. Haematite contains iron oxide, Fe_2O_3 .

(i) What is the meaning of the term *ore*?

A rock that contains enough metal to make it worth extracting

(1)

(ii) Iron can be produced by reacting iron oxide with carbon in a blast furnace.

What type of reaction produces the iron?

Anything with carbon is a REDUCTION REACTION (LOSS OF OXYGEN)

(1)

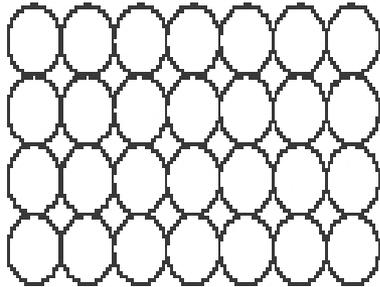
(iii) The word equation for this reaction is:

iron oxide + carbon → iron + carbon dioxide

Complete and balance the symbol equation for this reaction.



(ii) This diagram represents pure iron.



Use the diagram to explain why pure iron is described as an element.

It is only made up of one type of atom – 1 mark

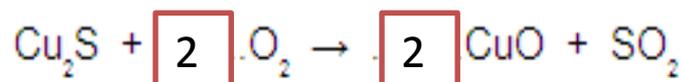
Iron atoms- 1 mark

(2)

Copper is a widely used metal. The main ore of copper contains copper sulfide. Copper can be extracted from copper sulfide in a three stage process.

(a) In the first stage of extraction the copper sulfide is heated in air.

(i) Balance the symbol equation for the reaction.



(1)

(ii) Explain why there would be an environmental problem if the gas from this reaction were allowed to escape into the atmosphere.

The gas is sulphur dioxide

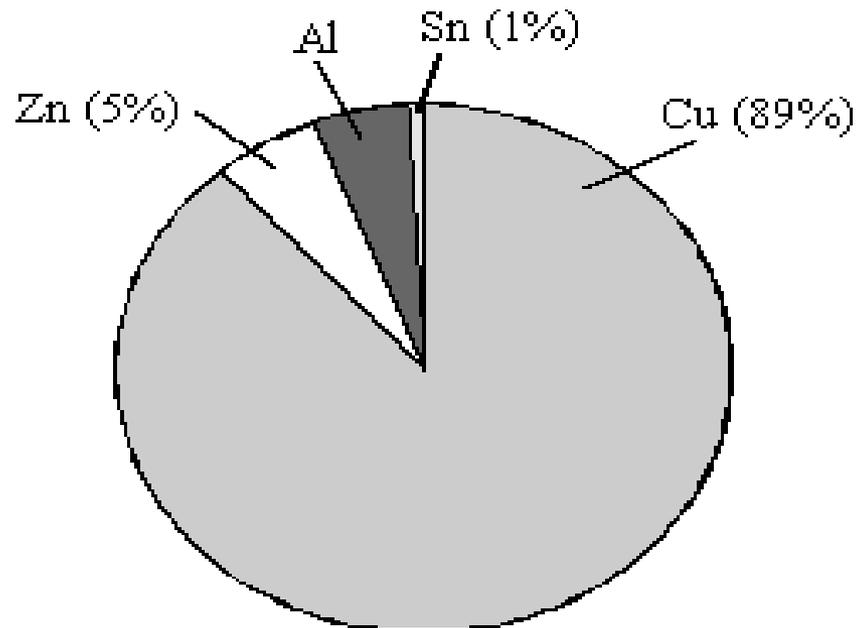
It would cause acid rain which would make lakes acidic and kill fish

(2)

The 50 Eurocent coin is made from an alloy called 'Nordic Gold'.



The pie chart shows the percentage by mass of each metal in 'Nordic Gold'.



A pie chart must add up to 100%.

So $100 - 89, 1, 5 = 5\%$

- (a) (i) Calculate the percentage of aluminium, Al, in the coin.

Remember to revise:

- Methods of extracting copper (smelting then electrolysis, bioleaching or phytomining)
- Traditional methods of extracting copper are quarrying then electrolysis.
- An environmental impact of quarrying is lots of solid waste from rocks etc.
- Iron is cheap

Learning Objectives for revision session

CHAPTER 4: CRUDE OIL AND FUELS

1. Recognise how crude oil is made
2. Recognise that crude oil has to be separated because it is a mixture of different hydrocarbons
3. Describe fractional distillation
4. Recognise that when we burn fuels with enough oxygen (complete combustion) we produce water and carbon dioxide
5. Recognise that when we burn fuels with little oxygen (incomplete combustion) we produce carbon monoxide which is poisonous
6. Know what cleaner fuels are
7. Recognise how we can produce other fuels

Crude oil

- From under the ground (dead animals and plants turned into fossil fuels)
- Crude oil contains a mixture of different sized hydrocarbons
- Some hydrocarbons are small- so they have a low boiling point. Others are big so they have a high boiling point.
- We can separate hydrocarbons by a process called fractional distillation.
- Fractional distillation involves: heating, boiling, evaporating, cooling and condensing the hydrocarbons. This allows them to separate into similar sized hydrocarbons (e.g. Small ones go to the top, biggest ones go to the bottom).
- Burning fuels causes pollution. Fuels contain sulphur too, which reacts with oxygen to produce sulphur dioxide.
- Unburnt carbon is called particulates that causes global dimming and bronchitis.
- Catalytic converters in cars remove nitrogen oxides (cause acid rain) and carbon monoxide (poisonous) before they go into the air from an exhaust.
- We can remove sulphur from fuel too as it burns with oxygen to produce sulphur dioxide otherwise.
- ALTERNATIVE fuels means other fuels instead of using crude oil. They are:
 1. Biofuels (made from plants- so they are renewable)- e.g.s of biofuels are VEGETABLE OILS (produced from olives, rapeseed oil etc by pressing) or ethanol- made from hydration of ethene or by fermentation. Biofuels use plants and the bad thing is we need plants for food not just fuel as it takes up a lot of space. But the good thing is plants take in carbon dioxide by photosynthesis.
 2. Hydrogen as a fuel- the good thing is the only waste product produced is water which is harmless. But it is a gas so it is difficult to store and takes up lots of space. It is produced by electrolysis of water.

Crude oil contains many useful substances.

- (a) What is the name of the process used to separate the useful substances from crude oil?

Fractional distillation

(2)

Fuel scientists develop and blend fuels for use in motor vehicles.

A good fuel has the following characteristics:

- volatile
- easy to ignite
- produces a large amount of energy when it burns
- produces the minimum amount of pollution.

Information about some of the hydrocarbons that are found in petrol is given in the table.

Name	Chemical formula	Melting point in °C	Boiling point in °C
Butane	C_4H_{10}	-138	0
Pentane	C_5H_{12}	-130	36
Hexane	C_6H_{14}	-95	69

(a) (i) Which hydrocarbon in the table is a gas at room temperature?

butane

(1)

(a) The table shows the boiling points of four of these hydrocarbons.

Hydrocarbon	Boiling point in °C
methane, CH ₄	-162
butane, C ₄ H ₁₀	0
pentane, C ₅ H ₁₂	+36
decane, C ₁₀ H ₂₂	+175

Tick (✓) **two** statements that are correct about these hydrocarbons.

Statement	Tick (✓)
decane has the largest molecules	<input type="checkbox"/>
pentane is a liquid at 40°C	<input type="checkbox"/>
methane and butane are gases at 20°C	<input type="checkbox"/>

Crude oil is a mixture of alkanes from which useful fuel fractions can be obtained.

Fraction	A hydrocarbon in this fraction	Boiling point of alkane in °C
petroleum gases	Propane	-42
petrol (gasoline)	Octane	+126
paraffin (kerosene)	Dodecane	+216
diesel	Eicosane	+344

- (a) (i) Suggest the lowest temperature to which crude oil needs to be heated to vaporise all of these fuel fractions.

Temperature 344 – 350(°C) °C

(1)

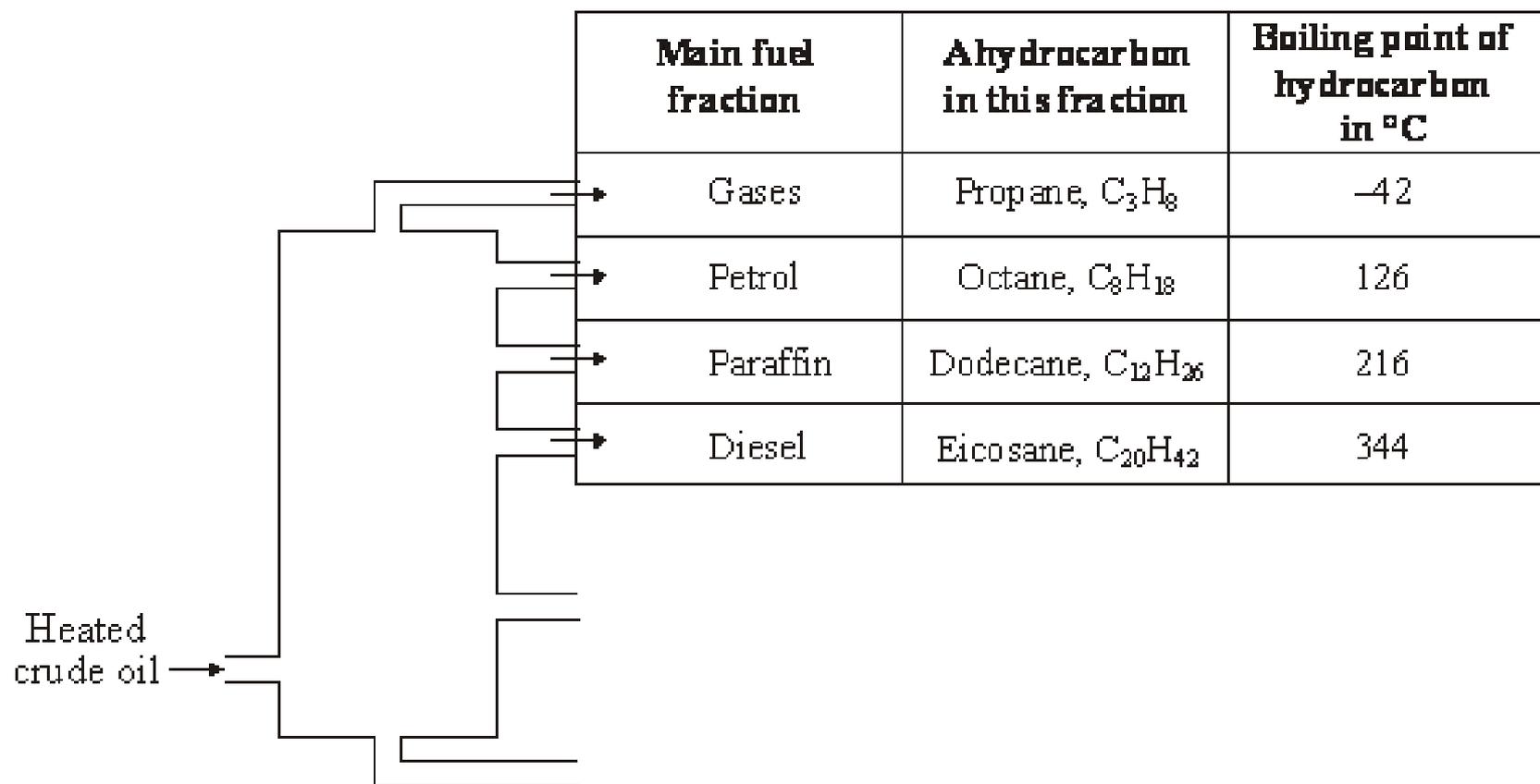
- (ii) Dodecane boils at +216 °C. At what temperature will dodecane gas condense to liquid?

Temperature 216(°C) °C

(1)

Crude oil is a resource from which fuels can be separated.

- (a) The name of the main fuel fractions and one of the hydrocarbons in each fraction are shown in the table.



The diagram illustrates the fractional distillation of heated crude oil. The oil enters from the bottom left and is separated into four main fractions, each with a corresponding hydrocarbon and boiling point listed in the table to the right.

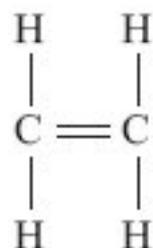
Main fuel fraction	A hydrocarbon in this fraction	Boiling point of hydrocarbon in °C
Gases	Propane, C_3H_8	-42
Petrol	Octane, C_8H_{18}	126
Paraffin	Dodecane, $C_{12}H_{26}$	216
Diesel	Eicosane, $C_{20}H_{42}$	344

- (i) How does the number of carbon atoms in a hydrocarbon affect its boiling point?

The more carbon atoms, the higher the boiling point

Crude oil is used to make useful substances such as alkenes and plastics.

(a) The alkene shown is ethene.



(i) Tick (✓) the correct formula for ethene.

Formula	(✓)
CH_4	
C_2H_4	<input checked="" type="checkbox"/>
C_2H_6	

(1)

(a) Name the environmental effect caused by:

(i) oxides of nitrogen (NO_x) and sulfur dioxide (SO_2)

Acid rain

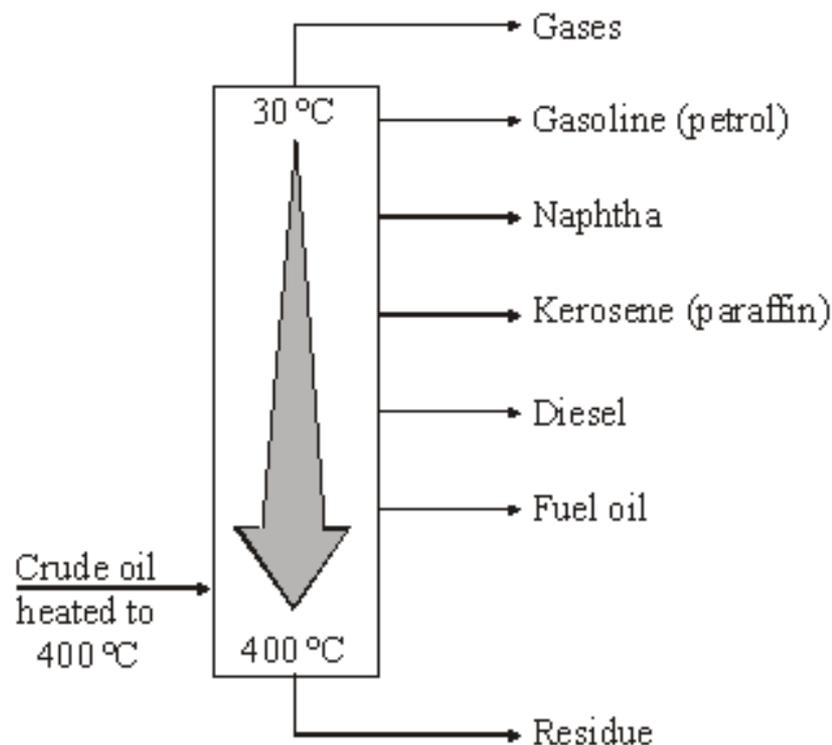
(1)

(ii) the increased level of particulates (PM_{10}).

Global dimming

(1)

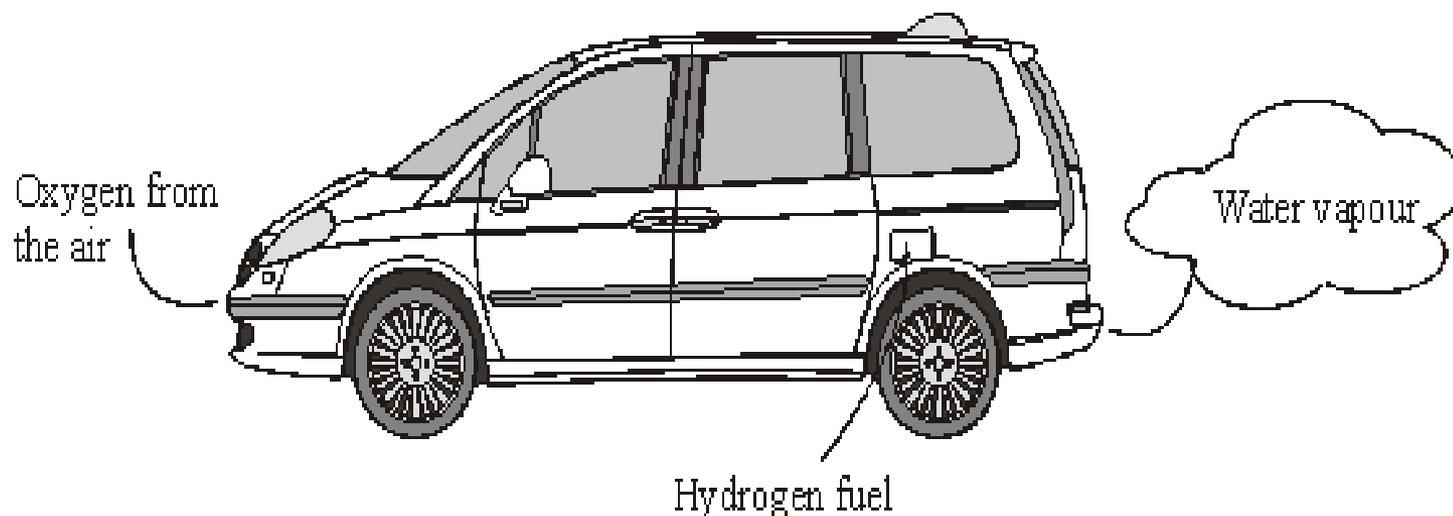
Crude oil is the source of many useful materials. Crude oil is separated into fractions by fractional distillation.



(a) Describe how the naphtha fraction separates from the other fractions.

It has a higher boiling point than gasoline but a lower boiling point than kerosene

(b) Hydrogen can be used as a *clean fuel* for cars.



(i) When hydrogen burns in air, it reacts with another element.

Complete the word equation for this reaction.



(1)

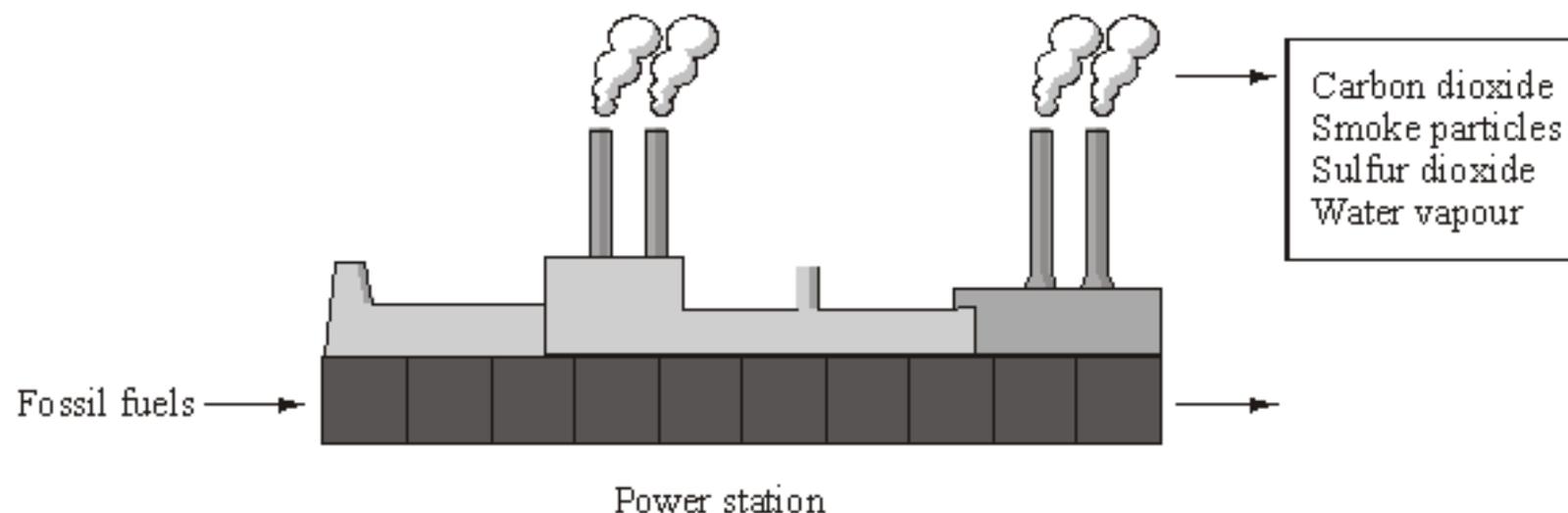
(ii) Suggest **one** reason why hydrogen is called a *clean fuel*.

The only waste product it produces when it burns is water which is harmless

.....

...

Most electricity in the UK is generated in power stations that burn fossil fuels. The diagram lists some of the substances released into the air when fossil fuels are burned.

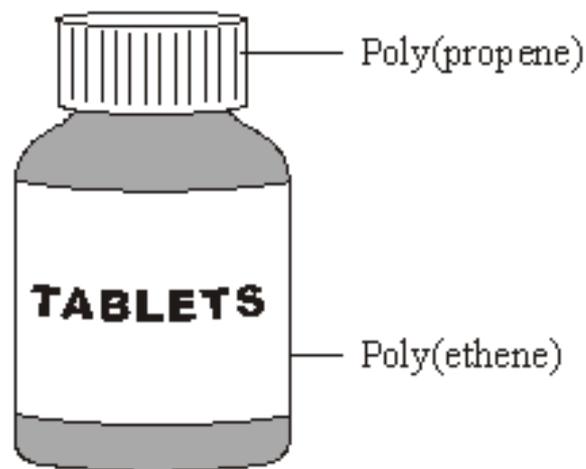


(a) (i) Which **one** of the substances released into the air causes acid rain?

Sulphur dioxide

(1)

Tablet containers are often made from two different polymers.



(a) Ethene, C_2H_4 , and propene, C_3H_6 , can be made from crude oil.

(i) Complete the following sentence.

Ethene and propene are called hydrocarbons because they are made up of carbon and hydrogen atoms only.

(1)

(ii) Ethene molecules are used to form poly(ethene) molecules.

Ethene is a monomer and lots of monomers (ethenes) bond together to form the polymer poly(ethene)

The hydrocarbons in crude oil can be separated into useful fractions.

Fraction	Boiling point in °C	Carbon chain length	Relative % in crude oil	Relative % demand
Naphtha	20–180	5–9	10	20
Gasoline (petrol)	20–200	5–10	10	20
Kerosene (paraffin)	180–260	10–16	15	23
Diesel	260–340	14–20	20	25
Fuel oil	370–600	20–70	45	12

(a) Why does gasoline (petrol) have a lower boiling point than fuel oil?

Less carbon atoms

(1)

- (a) Coal contains carbon and small amounts of sulfur. The steam train would cause environmental problems if coal were used as the fuel.

Explain why.

Coal burns to produce carbon dioxide which is a greenhouse gas.

Greenhouse gases produce climate issues like global warming.

The sulfur burns with the oxygen to produce sulphur dioxide

Sulfur dioxide causes acid rain

Crude oil is a natural resource from which useful fuels can be separated.

(a) Crude oil is a mixture of hydrocarbons.

Complete the sentence about a hydrocarbon molecule.

A hydrocarbon molecule is made up of and carbon atoms only.

(1)

Known crude oil reserves are being used up rapidly. Crude oil is used to produce many useful fuels, such as petrol. One way to conserve crude oil reserves would be to increase the production of bio-fuels.

- (a) Ethanol can be produced for use as a bio-fuel. Cars can be powered by ethanol or ethanol–petrol mixtures.

Sugar cane can be fermented to give a mixture of water (boiling point 100 °C) and ethanol (boiling point 78 °C).

- (i) How can ethanol be separated from water?

Evaporation as they
have different boiling
points

(1)

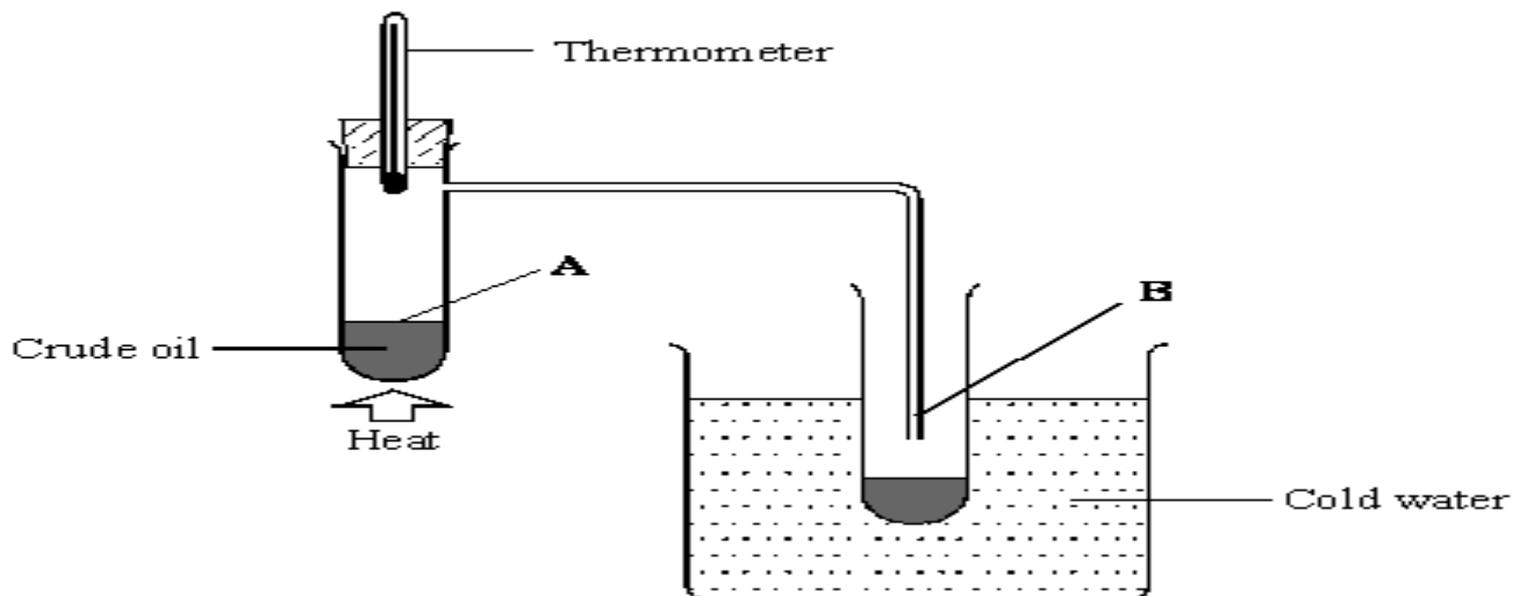
- (ii) Ethanol, C_2H_5OH , burns to release heat energy.

Complete the balanced symbol equation by writing in the formulae of the two products.



(2)

(b) The diagram shows a laboratory experiment used to separate crude oil.



Complete each sentence by choosing the correct words from the box.

condensation	distillation	evaporation
melting	sublimation	

The main process taking place at **A** is .. Evaporation (cant be melting as it is a liquid already)

The main process taking place at **B** is Condensation (turn back to a liquid)

This method of separating crude oil is called .. distillation

Learning Objectives for revision session

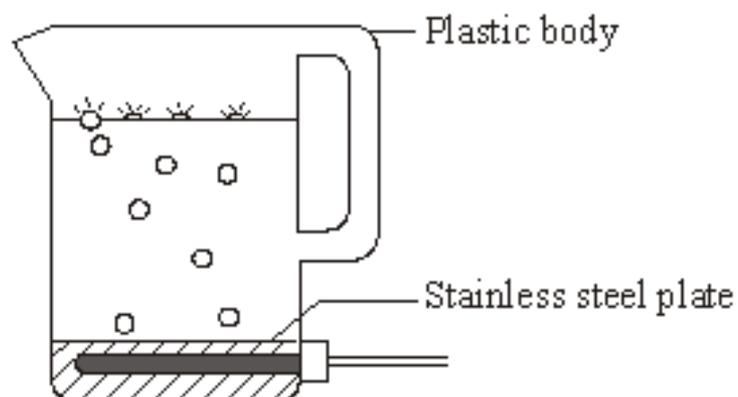
CHAPTER 5: PRODUCTS FROM OIL

1. Know what cracking is
2. Describe polymerisation
3. Give some examples of new and useful polymers
4. Recognise the problems with plastics (longer answer question)
5. Describe ethanol in detail

Don't forget

- Fractional distillation is separating hydrocarbons
- Cracking is breaking big hydrocarbons into smaller ones (using heat and a catalyst)
- Polymerisation is making plastics using alkenes

Plastics are used to make many everyday items, such as the body of the kettle.



(a) Complete the sentences by drawing a ring around the correct words.

(i) The plastic is made from many small molecules called

catalysts

monomers

polymers

(1)

(b) The naphtha fraction is often used to make other useful materials.

This involves the cracking of hydrocarbons in the naphtha fraction.

For example:

decane → hexane + ethene



(i) Balance the symbol equation given above.

(1)

(ii) Describe how cracking is carried out.

1 mark- cracking is a thermal decomposition reaction

1 mark- cracking breaks down a large hydrocarbon into smaller ones

1 mark- cracking also requires a catalyst to speed up the reaction

(2)

(iii) Suggest how the burning of fossil fuels may cause climate change.

1 mark- burning fossil fuels like crude oil or coal produces carbon dioxide

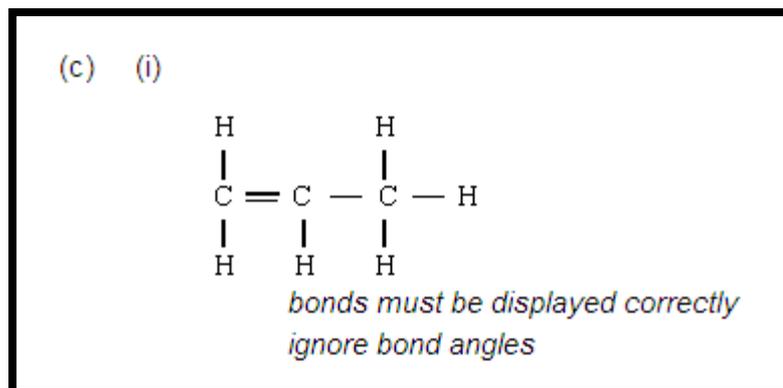
1 mark- carbon dioxide is a greenhouse gas

1 mark- greenhouse gases trap heat which leads to global warming as we are producing more greenhouse gases by burning hydrocarbons (fossil fuels)

(2)

(c) Ultraviolet radiation from the Sun produces simple alkenes, such as ethene and propene, from methane in Titan's atmosphere.

(i) Draw the structure of propene, C_3H_6 , to show the covalent bonds.



(1)

(ii) Explain how propene molecules form a polymer. You should name the polymer formed.

Lots of propenes (the **monomers** in this case) **bond** together to form a polymer

.....

.....

.....

- (i) Ethene is the small molecule (the monomer) used to make the polymer for this plastic bag.

Name the polymer that is made from ethene.

Poly(ethene)

(1)

- (ii) Use the correct word from the box to complete the sentence about ethene.

condensing corroding cracking

Ethene is made by breaking down large hydrocarbon molecules into smaller hydrocarbon molecules by a process called

cracking

(1)

- (iii) The hydrocarbon ethene has the formula C_2H_4

Complete the sentence about ethene.

Ethene is a hydrocarbon made up of carbon and

hydrogen

atoms.

(1)

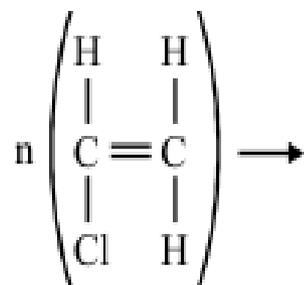
(b) Poly(chloroethene) is a polymer formed by the *addition polymerisation* of chloroethene.

(i) Chloroethene is an unsaturated molecule. Why is this molecule said to be unsaturated?

It contains one or more double bonds

(1)

(ii) Complete the diagram to represent how poly(chloroethene) is formed from chloroethene.

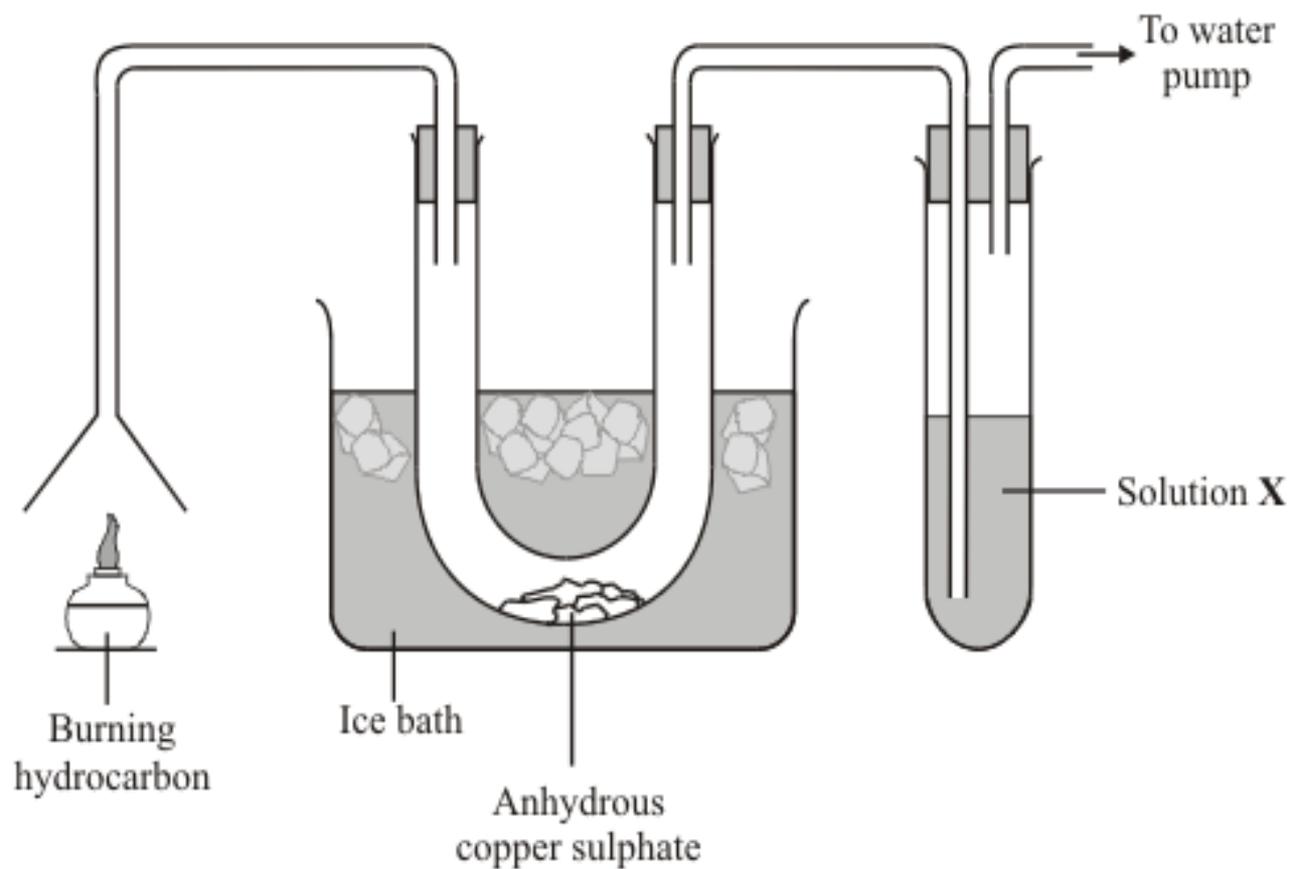


(3)

(iii) Explain what is meant by the term *polymerisation*.

Many monomers **bonding** together to form a **polymer**

(b) This apparatus was used to study the combustion of a hydrocarbon fuel.

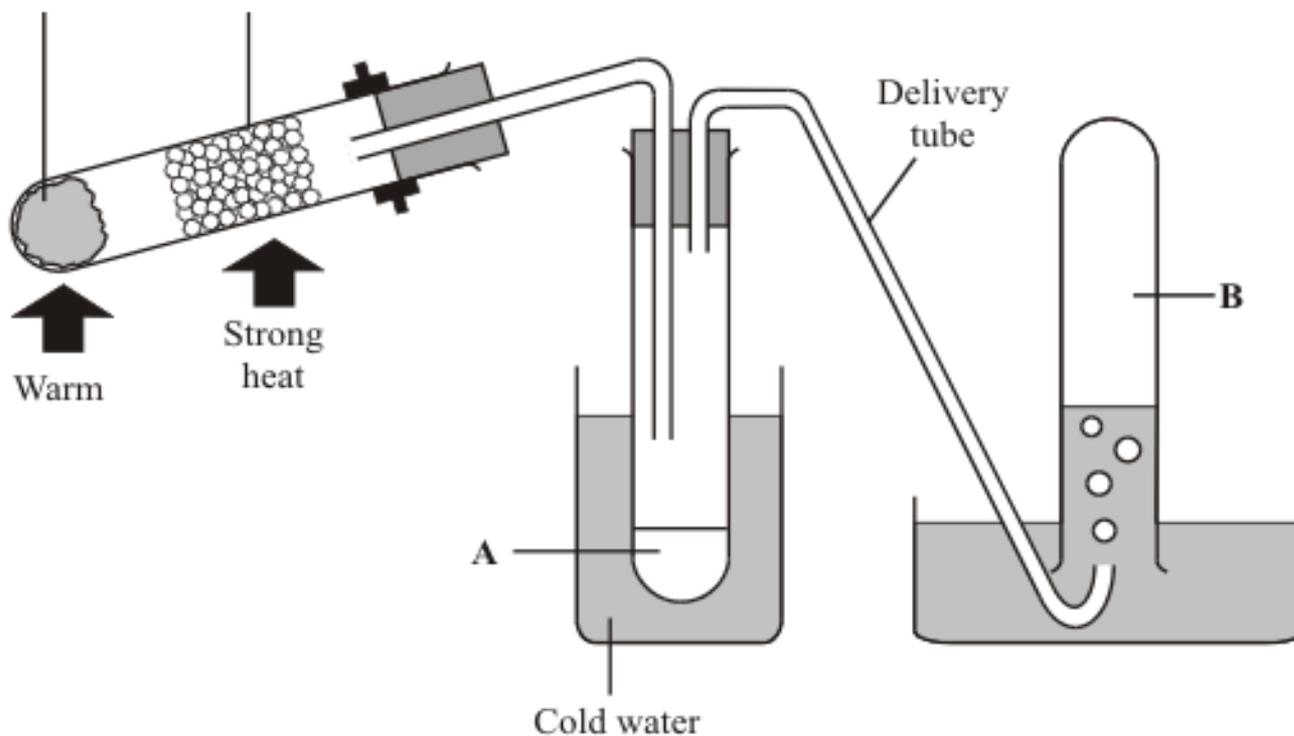


(i) Name the substance which changed the anhydrous copper sulphate from white to blue.

water

The diagram shows an apparatus that can be used to carry out cracking reactions in a laboratory.

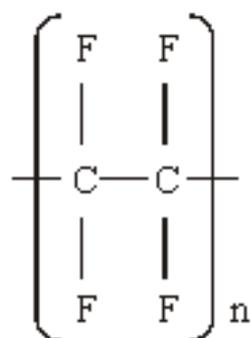
Paraffin soaked
onto mineral wool



(a) Why is aluminium oxide or broken porcelain used?

It is a catalyst

(b) The structure of this polymer can be represented by the diagram below.



Draw the structure of the monomer, tetrafluoroethene, from which it is formed.

(2)

(c) Describe how this addition polymer forms from monomers.

(a) What is meant by *hydrocarbon*?

A compound containing hydrogen and carbon atoms only

(2)

(b) When methane burns there must be a good supply of air.

(i) Complete the word equation by choosing the correct **two** chemicals from the box.

carbon dioxide hydrogen oxygen water

methane + oxygen →

water

+

Carbon dioxide

Remember- any hydrocarbon that burns with oxygen produces water and carbon dioxide

(ii) Without a good supply of air, carbon monoxide is formed. Why is carbon monoxide a dangerous gas?

It is poisonous and it binds with our haemoglobin in our blood more easily than oxygen

(1)

(Total 5 marks)

(a) Alkenes can be made by cracking large alkane molecules.

(i) Explain how the cracking process is carried out.

1 mark- cracking is a thermal decomposition reaction

1 mark- cracking breaks down a large hydrocarbon into smaller ones

1 mark- cracking also requires a catalyst to speed up the reaction

(2)

(ii) Give a chemical test which would show the difference between an alkene and an alkane.

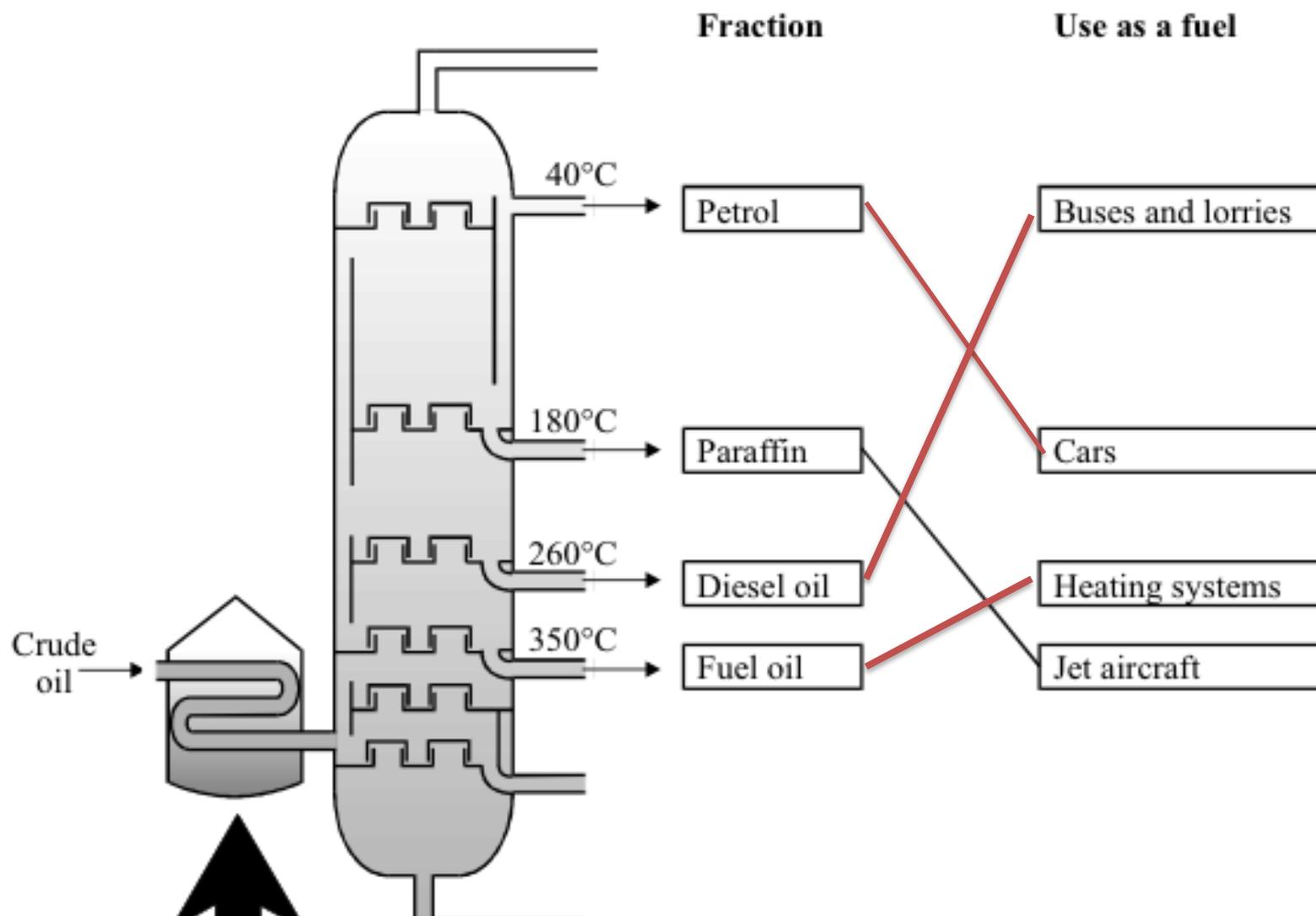
Test Bromine water

Result of test

Bromine water is orange/brown. If an alkene (unsaturated hydrocarbon) is present, it will go colourless. If an alkane (saturated hydrocarbon) is present, it will stay the same.

(2)

(a) Draw a line to join each fraction to its use as a fuel. One line has been drawn for you.



The table shows some information about alkanes.

Name	Formula	Relative formula mass	Boiling point in °C
methane	CH_4	16	-160
ethane	C_2H_6	30	-90
propane		44	-40
butane	C_4H_{10}	58	
pentane	C_5H_{12}	72	36
hexane	C_6H_{14}	86	68

(a) Give the formula of propane.

C_3H_8

(1)

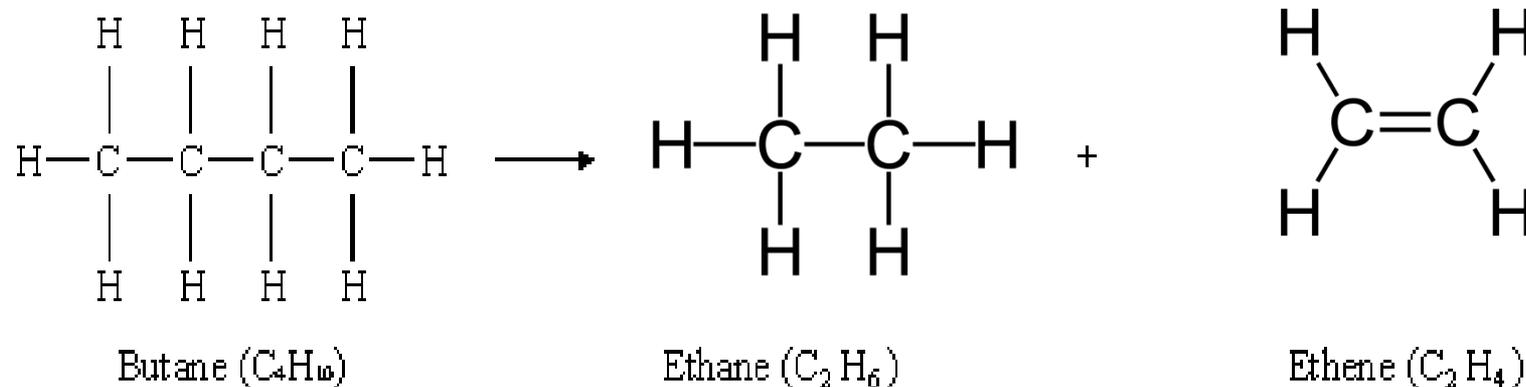
- (a) The first stage in the formation of a plastic material is called cracking. Butane (C_4H_{10}), a hydrocarbon in crude oil, can be cracked to produce two different hydrocarbons, ethane (C_2H_6) and ethene (C_2H_4)

- (i) For cracking to happen what needs to be done to the hydrocarbon?

It needs to be broken
down using heat and a
catalyst

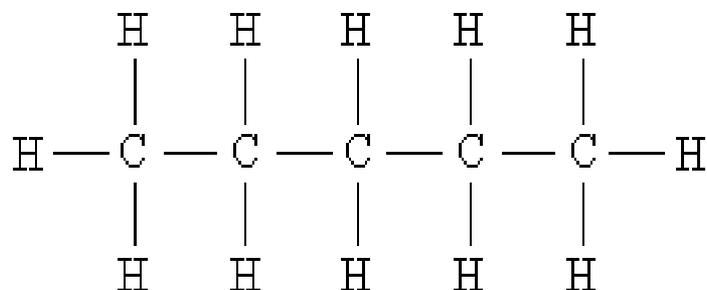
(2)

- (ii) Complete the equation for the cracking of butane using displayed formulae.



(2)

Crude oil is a mixture of a large number of compounds most of which are hydrocarbons such as the molecule shown below.



(a) What is a hydrocarbon?

A compound that contains hydrogen and carbon only

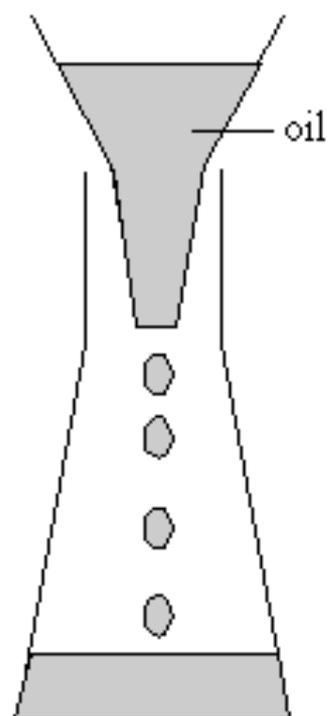
(1)

(b) What is the chemical formula of the molecule shown above?

C₅H₁₂

(1)

A teacher carried out an experiment to study car engine oil. The experiment was carried out in a fume cupboard and the teacher wore plastic gloves. The oil was poured through a funnel. The time taken for all the oil to go through the funnel was measured. The experiment was repeated with the oil at different temperatures.



(a) What **two** safety precautions were taken in the experiment?

Crude oil is a mixture of many *saturated hydrocarbons*. They can be separated into *fractions* by the process of fractional distillation.

State what is meant by:

(i) *hydrocarbon* ...

A COMPOUND THAT CONTAINS HYDROGEN AND CARBON ONLY

(2)

(ii) *saturated* ...

A HYDROCARBON THAT HAS NO DOUBLE BONDS AND HAS THE MAXIMUM AMOUNT OF HYDROGENS IT CAN POSSIBLY HOLD . THEY ARE ALSO CALLED ALKANES IN CRUDE OIL

(1)

(iii) *fraction*

HYDROCARBONS THAT HAVE BEEN SEPARATED BY A PROCESS CALLED FRACTIONAL DISTILLATION AND HAVE A SIMILAR NUMBER OF CARBON ATOMS SO SIMILAR BOILING POINTS.

(1)

(Total 4 marks)

Propane and ethene are both important hydrocarbons.

	propane	ethene
formula	C_3H_8	C_2H_4
structure	$\begin{array}{ccccccc} & H & H & H & & & \\ & & & & & & \\ H & -C & -C & -C & -H & & \\ & & & & & & \\ & H & H & H & & & \end{array}$	$\begin{array}{c} H & & H \\ & \diagdown & / \\ & C = C & \\ & / & \diagdown \\ H & & H \end{array}$

- (a) **Complete the table** by adding the formula of the ethene molecule and the structure of the propane molecule.

(2)

Crude oil is a complex mixture of hydrocarbons, mainly alkanes. The number of carbon atoms in the molecules ranges from 1 to over 100.

- (a) How does the boiling point change as the number of carbon atoms in the molecules increases?

It increases with more carbon atoms

(1)

- (b) Name the method used to separate petroleum into fractions.

Petroleum is another name for crude oil. So the method to separate crude oil is fractional distillation

(1)

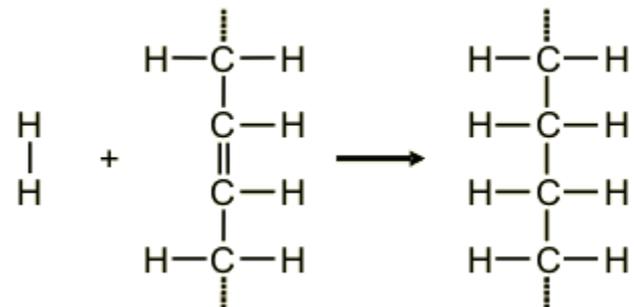
Learning Objectives for revision session

CHAPTER 6: PLANT OILS

1. Describe how we can extract vegetable oils
2. Describe why it is better to cook with oils than water
3. Explain the difference between saturated and unsaturated oils
4. Describe an emulsion
5. Longer answer questions: evaluate the benefits and drawbacks of using vegetable oils and emulsifiers in foods

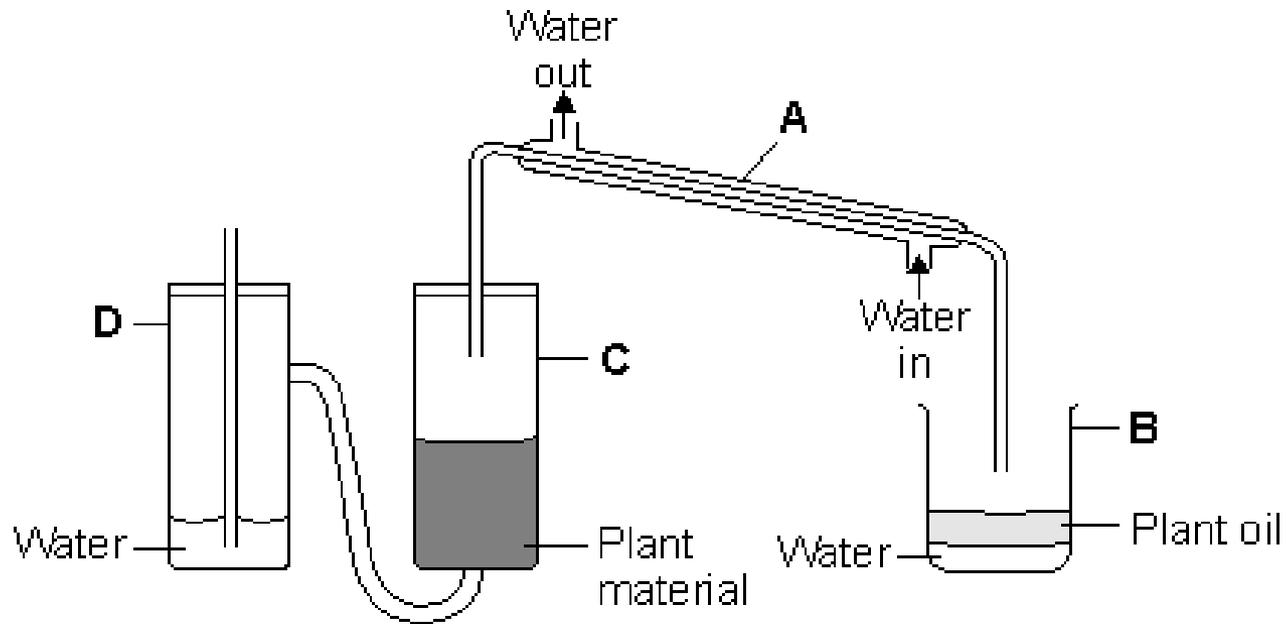
Things to remember:

- We can extract vegetable oils by a method which involves pressing. E.g. Using olives or rapeseeds.
- We can't eat crude oil. But we can eat vegetable oils. Vegetable oils are also hydrocarbons and also contain saturated and unsaturated types.
- The saturated hydrocarbons are not good for our health if we have too many. Unsaturated ones are better, and we find them in fish, e.g. Cod liver oil.
- The test for unsaturation in vegetable oils is the same as the test for unsaturation in crude oil- bromine water.
- Cooking with oil can be better than cooking with water as oil has a higher boiling point so food tastes crispier.
- An emulsifier is something that has a hydrophobic and hydrophilic part to it. It can allow immiscible things such as oil and water to mix. The emulsifier has a head which is hydrophilic and attaches to water and a tail which is hydrophobic and attaches to the oil. This forms an emulsion (:
- We can turn oils into butter by a process called hydrogenation using NICKEL as the catalyst and a temperature of 60°C adding hydrogen's to make unsaturated oils into



Many plants produce useful oils.

(a) The diagram shows some apparatus used to obtain oil from plant material.



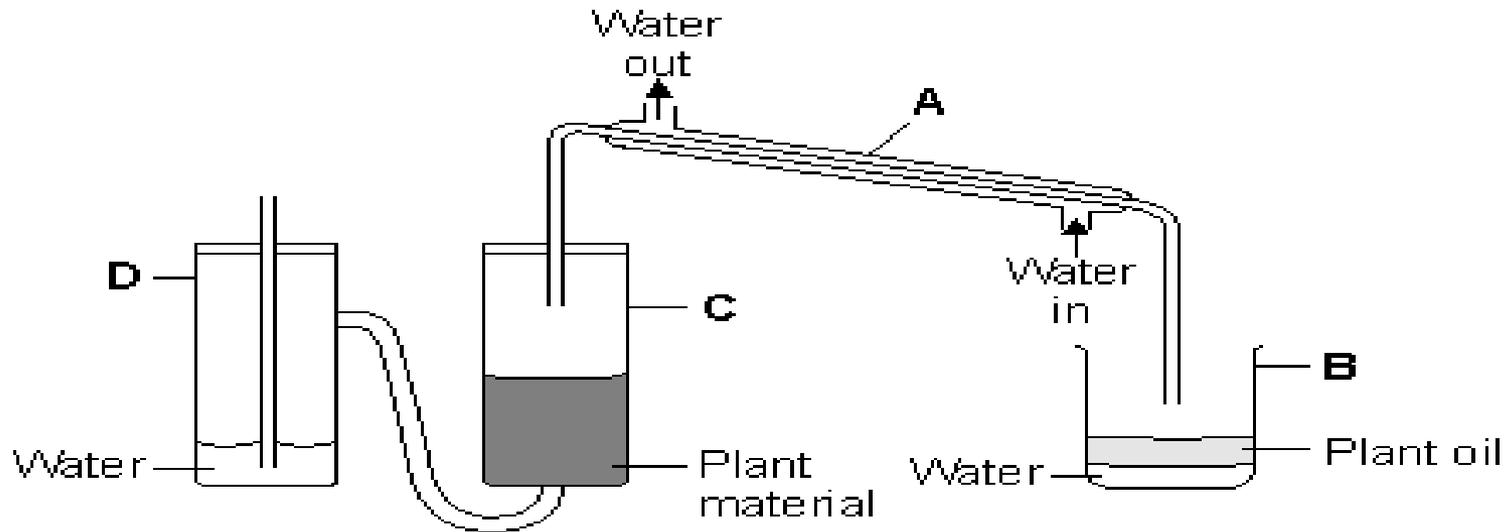
Four parts of the apparatus are labelled, **A**, **B**, **C** and **D**.

Use the information in the diagram to complete the sentences.

Steam is made in part D.

Many plants produce useful oils.

(a) The diagram shows some apparatus used to obtain oil from plant material.



Four parts of the apparatus are labelled, **A**, **B**, **C** and **D**.

Steam is made in part .

Oil from the plant material is vaporised in part .

Steam and oil vapour are condensed in part .

Draw a ring around the correct word in each box to complete the sentences.

(i)

The oil is obtained from crushed sunflower seeds by

evaporating.

filtering.

pressing.

(1)

(ii)

The oil does not

burn

dissolve

melt

in water.

(1)

(d) The company intends to use sunflower oil to make its margarine.

Explain how the company could process the sunflower oil to make it suitable for the manufacture of margarine.

To make margarine (solid) from sunflower oil (liquid) you need to:

1 mark- do a reaction called hydrogenation or hardening

1 mark- involves heating (60 degrees C) and using a nickel catalyst

1 mark- need to add hydrogen's to the oil to remove unsaturated bonds and make them saturated (to turn into solid)

(3)
(Total 9 marks)

Use the correct words from the box to complete the sentences.

higher	hydrogen	lower
oxygen	saturated	unsaturated

(i) Animal and vegetable oils that contain **unsaturated** fats can be hardened.

(1)

(ii) When oils are hardened with **hydrogen** gas, a chemical change takes place, producing margarine which has a **higher** melting point than the original oil.

(2)

(Total 3 marks)

(a) One of the main ingredients in salad dressing is vegetable oil.

(i) Use the correct word from the box to complete the sentence about the extraction of vegetable oil.

crushed	evaporated	hardened
----------------	-------------------	-----------------

To extract the vegetable oil, the fruits or seeds of plants are first

..... **crushed**

(1)

(ii) The liquids can be separated from the solid parts of the fruits or seeds by filtering.

Suggest **one** reason why separation by filtering is better than separation by distilling.

..... It's cheaper

..... OR

It's easier

(1)

Don't say both as it specifically asks for one answer!

A company compared the relative 'unsaturation' of five oils. Bromine water was added from a burette to equal amounts of each oil until the bromine water remained orange-yellow.

The volume added was recorded.

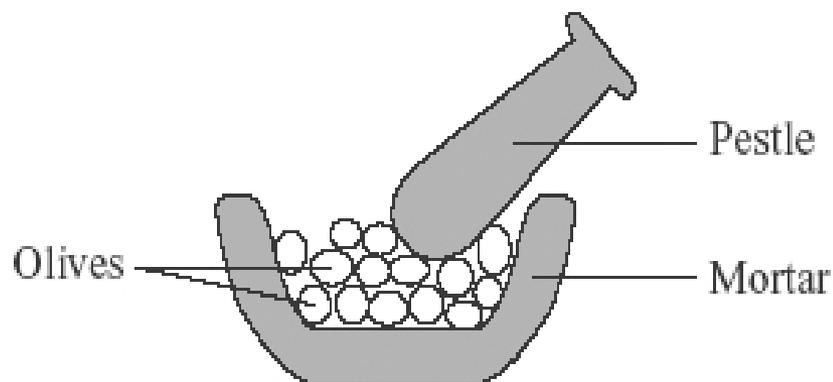
Type of oil	Volume of bromine water added in cm ³
Maize	25.6
Olive	6.1
Palm	4.9
Soya Bean	29.9
Sunflower	25.1

- (i) What would you see when the first few drops of bromine water are added to each oil?

Decolourises

A vegetable oil can be extracted from olives.

(a) The diagram shows the first step in this extraction.



Use the correct word from the box to complete the sentence about this first step.

evaporating **filtering** **pressing**

The olive oil is extracted by **pressing** the olives.

(1)

Saturated fats are linked to heart problems. In order to claim that their crisps are healthy, the manufacturer keeps the proportion of saturated fats low.

(i) What type of fat contains double carbon carbon bonds?

..... (1)

(ii) The colour of bromine water is orange.

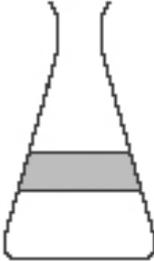
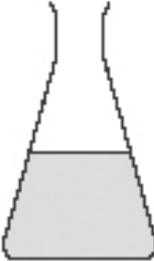
What is seen when bromine water is shaken with:

an unsaturated fat

a saturated fat? (2)

(iii) Unsaturated vegetable oils can be hardened to make them useful as spreads. Describe how unsaturated vegetable oils are hardened.

- Nickel catalyst
- 60 degrees C
- Hydrogen gas needed to remove double bonds

Vegetable oil and water	Vegetable oil, water and an additive
 <p data-bbox="401 591 529 629">Flask 1</p>	 <p data-bbox="1174 591 1302 629">Flask 2</p>

(i) Give a reason for the result in **Flask 1**.

Water and oil don't mix

(1)

(ii) Explain the result in **Flask 2**.

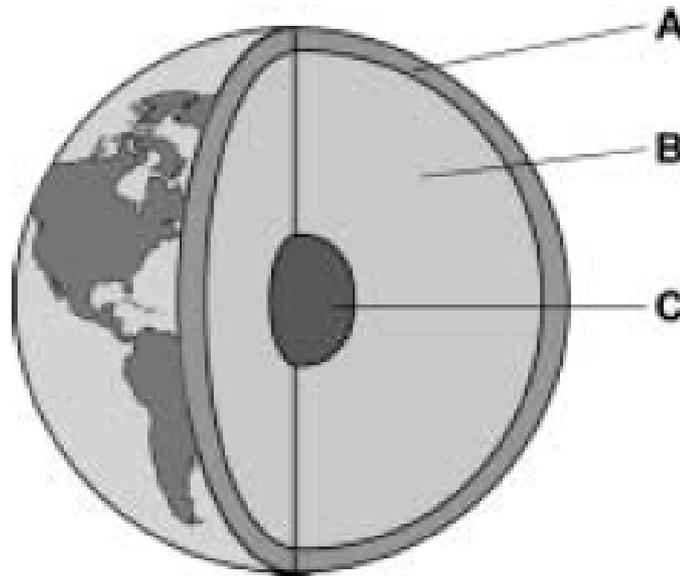
Water and oil have mixed. So the additive must be an **emulsifier**

Learning Objectives for revision session

CHAPTER 7: OUR CHANGING PLANET

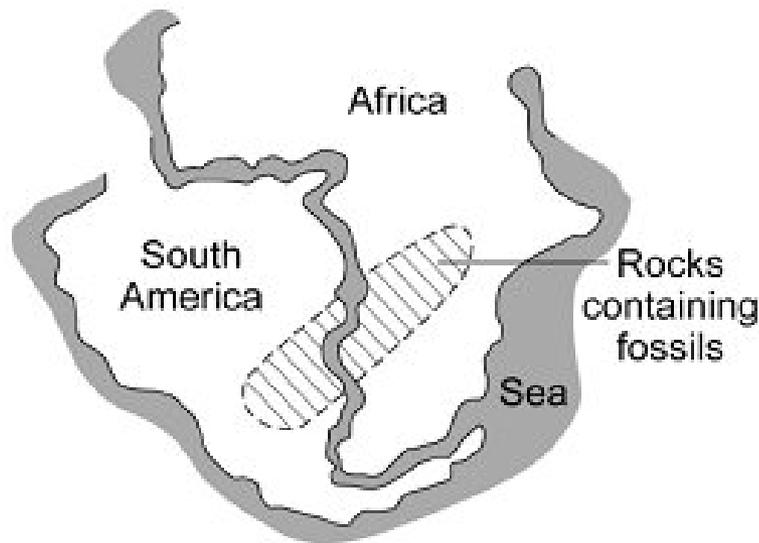
1. Draw the structure of the Earth (and label it)
2. Know Wegener's theory
3. Know the evidence Wegener had why the continents may have been JOINED
4. Explain why not many people believed Wegener
5. Describe the gases in the atmosphere past and present
6. State what the primordial soup is
7. Explain the carbon cycle (how carbon dioxide comes and leaves our atmosphere)

The diagram shows the three layers of the Earth.



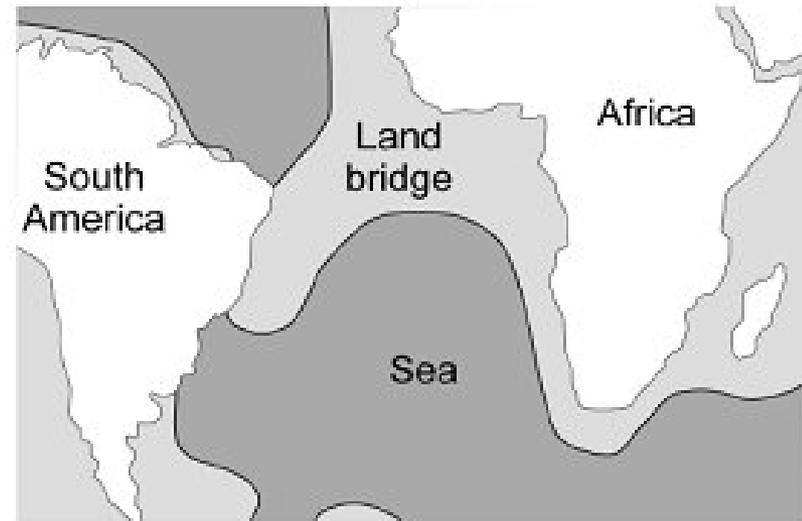
(a) Complete the table by writing the letters, **A**, **B** or **C**, from the diagram in the correct box.

Layer of Earth	Letter
Core	C
Crust	A
Mantle	B



Map 1

Wegener suggested his hypothesis that all of the continents, including Africa and South America, had been joined together but then drifted slowly apart.



Map 2

In 1920 other scientists stated that all of the continents were in fixed positions, including Africa and South America, and that they had once been joined together by a land bridge.

- (i) Use the information to suggest **two** pieces of evidence that may have led Wegener to propose his hypothesis that continents move.

-Similar rocks containing fossils on the edges of Africa and South America
-Both continents seem to fit together like a jigsaw

There was little or no nitrogen in Earth's early atmosphere, but a gaseous compound of nitrogen was present in small amounts.

- (a) Name this gaseous compound.

NH₃ / ammonia

(1)

- (b) In 1892, Lord Rayleigh compared nitrogen from the air with very pure nitrogen obtained from nitrogen compounds. The density of the nitrogen was:

nitrogen from the air = 1.2572 grams per litre

nitrogen from nitrogen compounds = 1.2511 grams per litre.

Rayleigh and Sir William Ramsay proved that atmospheric nitrogen was not pure but contained five other gases, which together made up about 1 % of the Earth's atmosphere.

The gases were argon (0.94 %) and traces of helium, neon, krypton and xenon. The five gases are similar in that they show no chemical reactions but have different physical properties, eg density, melting point, boiling point.

- (i) Suggest **one** reason why scientists did **not** find these five gases in the atmosphere at an earlier date.

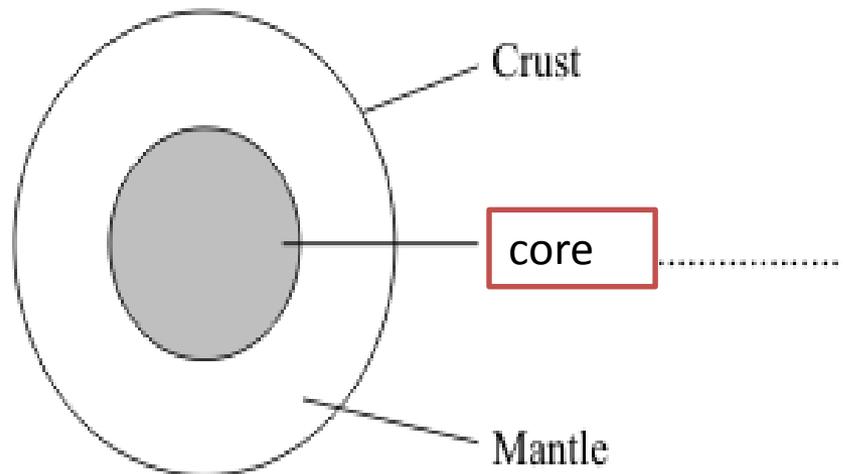
because the gases are unreactive
accept because the measuring equipment was
not very precise

Earthquakes are common in certain places on Earth.

(a) The diagram shows the layered structure of the Earth.

Choose one word from the box to complete the label on the diagram.

atmosphere core plate



(1)

- (b) (i) Scientists do **not** know the accurate composition of the Earth's early atmosphere. Suggest why.

It was so long ago!

(1)

- (ii) Use information from the table to answer this question.

Water vapour is present in the atmospheres of the Earth and Venus today. The Earth's surface is mainly covered by water.

Suggest why there is no water on the surface of Venus.

The boiling point of water is 100 degrees C and Venus is hotter than this, so it would have evaporated!!

Remember this- the boiling point of water is 100 degrees C so anything above this, the water turns into water vapour (steam)

(1)

Modern South American animals are different from modern African animals.

Most fossils of animals found in South America and Africa are exactly the same.

(a) Consider the information above.

(i) What evidence gave Wegener the idea that the continents of South America and Africa had been joined?

Similar fossils on
both continents

(1)

(ii) Suggest **two** reasons why the other scientists in 1920 thought that Wegener was wrong.

1

He had evidence why they were once joined, but no evidence why they could have moved

2

People thought the
continents were
fixed

Can also mention a
landbridge

(2)

(b) Complete the sentences by writing in the correct words.

Recent evidence has supported Wegener's idea.

The Earth's and the upper part of the mantle are now thought to be composed of tectonic plates.

Heat released by radioactive processes causes convection currents within the Earth's These convection currents cause the plates to move a few centimetres per ...

(3)
(Total 6 marks)

- (a) Use words from the box to complete the sentences about earthquakes.

convection

radioactive

tectonic

volcanic

The earthquake was caused by the movement of two of the Earth's

tectonic

..... plates.

The energy for this movement comes from the heat released by natural

radioactive

..... processes.

(2)

- (b) It was estimated that 300 000 people died as a result of the tsunami in 2004.

Some newspapers criticised scientists for not predicting the tsunami, because if people had been warned they could have moved to safety.

- (i) Suggest why we can only estimate that 300 000 people died as a result of the tsunami.

.....
-Body's can't be found

-Records not available

(ii) Explain why scientists could not have predicted the tsunami.

.....

.....

.....

.....

- (ii) any **two** from:
- cannot predict earthquakes / plate movement
 - (cannot) accurately (predict earthquakes)
 - (earthquakes / tsunamis) are random / not regular / sudden
 - do not know what is happening below / in the Earth's crust / in the mantle
 - very slow / thousands of years build up of pressure
- ignore references to technology / equipment

(2)
(Total 6 marks)

- (a) Two hundred years ago, scientists thought that the Earth was about 400 million years old. This estimate came from the idea that the centre of the Earth was still molten. More recently, measurement of radioactivity in rocks has shown that the Earth is much older than 400 million years.

Suggest **one** reason why scientists now know that the Earth is much older than 400 million years.

the Earth is not
cooling

OR

Radioactivity keeps
the core hot

(1)

(b) There is evidence that the composition of the Earth's atmosphere is still changing. One possible reason is that many power stations generate electricity by burning fossil fuels such as coal, oil or natural gas. Sulfur dioxide, SO_2 , is produced when coal burns in air.

(i) What environmental problem does sulfur dioxide cause?

Acid rain

(1)

(ii) How could this environmental problem be reduced in coal-fired power stations?

Remove the sulfur before it gets burnt to produce sulfur dioxide

(1)

(iii) Gas-fired power stations burn methane, CH_4 , in air.

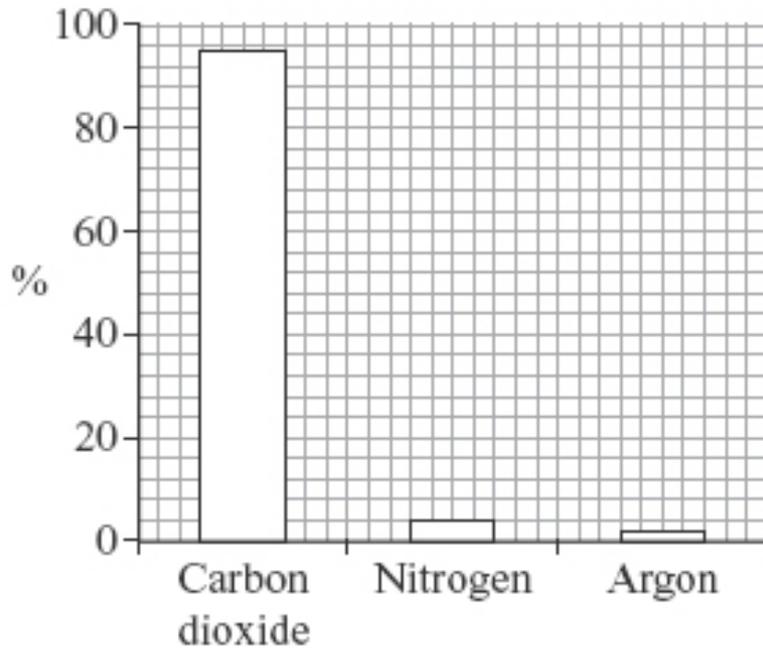
Complete the word equation for this reaction.

methane + oxygen → carbon dioxide + water

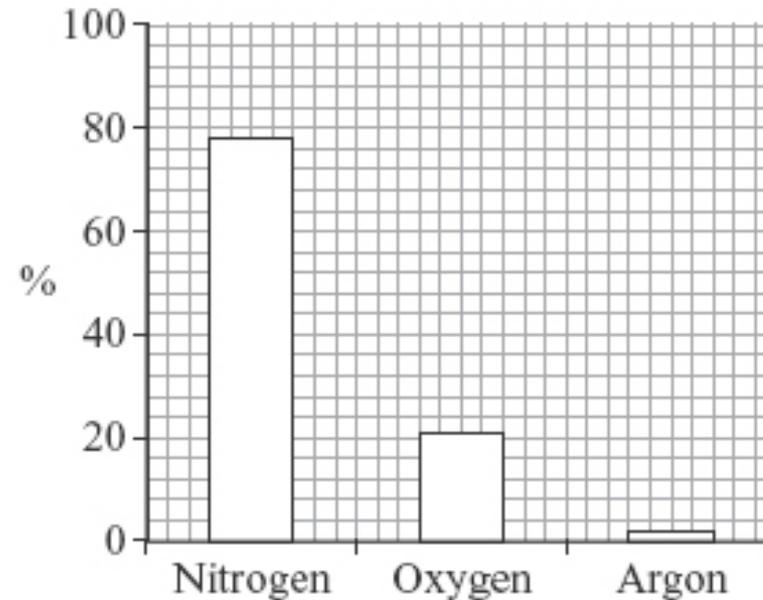
(2)

The bar charts show the three most common gases in each atmosphere today.

The atmosphere of Mars today



The atmosphere of Earth today



(i) Use the bar charts to complete the sentence by writing in the correct gases.

In the atmosphere of Mars today there is mainly .. and no

- (ii) Earthquakes within the Earth's crust can be sudden and disastrous. Scientists cannot accurately predict when earthquakes will occur.

Explain why.

To obtain full marks
earthquakes.

any **three from:**

there are many earthquakes predicted by
scientists each year

expense / inconvenience / panic caused by
government / people taking action

most / some earthquakes do little or no
damage

scientists do not know what is happening
below the crust

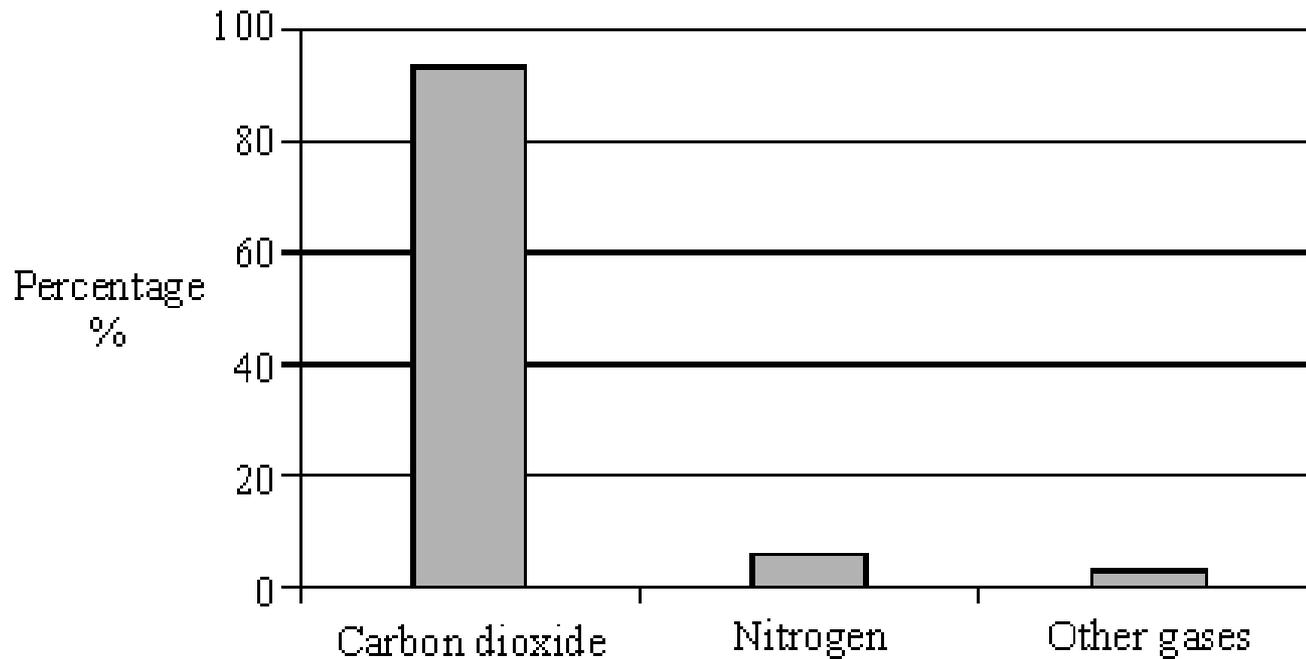
scientists cannot (accurately) predict where
the earthquake will occur

scientists cannot (accurately) predict when the
earthquake will occur

scientists cannot (accurately) predict the
strength of the earthquake

of what causes

The bar chart shows the percentage composition of the atmosphere on Mars.



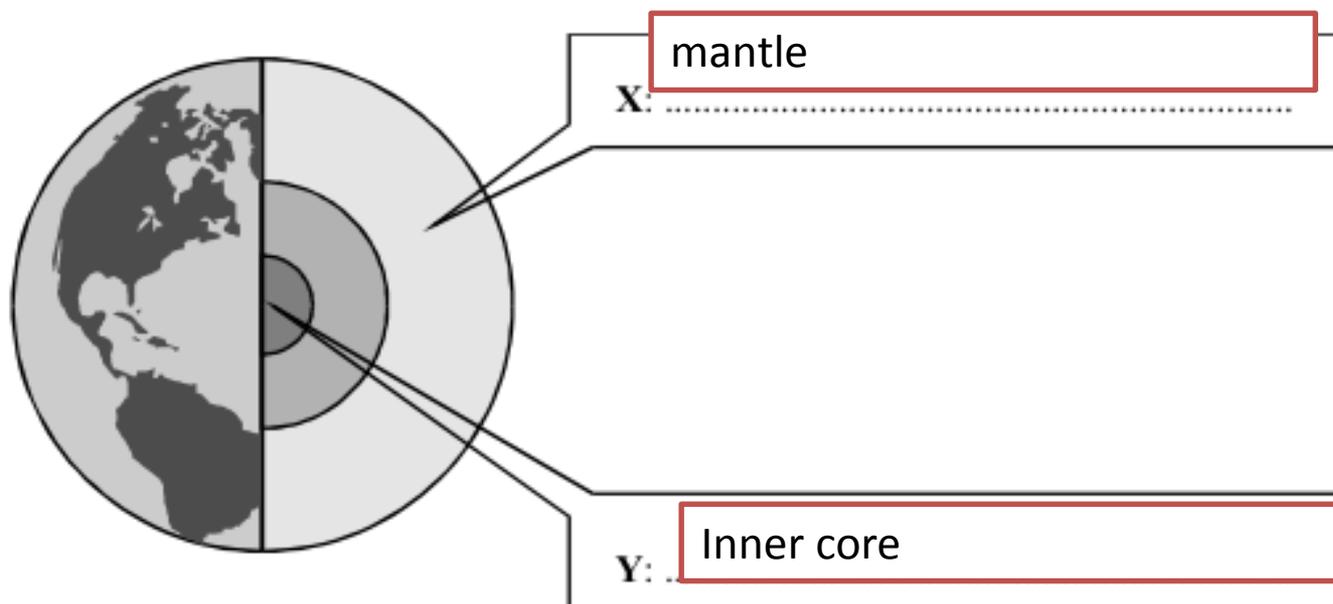
Did you know:

The earth's early atmosphere (billions of years ago, is just like that of Mars and Venus today!

(a) State **three** ways in which the atmosphere on Earth today is different from that on Mars.

1. Mars- more carbon dioxide THAN EARTH (or other way, earth has less carbon dioxide than mars)
2. Mars- has less nitrogen THAN EARTH (or say it other way round, i.e. Earth has more nitrogen than mars)
3. There is very little/no oxygen on mars compared to Earth which has 21% oxygen.

(a) The diagram shows the layered structure of the Earth.

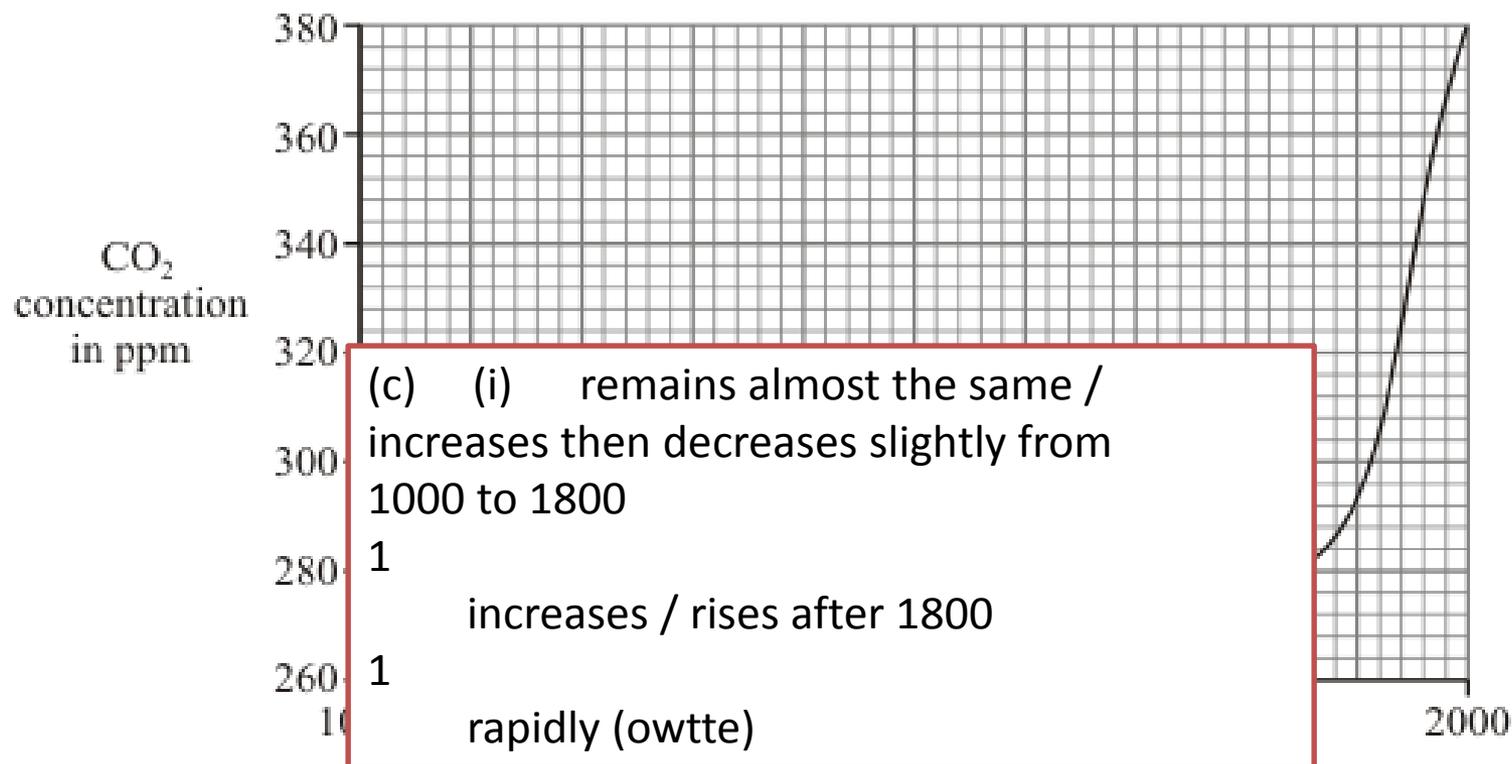


(i) Write in the boxes the name of layer **X** and the name of layer **Y**.

(2)

(ii) The overall density of the Earth is about 5500 kg/m^3 . The average density of the rocks in the Earth's crust is about 2800 kg/m^3 . What does this suggest about the material that makes up the lower layers of the Earth?

(c) The graph shows how the concentration of carbon dioxide in the air has varied since the year 1000.



(i) Describe the changes in the concentration of carbon dioxide in the air since the year 1000.

.....

(i) What name is given to the outer layer of the Earth labelled X?

Crust

(1)

(ii) What is the difference between the inner core and the outer core?

Inner core is solid whereas the outer core is liquid

(2)

(b) Which of the following is used to detect the waves produced by an earthquake?

Draw a ring around your answer.

barograph

seismograph

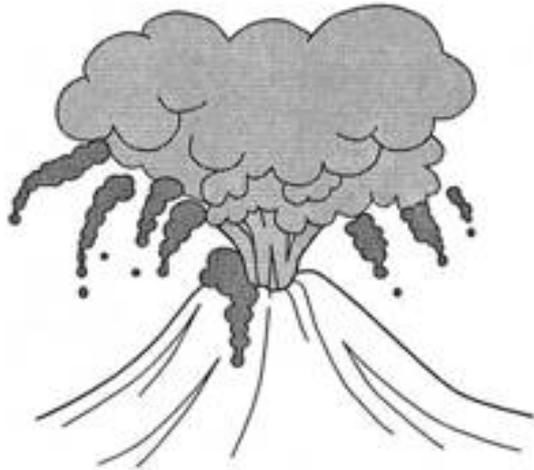
tachograph

(1)

(Total 4 marks)



- (a) During the first billion years of the Earth's existence, there were many active volcanoes. The volcanoes released the gases that formed the early atmosphere.



Describe how volcanoes caused the oceans to be formed.

During the first billion years of the earth's existence, there were lots of volcanoes. They released gases like carbon dioxide and water vapour (water but in the gas form). The water vapour **condensed (gas turns into liquid)** to form the oceans!

- (a) For the last 200 million years the amount of carbon dioxide in the atmosphere has remained almost the same.

Describe the natural processes which remove carbon dioxide from the atmosphere.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

Carbon dioxide is removed from the atmosphere by:

1. Photosynthesis of plants- plants take up carbon dioxide by a process called photosynthesis. Plants do this to produce oxygen (which we need!) **(when we burn trees or cut them down (deforestation), they release carbon which reacts with oxygen to form carbon dioxide again!)**
2. Coal takes up carbon dioxide! **(when we burn coal, we release carbon which reacts with oxygen to form carbon dioxide again!)**
3. **Oceans** (yes oceans!) take in carbon dioxide and therefore, **also reduce the amount of carbon dioxide in the atmosphere (a good thing!)**
4. Carbon dioxide also becomes locked up in sedimentary rock like limestone. **When we heat the limestone, we release the carbon dioxide again (thermal decomposition reaction, remember?!)**

(b) The amount of carbon dioxide in the atmosphere has increased over the last one hundred years. Suggest **two** reasons why this has happened.

1

The opposite of the last slide:

2

1. Deforestation (so plants don't take it up)
2. Burning fossil fuels (like coal or oil)

(2)

(Total 6 marks)

- (b) Complete these sentences by choosing the correct words from the box. Each word may be used once or not at all.

continental	crust	earthquake	evolution
mantle	mountain	tectonic	

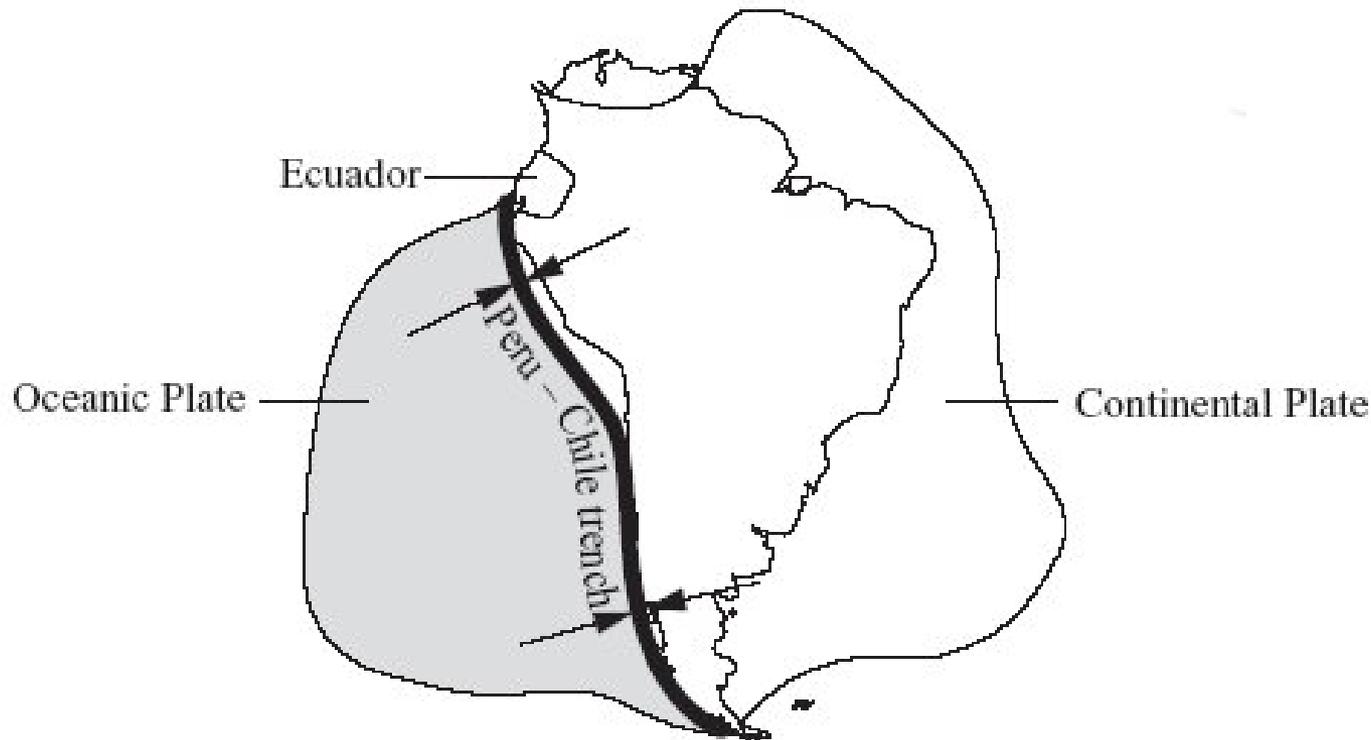
The theory of **continental** drift can explain how Africa and South America moved apart and why both have mountain ranges. Many scientists did not agree with the theory. They thought that mountains were formed because the Earth had cooled down, making the **crust** shrink. Many years later other scientists found that the Earth's lithosphere was broken into a number of large pieces. These pieces, called **tectonic** plates, are moving apart very slowly.

(3)

(Total 5 marks)

The lithosphere is the crust and upper part of the mantle. It is broken into pieces called tectonic plates

The Peru-Chile trench runs down the west coast of South America. It is the boundary between two tectonic plates that are slowly moving towards each other.



Source: Witney, Drozdowska and Maile, *AQA GCSE Physics* (Hodder & Stoughton) 2002.
Adapted and reproduced by permission of Hodder & Stoughton.

Explain what causes the tectonic plates to move.

In the mantle, **heat** is produced because of **radioactive decay**. This heat causes **convection currents** in the mantle (so the liquid moves). This makes the tectonic plates above it move.