MINISTRY OF EDUCATION

CHEMISTRY LESSON PLAN

NAME OF TEACHER:_____ **DATE**:_____

SCHOOL:_____ **TIME**:_____

TOPIC:_____ **DURATION:**_____

SUB-TOPIC: _____ **GRADE:**_____

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LESSON INTRODUCTION

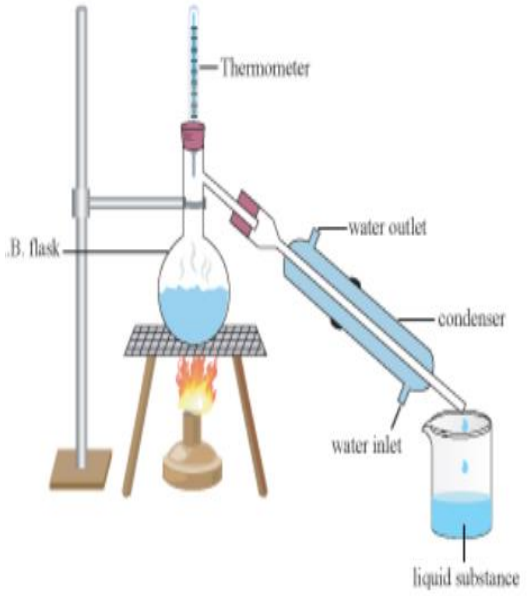
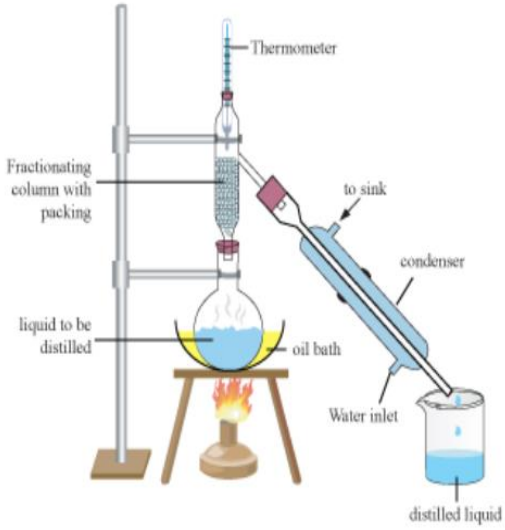
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(For these and many more Primary and Secondary lesson plans Watsup **0963829015**)

STAGE	TEACHERS ACTIVITY	PUPILS ACTIVITY(METHODS)
	simple distillation is the process used to separate a liquid from a solution by evaporating the mixture and condensing the mixture back to liquid  **Some points on the apparatus;** 1. The thermometer is used to check the boiling point for the fraction being distilled 2. The thermometer is used to check the temperature of the fraction being distilled 3. The glass beads condense the fractions whose boiling point has not yet reached so that they drop back into the distillation flask. 4. The fractionating column offers a large surface area for condensing less volatile vapours 5. The Liebig condenser holds a cold solvent e.g. water to condense the water back into the liquid state. 6. A coolant e.g. water moves into the condenser from the lower end and out of the condenser from the upper end so that it can sufficiently cool the vapours.	**Industrial application of fractional distillation** (a) Separation of various components of crude oil (petroleum) (b) Used in the manufacture of spirits such as whisky, rum, gin etc. (c) Separation of liquid air into nitrogen and oxygen (nitrogen boils at while oxygen boils at) **Fractional distillation** is the process used to separate miscible liquids with different boiling point. e.g. pure water, boiling point 100℃ and ethanol with boiling point 73℃ are heated to 100℃ and 73℃ respectively at the temperature is let to at constant until all the ethanol evaporate and the raised to 100℃ 

CONCLUSION:

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EVALUATION:

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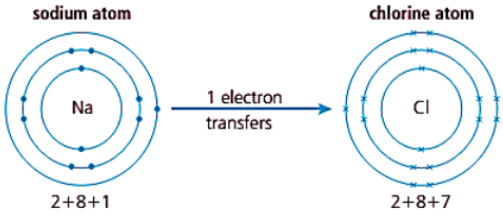
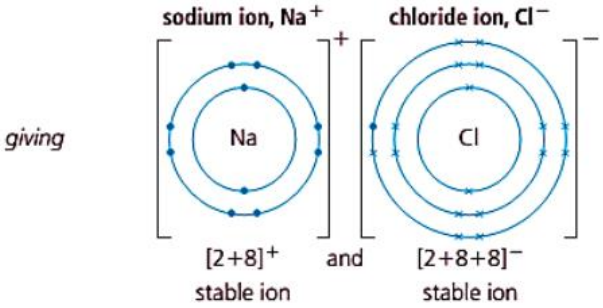
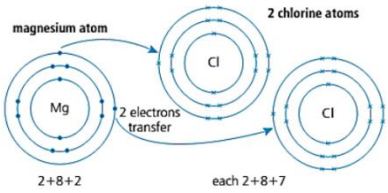
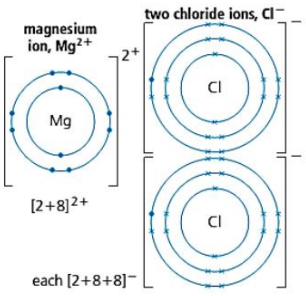
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STAGE	TEACHERS ACTIVITY	PUPILS ACTIVITY(METHODS)
	Ions Definition: An ion is a charged particle **Types of ions** There are two types of ions; cations and anions A cation is a positively charged particle A cation has more protons than electrons **Formation of cations** Metals lose their outer most shell electrons to form cations Cations can be divided into three categories **1. Monovalent cations** These are formed when a metal loses a single electron Na 2. 8. 1 (neutral sodium atom) **2.Divalent cations** These are formed when a metal loses two electrons Mg 2. 8. 2 (neutral magnesium atom) **2.Trivalent cations** These are formed when a metal loses three electrons Al 2. 8. 3 (neutral aluminium atom) **10.4.1.10 Demonstrate the build-up of electrons in shells** ● The number of shells are drawn according to the period where an element is found. If an element is found in period 3, the element has three shells. The first shell must have a maximum number of two electrons. The next shell must have maximum number of 8 electrons. The remaining electron are spilled into the next shell until all electrons are filled into the shell. **10.4.2.1 Describe a compound**. ● A compound is made of atoms of different elements, bonded together. The compound is described by a formula, made from the symbols of the atoms in it. (The plural of formula is formulae.) **10.4.2.2 Describe the formation of ions (radicals).** ● An atom becomes an ion when it loses or gains electrons. **An ion is a charged particle. It is charged because it has an unequal number of protons and electrons** An anion is a negatively charged particle An anion has more electrons than protons **Formation of anions** Non-metals gain electrons to form anions Anions can be divided into three categories The ions form a lattice with two chloride ions for each magnesium ion. So the formula of the compound is **$MgCl_2$**. It has no overall charge.	  Other metals and non-metals follow the same pattern. **A metal reacts with a non-metal to form an ionic compound. The metal atoms lose electrons. The non-metal atoms gain them.The ions form a lattice. The compound has no overall charge.** **Magnesium chloride** When magnesium burns in chlorine, each magnesium atom reacts with *two* chlorine atoms, to form **magnesium chloride**. Each ion has 8 outer electrons  

CONCLUSION:

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EVALUATION:……

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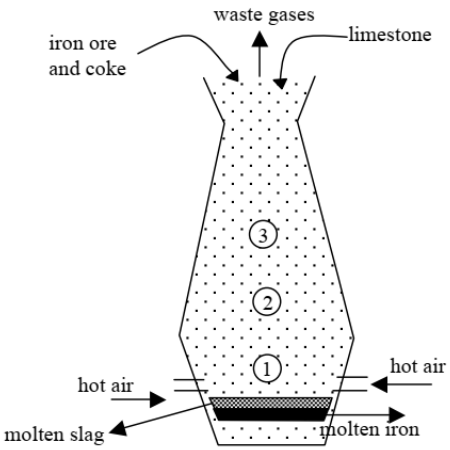
LESSON INTRODUCTION

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STAGE	TEACHERS ACTIVITY	PUPILS ACTIVITY(METHODS)
	Extraction using Carbon Reduction - Iron Iron(III) oxide (haematite) is mixed with coke (almost pure carbon obtained by heating coal in the absence of air) and limestone (calcium carbonate). These enter the blast furnace from the top, and hot air is blown in at the bottom. Some of the carbon is oxidised, giving out much heat and taking the temperature up to 1200oC **The Blast Furnace**  $2C + O_2 \rightarrow 2CO$ (at 1 in the diagram) *Iron ore is reduced* by both CO and C: $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$ $Fe_2O_3 + 3C \rightarrow 2Fe + 3CO$ (at 3) *Slag formation* occurs at 2: $CaCO_3 \rightarrow CaO + CO_2$ $CaO + SiO_2 \rightarrow CaSiO_3$ (molten slag)	The molten iron runs to the bottom of the furnace, where it is tapped off from time to time. The limestone decomposes as shown, to give calcium oxide, and this reacts with impurities such as silicates to produce a molten slag, which floats on top of the iron and is itself removed periodically. **Rusting of Iron** Most metals tend to oxidise slowly if left out in the air, especially if the air is wet and if it contains salt. This type of corrosion is most important for iron and steels, when it is known as **rusting**. Rust is iron(III) oxide, Fe2O3. Rusting can only occur if **iron** comes into contact with both **air** and **water**. It occurs more rapidly near the sea, and in winter when salt is put on the roads, because salt (sodium chloride) speeds up the reaction. We usually try to prevent rusting by keeping out both air and water. Various methods are possible: □ **Painting**: this is cheap, and covers the surface. But the paint may chip, and once surface is exposed rusting begins. □ **Coating with zinc**: (galvanising). This involves dipping the steel object into molten zinc. It forms a tougher coating than paint, and once scratched rusting is slow, because the zinc is more reactive than iron and oxidises in preference (a form of sacrificial protection). Used in corrugated iron, galvanised buckets etc. □ **Sacrificial protection**: fastening blocks of a more reactive metal such as magnesium to the steel, at intervals (e.g. to a steel mast on a yacht). The more reactive metal oxidises in preference to the iron – i.e. is sacrificed – and can be replaced.

CONCLUSION:

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STAGE	TEACHERS ACTIVITY	PUPILS ACTIVITY(METHODS)

Oxygen gas

Formula: O_2

Oxygen gas exits as a diatomic molecule, O_2

It makes up about 21% of air by volume

Preparation of oxygen

1. Laboratory preparation of oxygen

In the laboratory, oxygen gas can be prepared using the following chemicals:

(a) Potassium chlorate, $KClO_3$

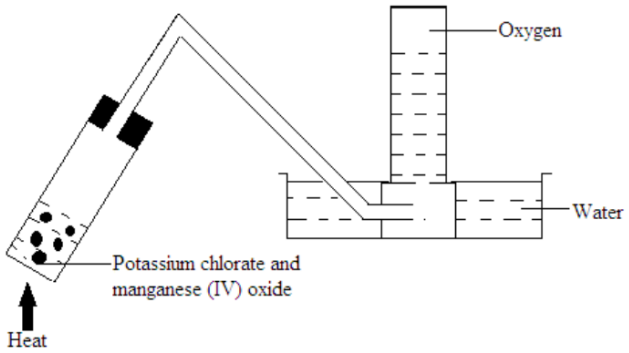
(b) Hydrogen peroxide, H_2O_2

(c) Sodium nitrate, $NaNO_3$ and Potassium nitrate, KNO_3

[A] Potassium chlorate

Potassium chlorate is mixed with a catalyst manganese (IV) oxide upon heating and decomposes into potassium chloride and oxygen gas

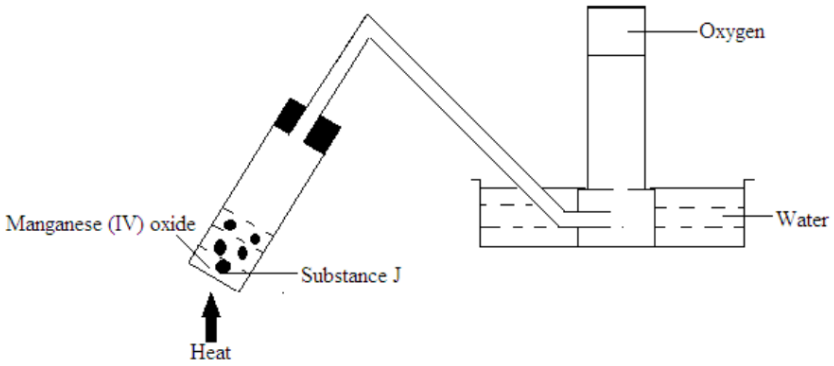
$2KClO_{3(s)} \rightarrow 2KCl_{(s)} + 3O_{2(g)}$



Note: This experiment is explosive

Example

1. Study the diagram below that shows preparation and collection of oxygen gas



(a) Name substance J

(b) Write a balanced chemical equation for the reaction in the experiment

(c) What is the method of collecting the gas used in the experiment?

(d) What is the function of the manganese (IV) oxide in the experiment?

(e) Explain why the first gas collected in the gas jar was not pure oxygen?

(f) State one industrial use of oxygen

Solution

(a) Potassium chlorate

(b) $2KClO_{3(s)} \rightarrow 2KCl_{(s)} + 3O_{2(g)}$

(c) Down ward displacement of water

(d) Acts as a catalyst

(e) It is contaminated with air already in the apparatus

(f) Welding (as oxyacetylene flame) etc.

CONCLUSION:……

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EVALUATION:……

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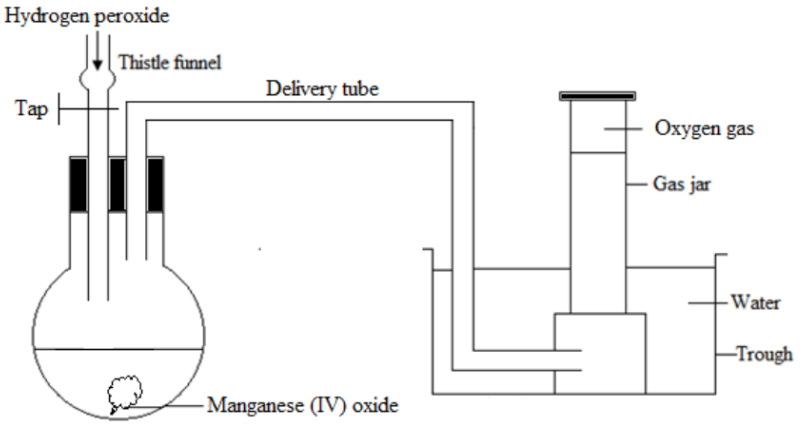
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STAGE	TEACHERS ACTIVITY	PUPILS ACTIVITY(METHODS)
	[B] Hydrogen peroxide Oxygen gas is also prepared by the decomposition of hydrogen peroxide solution using manganes (IV) oxide as a catalyst. No heating is required $2H_2O_{2(aq)} \rightarrow 2H_2O_{(l)} + O_{2(g)}$  Oxygen gas is collected over water Method of collection: Down ward displacement of water Drying agent: Concentrated sulphuric acid **[C] Sodium nitrate and potassium nitrate** Oxygen gas can be prepared by heating sodium nitrate or potassium nitrate (I) $2NaNO_{3(s)} \rightarrow 2NaNO_{2(s)} + O_{2(g)}$ (II) $2KNO_{s(s)} \rightarrow 2KNO_{2(s)} + O_{2(g)}$ **2. Industrial preparation of oxygen gas** On the large scale, oxygen gas is manufactured by fractional distillation of liquid air. Liquid oxygen boils at -183°C while liquid nitrogen boils at -196°C Nitrogen gas which has a the lower boiling point distils off first **Test for oxygen gas** Oxygen gas relights a glowing splint introduced in its container **Uses of oxygen** 1. It is used in the manufacture of steel in the blast furnace 2. It is used in oxygen tents in hospitals for patients in the intensive care unit 3. It used for welding in the oxy-acetylene flame 4. It used by deep sea divers and mountain climbers 5. It is used as liquid oxygen in rockets when in outer space to support burning of hydrogen **Physical properties of oxygen**	1. It is colorless 2. It is odorless 3. It is slightly soluble in water 4. It is slightly denser than air 5. It supports burning 6. It boils at -183oC 7. It does not burn **Chemical properties of oxygen** **1. Respiration** Respiration is the process by living organisms oxidize glucose to produce carbon dioxide, water and energy C6H12O6 + 6O2 → 6CO2 + 6H2O + energy **2. Combustion** Alternative term: Burning Combustion is the process by which a substance reacts with oxygen to produce an oxide and heat. It is also defined as the burning of substances in oxygen. **Example** Carbon burns in oxygen to form carbon dioxide and heat energy. C + O2 → CO2 + energy **3. Rusting** Rusting is the corrosion of iron. Corrosion is a process by which something, especially a metal, is destroyed progressively by chemical action, as iron when it rusts It is an electrochemical process by which iron corrodes in the presence of oxygen, water and an electroly

CONCLUSION:

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EVALUATION:……

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Carborn

Allotropes of carbon

Definition: Allotopes are elements in different physical forms but in the same state

Allotropy is the existence of an element in different physical forms but in the same state

Carbon exists in the form of graphite, diamond and amorphous

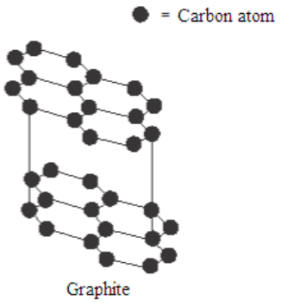
Grapphite and diamond are allotropes of carbon.

[A] Graphite

Structure of graphite

Graphite is a soft, black, crystalline form of carbon that is a fair conductor of electricity.

It is made up of flat sheets of carbon atoms



Graphite

Each carbon atom is boneded to three others while the fourth electron is delocalised. Since each carbon atom forms covalent bonds to three other, this gives rings of six atoms that join to make flat sheets

The sheet of atoms lie on top of each other, held together by weak forces

Physical properties of graphite

1. It is a good conductor of electricity because of free moving electrons in between the layers of carbon atoms
2. It is soft and slippery. This is because the sheets of atoms can slide over each other easily.
3. It writes well on paper
4. It is has a density of $2.22 g/cm^3$
5. It has a high melting point. This is because the strong bonds between the carbon atoms within a layer make graphit difficult to pull apart in the direction of the layer.

Uses of graphite

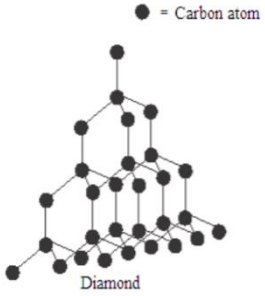
1. It is used as a lubricant because the layer of carbon atoms slide over each other easily
2. It is used as an electrode in electrolysis
3. It is used in making the "lead" for pencils. This is because it leaves a grey streak when it is drawn across a sheet of paper

[B] Diamond

Structure of diamond

Diamond is a colourless, crystalline solid with an extremely high density

It is a giant structure of carbon atoms



Diamond

Each carbon atom shares electrons with each of its four nearest neighbours, thus forming four
covalent bonds

In addition, each carbon atom is imagined to be at the centre of the tetrahedron surrounded by four
other carbon atoms whose centres are at the corners of the tetrahedron

Physical properties of diamond

1. It is very hard - the hardest substance known. It has a very high melting point of about
3700oC because each atom is held in place by four strong bonds.
2. It is colourless and transparent with a dazzzling brilliant lustre
3. It has a density of 3.5g/cm3
4. It does not conduct electricity because there are no ions or free electrons in it to carry
charge

Uses of diamond

1. It is uesd for cutting tools and drilling devices
2. It is used for cutting glass

CONCLUSION:

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