

OXYGEN

What is oxygen?

- Oxygen is the gas that forms about 21% by volume of the air.

TERMINOLOGIES USED DURING PREPARATION OF OXYGEN

- The following are the terminologies used during preparation of oxygen in the laboratory.

1. DECOMPOSITION

What is decomposition?

- Decomposition is a breakdown of large compound into smaller compounds or elements.

2. CATALYST

What is catalyst?

- Catalyst is a substance that alters the rate of chemical reaction but remain unchanged at the end of the reaction.

Ubn-academic-centre Gmbto Ulongoni-b-dsm

(1)

EXAMPLES OF CATALYST

(2)

- Below are the some of examples of Catalyst

(i) Manganese (IV) oxide

— Formula (MnO_2)

(ii) Platinum

— Symbol (Pt)

(iii) Nickel

— Symbol (Ni)

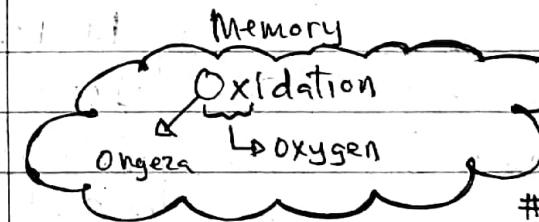
(iv) Vanadium (V) oxide

Sir Robert
0624254757

3. OXIDATION

What is oxidation?

- Oxidation is the addition of oxygen to a substance



Oxidation is the removal of hydrogen from a substance;

oxygen oxygen:

Oxidizing agent: Is a substance that add oxygen to a substance.

4. REDUCTION

- Is a removal of oxygen from a substance.

Reducing agent: Is a substance that cause reduction to take place (3)

SAMPLE QUESTIONS

① Give the meaning of the following terms

- (a) Oxygen
- (b) Decomposition
- (c) Catalyst.

② List down three examples of Catalyst

③ Distinguish oxidizing agent from reducing agent

④ Match the items in List A with Corresponding answers to list B .

LIST-A

- i) Removal of hydrogen from a substance
- ii) Removal of oxygen from a substance
- iii) Substance which remove of hydrogen from a substance
- iv) Substance which remove of oxygen from a substance
- v) Alter the rate of chemical reaction

LIST-B

- a) oxidation
- b) Reduction
- c) Catalyst
- d) Reducing agent.
- e) Oxidizing agent.
- f) Decomposition

⑤ Write the Composition of the following gases in the atmosphere. (4)

- (a) Oxygen
- (b) Nitrogen
- (c) Carbon dioxide

Robert Maki
0624254757
Free Notes

ANSWERS

① a) Oxygen is the gas that forms about 21% by Volume of the air.

b) Decomposition is the reaction in which a Chemical Compound breaks down into its Constituent elements or Simpler Compounds.

c) Catalyst is a Substance that alters the rate of chemical reaction but remain Unchanged at the end of the reaction.

② Examples of Catalyst

- (i) Manganese (IV) oxide
- (ii) Platinum
- (iii) Nickel

③ Oxidizing agent is the Substance that cause oxidation to take place while reducing agent is a Substance that cause reduction to take place.

(04)

I	II	III	IV	V
A	B	E	D	C

(5)

1. DECOMPOSITION OF HYDROGEN PEROXIDE

(6)

(A) APPARATI

- (i) Thistle funnel.
- (ii) Flat bottomed flask.
- (iii) Delivery tube
- (iv) Water bath (Trough).
- (v) Gas Jar. (Inverted).
- (vi) Rubber.
- (vii) Tap.

Prepared by
Robert Msaki
0624254757

(B) CHEMICALS

- (i) Hydrogen peroxide
→ Formula (H_2O_2)
- (ii) Manganese (IV) oxide
→ Formula (MnO_2)
- # Water
→ formula (H_2O)

You SHOULD NOTE THAT

- The common method for preparing oxygen in the laboratory is catalytic decomposition of hydrogen peroxide.
- This method is very safe because it does not involve the uses of heat (Heat may cause fire accidents).

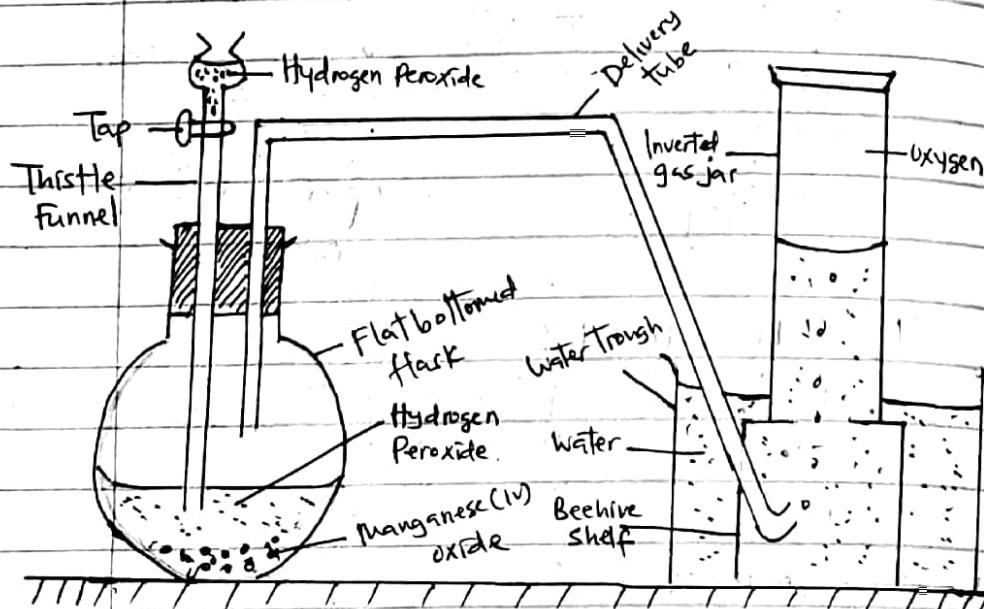
Example-06

- Why decomposition of hydrogen peroxide method is mostly preferred in the preparation of oxygen gas?

Answer

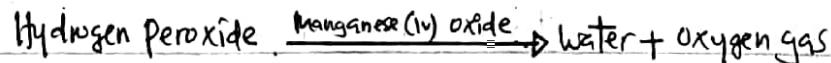
- Because it produces enough gas without the use of heat.

EXPERIMENTAL SET-UP FOR PREPARATION OF OXYGEN BY USING HYDROGEN PEROXIDE

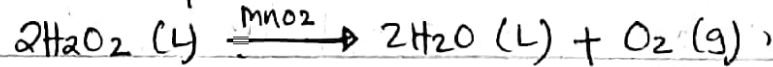


(C) EQUATION (REACTION TAKING PLACE)

(i) Word equation



(ii) Chemical equation



#G•mboto (Ulongoni•b-Kibaoni) Dar-es-Salaam

(D) CATALYST

- During preparation of oxygen by decomposition of hydrogen peroxide (H_2O_2) the catalyst used is Manganese (IV) oxide.
- Its formula is MnO_2 .

(E) ROLE OF CATALYST

- The Role of manganese (IV) oxide during preparation of oxygen by decomposition of Hydrogen peroxide is to speed up the decomposition of Hydrogen peroxide.

Simply: Role of manganese (IV) oxide is to speed up the rate of chemical reaction.

Example-07

Speed up the decomposition of H_2O_2 during preparation of oxygen in the laboratory.

(a) NaOH

(b) CaCO_3

(c) O_2

(d) MnO_2

D

Ubn-academic
centre

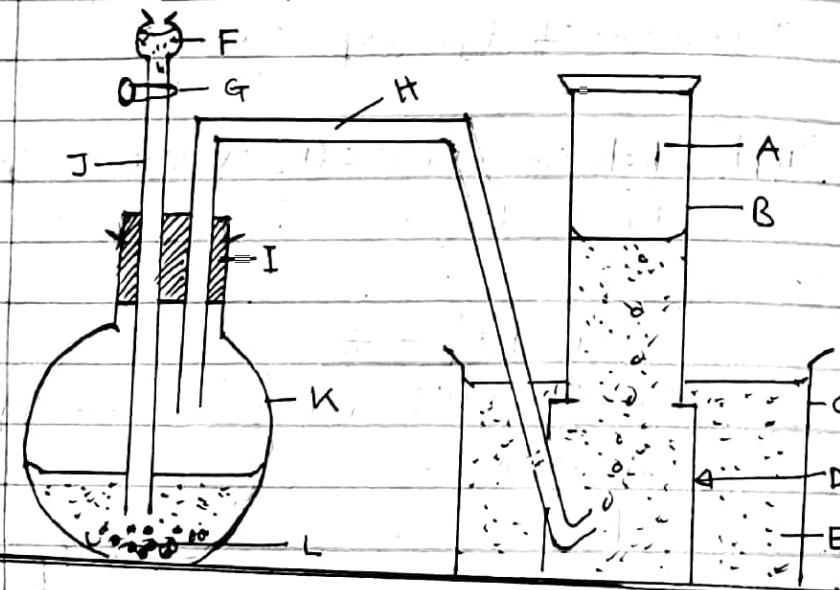
Example-08

The following are the apparatus used during preparation of oxygen in the laboratory by decomposition of hydrogen peroxide.

- (a) Beaker and thistle funnel
- (b) Round bottomed flask and trough
- (c) Gas jar and Calorimeter
- (d) Beehive shelf and delivery tube

D

Example-09



- (i) Complete the diagram above
- (ii) From the diagram, what is the function of the chemical labelled "L"

- (iii) State the role of the chemical labelled "F" ⑩
- (iv) Briefly explain why the method used above is called "Catalytic decomposition of hydrogen peroxide"?
- (v) The gas produced from the figure above is called _____ and it is form about _____ percent by Volume of air.
- (vi) Why the gas produced is collected above water?
- (vii) What is the function of the tube labelled by letter "H"?
- (viii) Write down the reaction takes place during Preparation of oxygen by decomposition of hydrogen peroxide (word equation and balanced chemical equation).

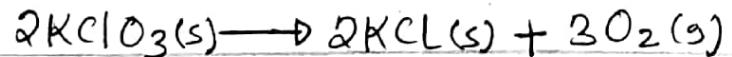
Answer

- | | |
|-----------------------|-------------------------|
| i) A = Oxygen gas | H = Delivery tube |
| B = Inverted gas jar | I = Rubber |
| C = Water trough | J = Thistle funnel |
| D = Beehive shelf | K = Flat bottomed flask |
| E = Water | L = Manganese (IV) |
| F = Hydrogen peroxide | oxide. |

- (ii) To speed up the decomposition of hydrogen peroxide.
- (iii) To prepare oxygen gas.
- (iv) Because it is involve the uses of catalyst.
- (v) Oxygen, 21
- (vi) Because it is slightly soluble in water.
or "Because oxygen is less denser than water".
- (vii) To deliver oxygen gas from flat bottomed flask to the gas jar.
- (viii) Refer to notes (Page - 07).

2. DECOMPOSITION OF POTASSIUM CHLORATE

Potassium chlorate decomposed on heating by using manganese (IV) oxide to produce potassium chloride and oxygen gas.



Where

KClO_3 = Potassium chlorate -

MnO_2 = Manganese (IV) oxide

KCl = Potassium chloride

O_2 = Oxygen gas -

PREPARATION OF OXYGEN GAS IN THE LABORATORY BY DECOMPOSITION OF POTASSIUM CHLORATE (12)

POTASSIUM CHLORATE

Apparati

- (i) Test tube
- (ii) Retort stand.
- (iii) Heat source
- (iv) Delivery tube
- (v) Inverted Gas jar
- (vi) Water Trough
- (vii) Beehive shelf

Chemicals

(i) Potassium chlorate

→ KClO_3

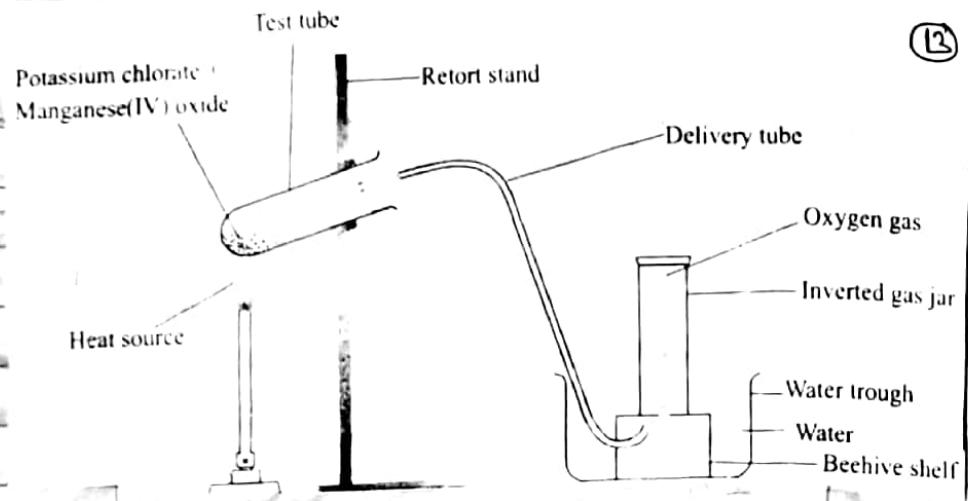
(ii) Manganese (IV) oxide

→ MnO_2

Water

→ H_2O

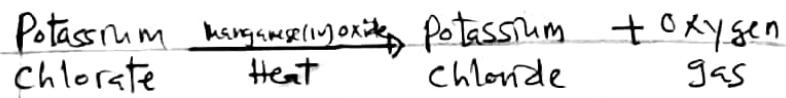
Robert Msaki - 0624254757
Uwezo by nature @ gmail.com



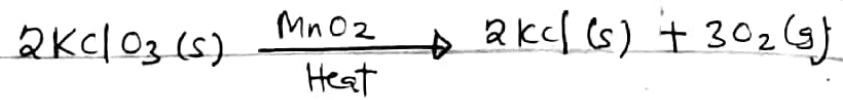
(13)

REACTION TAKING PLACE

(A) WORD EQUATION



(B) FORMULA EQUATION



METHOD OF COLLECTION

Oxygen gas is collected by downward displacement of water.

WHY?

Because it is slightly soluble in water.

TEST FOR OXYGEN GAS

(14)

Oxygen gas

: Relights a glowing wooden splint

PROPERTIES OF OXYGEN GAS I

- Oxygen has got
 - (a) Physical properties
 - (b) Chemical properties

(A) PHYSICAL PROPERTIES OF OXYGEN

- The following are the physical properties of oxygen gas
 - (i) It is odourless, colourless and tasteless
 - (ii) It is slightly soluble in water
 - (iii) It boils at -183°C
 - (iv) It freezes at -218°C
 - (v) It is slightly denser than air

(B) CHEMICAL PROPERTIES OF OXYGEN

- The following are the chemical properties of oxygen
 - (i) It supports combustion.
 - (ii) It is very strong oxidizing agent.
 - (iii) It reacts with metal to form basic oxide

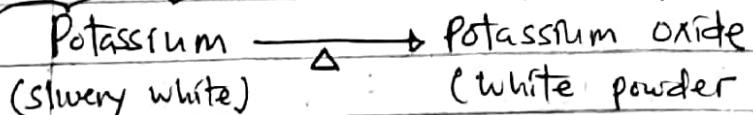
(iv) It reacts with non metal to form acidic oxides.

REACTION OF SOME METALS AND OXYGEN (15)

Oxygen react with metal to form basic oxides

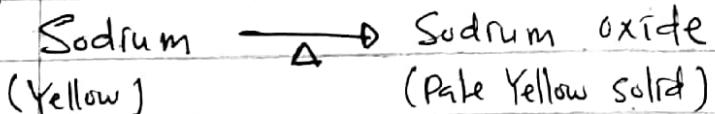
1. POTASSIUM

- Potassium melt easily and burns with a lilac flame to produce potassium oxide.



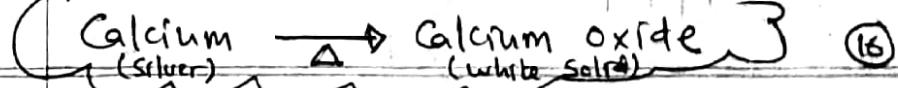
2. SODIUM

- Sodium burns vigorous with a yellow flame to produce Sodium Oxide



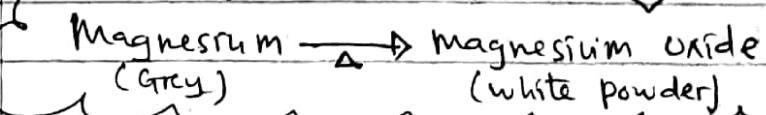
3. CALSIUM

- Calcium does not melt, burns with brick red flame to produce Calcium oxide



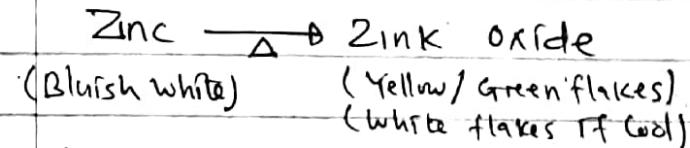
4. MAGNESIUM

- Magnesium melts before it burns with bright white flame to produce magnesium oxide .



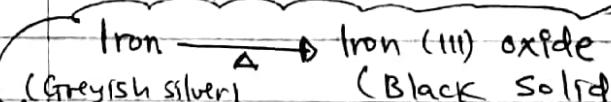
5. ZINK

- Zinc burns slowly with a dull red flame to produce Zinc oxide



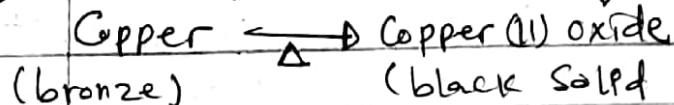
6. IRON

- Iron glows red to produce iron (III) oxide



7. COPPER

- Copper turns orange then the surface of the product turns black.

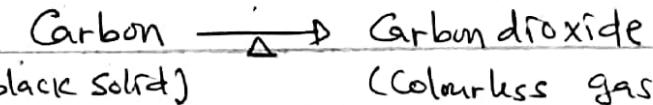


REACTION OF SOME NON-METALS AND OXYGEN

Oxygen reacts with non-metals to produce by
src oxides

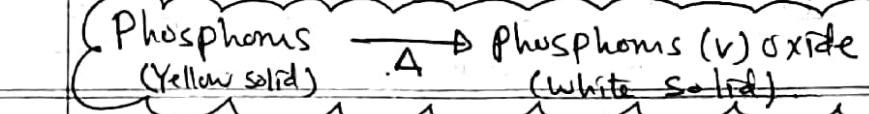
1. CARBON

- Carbon burns slowly with a yellow white flame to produce Carbon dioxide.



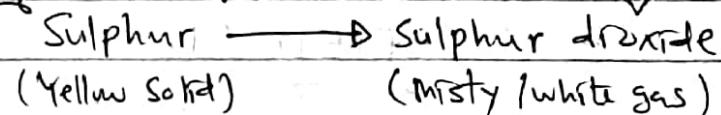
2. PHOSPHORUS

- Phosphorus burns brightly to produce clouds of white Smokes of phosphorus (V) oxide.



3. SULPHUR

- Sulphur melts and burns slowly with a blue flame to produce Sulphur dioxide



N.B

These products are said to be acidic because when react with water they form acidic solution.

Those which are called basic, because when they react with water they form base solution.

Example - qg

FTNA - 2022

- A large Percent of air is composed of

- (A) Nitrogen (C) Carbon dioxide
(B) Noble gases (D) Oxygen

A

INDUSTRIAL MANUFACTURE OF OXYGEN (LARGE SCALE)

(19)

- In Industry Oxygen produced in large Scale by Using Fractional distillation of liquefied air.

FRACTIONAL DISTILLATION OF LIQUEFIED AIR

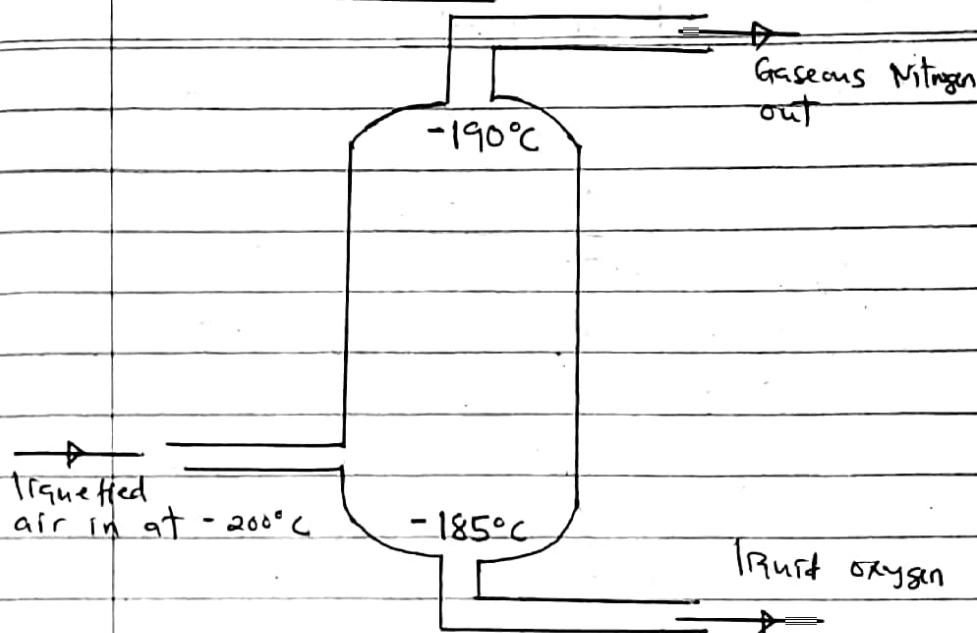
- The following are the steps used to obtain O₂ in Industry

- Filter air to remove dust.
- Air is liquefied (Air changed to liquid) by lower temperature to -200°C
 - Water Vapour condensed and removed by using special filters.
 - Carbon dioxide freezes at -79°C and removed
 - Oxygen liquified at -218°C
 - Nitrogen liquified at -196°C
- The remains mixture (Nitrogen and water) is Separated by Using fractional distillation.

Prepared by R.S. Msaki 0624254757

Diagram

(20)



Nitrogen collected at the top and piped off then stored.

Oxygen collected at the bottom and piped off then stored

USES OF OXYGEN

- The following are the uses of oxygen.
 - It is used by mountain climbers.
 - It is used by divers.
 - It is used in respiration process.
 - It is used in hospitals.
Eg: In incubators and I.C.U

V) It is used for welding purpose.

Example-10

→ Write down chemical properties of oxygen

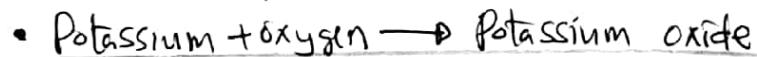
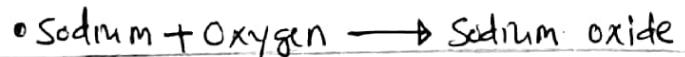
Answer

(i) It supports Combustion

(ii) It is a good oxidizing agent

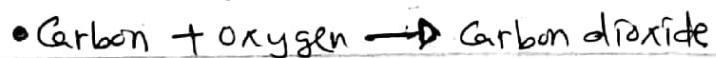
(iii) Oxygen reacts with metal to form metal oxide (basic oxide).

Example



(iv) It reacts with non-metal to form non-metallic oxide (acidic oxide).

Example



⑫ What do you understand by the following terms

(a) Basic oxide

(b) Acidic oxide.

⑬ How would you distinguish pure oxygen from ordinary air

Ans: Oxygen relights a glowing wooden splint but ordinary air does not relights it.

⑭ What would happen if there were no oxygen in the atmosphere?

⑮ Why is hydrogen peroxide preferred to potassium chlorate in the laboratory preparation of oxygen?

⑯ Most uses of oxygen are dictated by its properties. Explain.

POSSIBLE QUESTIONS

⑦ What happens when the following elements are burnt in oxygen?

(a) Calcium

Ans: Check page

(b) Sulphur

15 and 18

UBN ACADEMIC CENTRE

G·MBOTO ULONGONI·B·DSM

KIBAO CHA SHULE

HYDROGEN

(1)

What is Hydrogen?

- Hydrogen is the lightest and most abundant element in the Universe

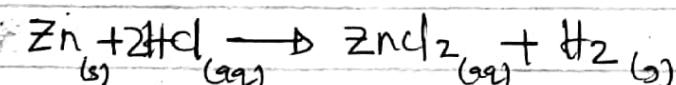
LABORATORY PREPARATION OF HYDROGEN

- Below are the common method for preparing hydrogen in the laboratory

- Reaction of dilute acid with some metals.
- Reaction of water with certain metals.
- Reaction of water with hot Carbon.
- Electrolysis of water.

1. REACTION OF DILUTE ACID WITH SOME METALS

Hydrochloric acid (HCl) reacts with Zinc metal to produce Zinc chloride and hydrogen gas.



EXPERIMENT

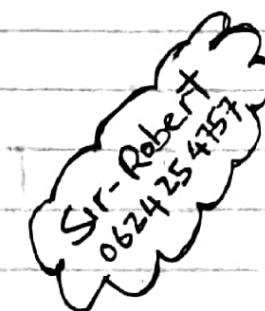
(2)

Aim

- To prepare hydrogen in the laboratory by reacting dilute hydrochloric acid with Zinc granules

REQUIREMENTS :

- Flat-bottomed flask.
- Thistle funnel
- Gas jars with their lids
- Water trough.
- Beehive shelf.
- Two-holed rubber bung.
- Zinc granules.
- Dilute hydrochloric acid.
- Water.

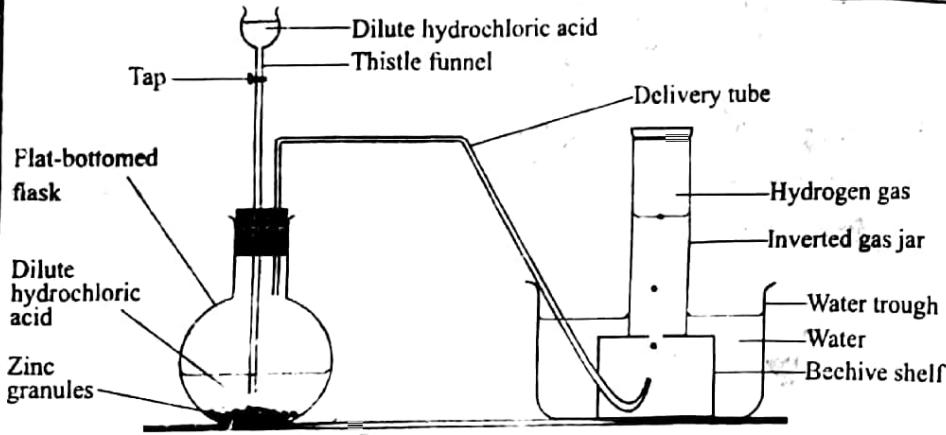


PROCEDURE

- Put some Zinc granules into flat bottomed flask
- Fill the gas jar with water and invert it on the beehive shelf in the water trough.
- Set up the rest of the apparatus as shown in the figure below:
- Add dilute hydrochloric acid to the Zinc granules.

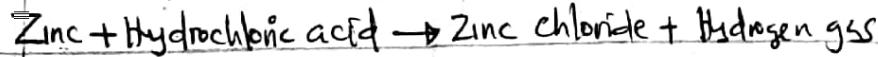
5. Collect the gas jar over water, ensuring that you only remove the gas jar when it is full, and that you keep the jar tightly closed with the lid.

(3)

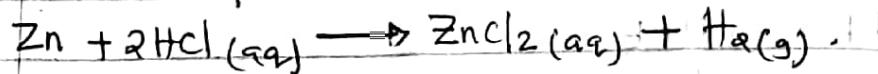


EQUATION:

(a) Word Equation



(b) Chemical equation



METHOD OF COLLECTING THE GAS

• Hydrogen gas is collected by downward displacement of water because it is less dense than air.

Example-01

→ Why hydrogen gas is collected by downward displacement of water.

Answer

→ Because it is less dense than air.

(4)

Example-02

→ Why hydrogen gas is collected over water?

Answer

→ Because it is slightly soluble in water

Example-03

→ Why does hydrogen rise high in the atmosphere?

Answer

→ Because hydrogen gas is lighter than air.

TEST FOR HYDROGEN

→ Hydrogen on gas jar tested by introduce a glowing wooden splint if hydrogen present it explode with a Pop sound.

Ubn-academic
centre

Example-04

→ Hydrogen gas is not often found free on its own on the earth's surface, instead it is found in combination with many other elements. Explain.

Example-05

→ Why should a gas jar of hydrogen be tightly closed with a lid?

Answers

- (4) Because hydrogen is very reactive element.
- (5) Because when the gas jar is left open hydrogen can escape since is lighter than air.

PROPERTIES OF HYDROGEN

Hydrogen has got

- (a) Physical properties.
- (b) Chemical properties.

Sir-Robert
0624254755

(A) PHYSICAL PROPERTIES OF HYDROGEN

- (i) It is odourless, colourless and tasteless.
- (ii) It is slightly soluble in water.
- (iii) It is lighter than air.

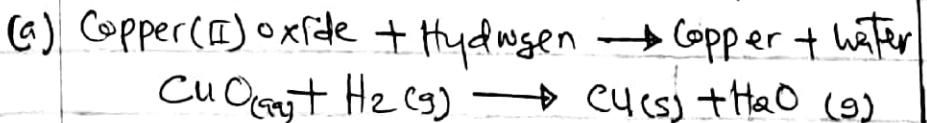
(B) CHEMICAL PROPERTIES OF HYDROGEN

- (i) It is neither basic nor acidic (It is Neutral to litmus paper).
- (ii) It does not support Combustion.
- (iii) It reacts slowly with oxygen to produce water.
- (iv) It is highly flammable and burns with a blue flame.

- (v) Combine easily with other chemical substance at high temperature.
- (vi) Mixture of hydrogen and oxygen explodes when lit.
- (vii) It reacts with oxides of metal to produce free metals.

REACTION OF HYDROGEN WITH OXIDES

Hydrogen reacts with oxides of metal to produce free metals, such as:



Copper (II) oxide is reduced to copper metal

Reduction is the addition of hydrogen to a substance.



Lead (II) oxide is reduced to lead metal

(c) Iron (II) oxide reacts with hydrogen to form iron and water.

(d) Calcium oxide reacts with hydrogen to form calcium and water.

Example-06

(7)

- Is hydrogen gas basic or acidic? Justify

Answer

- Hydrogen gas is neither basic nor acidic because it is neutral to litmus paper.

INDUSTRIAL MANUFACTURE OF HYDROGEN

- Hydrogen in Industry is manufactured by
 - (a) Electrolysis of water.
 - (b) Steam reforming of natural gas.

(A) ELECTROLYSIS OF WATER

What is electrolysis of water?

- Electrolysis of water is a process that decomposes water into oxygen and hydrogen gas by means of an electric current.

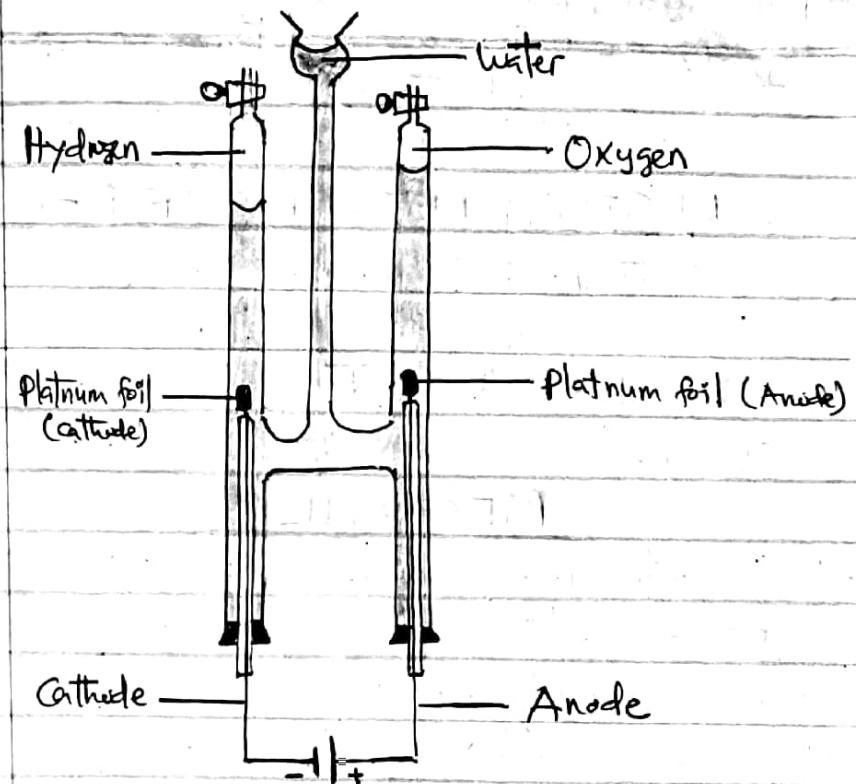
N.B

- The set-up for the electrolysis of water is called the Hofmann Voltmeter.

Ubn-academic-centre-Ulongoni-b-Gmboto

Diagram

(8)



MECHANISM OF HOFMANN VOLTAMETER

- When the electricity is switched on, water decomposes and hydrogen collected at Cathode (negative terminal) and Oxygen collected at anode (positive terminal).

Example-07

- Draw a well diagram of hofmann voltameter and explain how it works (its action).

Scanned with CamScanner

N.B

(9)

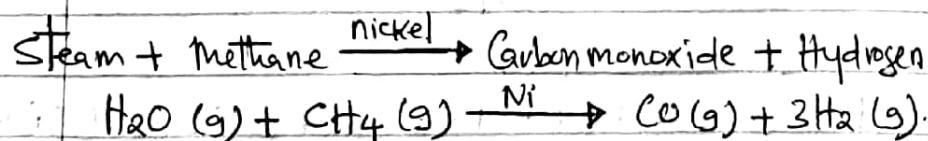
- Pure hydrogen is manufactured Industrially by electrolysis of water or by steam reforming of natural gas (Methane).

(B) STEAM REFORMING OF NATURAL GAS

- This method is used to produce or manufacture hydrogen.
- It is also called Steam Methane Reforming (SMR).

MECHANISM

- When steam at 700°C to 1000°C reacts with methane (natural gas) produce Carbon monoxide and hydrogen.



- This reaction takes place in the presence of Metal catalyst such as nickel or platinum.

USES OF HYDROGEN

- The following are main uses of hydrogen.

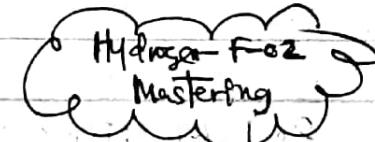
- Manufacture of ammonia.
- Manufacture of margarine.

- (10)
- Manufacture of oxy-hydrogen flame.
 - Manufacture of hydrochloric acid.
 - Prepare water gas (Fuel).
 - Filling weather balloons.
 - welding and metal cutting -

NB: Hydrogenation is the process of passing hydrogen through liquid oil to harden it.

MANUFACTURING OF AMMONIA

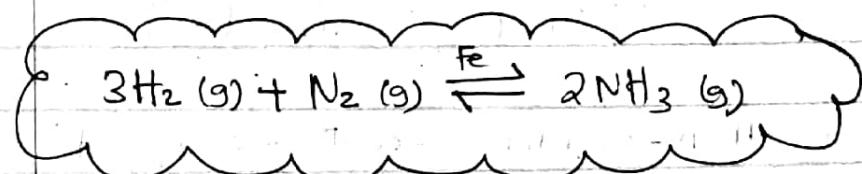
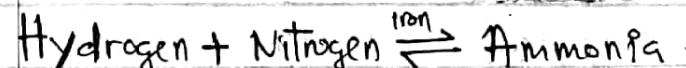
- Hydrogen reacts with nitrogen under iron Gtz. lyst to yield ammonia on large scale called Haber Process:



HABER PROCESS

What is Haber process?

- Haber process is the process of manufacturing ammonia.



USES OF AMMONIA

(11)

- (i) Production of Nitric acid.
- (ii) Production of fertilizers.
- (iii) Synthetic fabrics Such as polyester fabrics and polyamide fabrics.

2. MANUFACTURE OF MARGARINE

- Hydrogen is bubbled through liquid oil with nickel catalyst to harden the liquid oil, which then is processed to form margarine. This process is called Hydrogenation.
- Hydrogenation is the process where by hydrogen reacts with other chemical substance.

3. MANUFACTURE OF OXY-HYDROGEN FLAME

- Hydrogen is manufacture oxy-hydrogen flame which is very hot up to 3000°C .

USES OF OXY-HYDROGEN FLAME

- (i) Used for welding.
- (ii) Used for cutting Metals

4. MANUFACTURE OF HYDROCHLORIC ACID

(12)

- Hydrogen reacts with chlorine to yield hydrogen chloride gas, which dissolved in water to form hydrochloric acid.

5. PREPARE WATER GAS (FUEL)

- Water gas prepared by using hydrogen used as fuel which used by rocket.

6. FILLING WEATHER BALLOONS

- Since hydrogen is less dense than air it used to fill balloons.

Sir - Robert
0624254757

RELATIONSHIP BETWEEN SOME USES OF HYDROGEN AND ITS PROPERTIES

USE	PROPERTY
i. Manufacturing of ammonia	Readily reacts with other substances, e.g. nitrogen and chlorine
ii. Manufacturing of hydrochloric acid	
iii. Production of oxy-hydrogen flame	Highly flammable
iv. Preparation of water gas	
v. Filling weather balloons	Lighter than air
vi. Manufacturing of margarine	Reducing agent.

Example-08

(13)

- The main uses of hydrogen can be linked to its various properties. Match each use in list A against the related property from list B.

LIST-A

- Inflating weather balloons
- Manufacturing of ammonia.
- Manufacturing of margarine
- Production of oxy-hydrogen flame.

LIST-B

- It readily combines with other elements.
- It is denser than air.
- It is lighter than air.
- It is an oxidizing agent.
- It is highly flammable.
- It is a reducing agent.
- It burns with blue flame.
- It relights a glowing splint.

Answer:

LIST-A	a	b	c	d
LIST-B	III	I	VI	V

Example-09

- Explain the origin of the term Hydrogen.

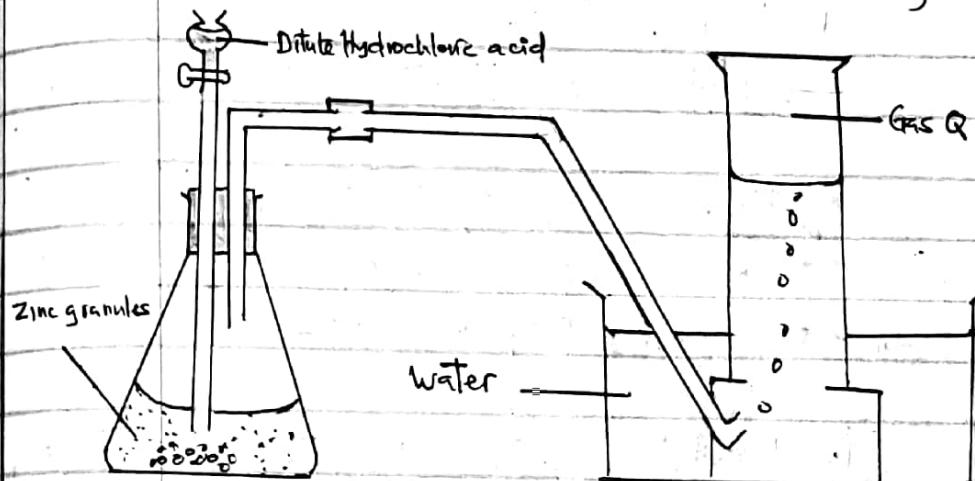
Answer:

(14)

- The word hydrogen comes from Greek words hydro - meaning "water" and genes - meaning "creator" or "generator".

Example-10

- The following figure shows a set-up for the preparation of gas Q in the laboratory.



- Identify gas Q

- What properties of Q make it possible to be collected as shown in the figure.

- Describe the properties of gas Q which relates with its uses.

Answer

- (a) Hydrogen gas
- (b) i) Slightly soluble in water.
ii) Less denser than water.
- (c) i) Hydrogen (Gas Q) is lighter than air
— Used in filling weather balloons.
- ii) Hydrogen (Gas Q) is reducing agent
— Used in manufacturing of Margarine.
- iii) Hydrogen (Gas Q) is highly flammable
→ Used in production of oxy-hydrogen flame
→ Used in preparation of water gas.
- iv) Readily reacts with other substances,
for example nitrogen and chlorine.
→ Used in manufacturing of ammonia.
→ Used in manufacturing of hydrochloric acid.

(15)

Prepared by: R.S. Msaki (Sir-Roby)
0624254757.

Example - II

FTNA - 2022

(16)

The laboratory technician planned to conduct an experiment for the preparation of gas Y. The following set of apparatuses was used: Flat bottomed flask, Thistle funnel, delivery tube, beehive shelf and gas jars. Also pieces of Zinc metal and dilute hydrochloric acid were used.

- Identify gas Y
- What apparatus is missing in the set provided?
- Draw a well labelled diagram for the preparation of gas Y in the laboratory.
- Write the word equation for the laboratory preparation of gas Y.

Answer

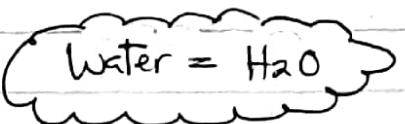
- HYDROGEN
- WATER TROUGH
- Refer to notes (Page - 14)
- Zinc + Hydrochloric acid → Zinc + Hydrogen chloride gas.

WATER

(1)

- What is water?

Water is an inorganic chemical substance composed of hydrogen and oxygen atoms:



OCCURANCE OF WATER

→ The water on earth occurs in three main states

- Solid
- Liquid
- Gaseous

(A) SOLID

Water when freeze become solid, and this process is called freezing.

FREEZING

What is freezing?

- Freezing is the change of state of matter from liquid to solid.
- Freezing point is the temperature at which a liquid change into solid.

EXAMPLES WHICH DESCRIBE WATER EXIST IN SOLID

(2)

- Includes

- Ice
- Snow
- Hail

Mastering of water f-02

(B) LIQUID

- Water may exist in liquid state. Normally
- The existence of water may change from solid to liquid through the process called Melting.

MELTING

What is melting?

- Melting is the change of state of matter from solid to liquid.
- Melting point is the temperature at which a solid change into liquid.

EXAMPLES WHICH SHOW THE EXISTANCE OF WATER IN LIQUID

- Includes

- Dew
- Rain

Sir-Roby
0624254757

(C) GASEOUS

- Water may also exist in gaseous state. ③
- A water may change into gas through the process called Evaporation.

EVAPORATION

What is evaporation?

- Evaporation is the change of state of matter from liquid to gas.

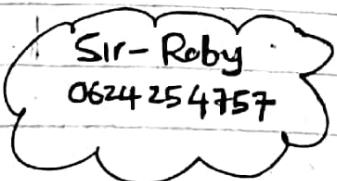
EXAMPLES WHICH SHOWS EXISTENCE OF WATER IN GASEOUS

→ Includes

- (i) Steam / Vapour
- (ii) Mist.
- (iii) Clouds.

N.B

- Water is exist in all three states of matter



HYDROLOGICAL CYCLE

What is Hydrological cycle?

- Hydrological cycle is the system where by water being recycled.
- Hydrological cycle is also known as water cycle

PARTS OF HYDROLOGICAL CYCLE

④

- Water cycle is made up with four main parts:

- Evaporation.
- Condensation.
- Precipitation.
- Collection.

Mastering of
Water-F-02

I. EVAPORATION (INCLUDE TRANSPIRATION)

- Water from rivers, lakes, streams, sea, ponds etc., evaporate to air. Plants lose water by transpiration while animals and human being lose water perspiration and Sweating.
- Transpiration is the process whereby plant loses water by evaporation.

II. CONDENSATION

- Water vapour obtained by evaporation, transpiration, perspiration and Sweating in the air gets cold and changes back into liquid to form clouds.

III. PRECIPITATION

- Rain starts when air fails to hold condensed water and final result rain.

IV. COLLECTION

- Takes place when rain water back to the ground which may run over the soil and collected in the rivers, lakes, stream, sea, ponds where cycle starts all over again.

Example-01

- (a) What is water cycle?
 (b) Explain four parts of water cycle.
 (c) Draw a well labelled diagram of water cycle.

Answer

(a) Water cycle is the sequence that describes continuous movements of water on, above and below the surface of the earth in different states.

(b) Four parts of water cycle.

(i) Evaporation

— Evaporation is the process whereby liquid water changes into vapour or steam.

(ii) Condensation

— Condensation occurs when vapour meets the cold condition of the atmosphere.

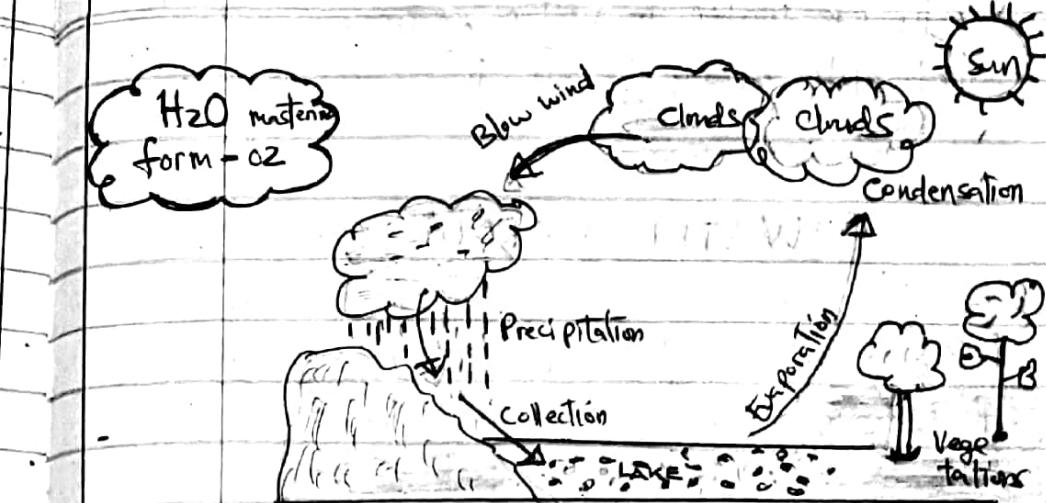
(iii) Precipitation

— Precipitation occurs when condensed atmospheric water falls under gravitational pull from clouds.

(iv) Collection

— After the water fall back to earth through precipitation, it may end up in the oceans, lakes, rivers, ponds or on land.

© Water Cycle (Hydrological cycle).



WATER CYCLE AND ENVIRONMENTAL CONSERVATION

— In order to preservation or restoration of water to be clean the following should be done in various aspects; Includes:

- (a) Water bodies.
- (b) Water Vapour.
- (c) Acidic rain.

*Sir-Robert
0624254757*

(A) WATER BODIES

- Water bodies should not be polluted in order to preservation or restoration of water to be clean.

HOW WATER BODIES POLLUTED

(6) (7)

- i) Environmental degradation destroy the quality of water in water bodies.
- ii) People dump waste materials into water bodies.

(B) WATER VAPOUR

- Gases (Sulphur dioxide, Nitrogen dioxide and Carbon dioxide) from Industries combine with water vapour to form FOG

(C) ACIDIC RAIN

- Acidic gases when combine with water vapour form acidic rain.

EFFECT OF ACIDIC RAIN

- Acidic rain kills plants
- Acidic rain kills life in water bodies.
- Acidic rain accelerates the decay of building materials like iron sheet and paints.

PROPERTIES OF WATER

(8)

- Water has got

- Physical properties.
- Chemical properties.

(A) PHYSICAL PROPERTIES OF WATER

- It is colourless, odourless and tasteless.
- Occurs naturally in all states of matter.
- It is universal solvent.
- Its freezing point is 0°C
- Its boiling point is 100°C
- It has high surface tension.
- It expands when freeze, that's why ice floats on water.
- It has high specific heat index.
- It is miscible with many liquid.

Example - 02

- What is water?
- Explain how water bodies can be polluted
- Mention Six physical properties of water

(B) CHEMICAL PROPERTIES OF WATER

- Water has got the following chemical properties: (9)

- Pure water is Neutral (Neither acidic nor basic)
- Cold water reacts with some metals to form Hydroxide and liberate hydrogen gas.
- Some metals react with steam to give respective metal oxide and hydrogen gas.

USES OF WATER

- The uses of water based on different activities such as

(A) DOMESTIC USES

Ubn-Academic
centre
Ulongani-b

- Drinking
- Cooking
- Cleaning our surroundings.
- Washing our bodies
- Washing our clothes.

(B) TRANSPORT USES

- In transport activities, water used as follows:

- Boats and ships used to transport people.
- Boats and ships used to transport goods.

(C) RECREATION USES

- In recreation activities water used as follows:

- Used for swimming.
- Used for Sporting fishing
- Ocean water used for Scuba diving.

(D) ECONOMIC USES

- In Economic activities water used in:

- Manufacture.
- Mining.
- Construction.
- Fishing.

I. MANUFACTURE

- Manufacture of chemicals
- Manufacture of foods.
- Manufacture of beverages
- Manufacture of soft drink

II. AGRICULTURE

- Used in irrigation.
- Used in animal dips
- Used in watering animals

III. MINING

- Used to carry away impurities.
- Used as solvent to extract minerals.

IV. CONSTRUCTION

- In construction of buildings used to mix sand and cement.

Sand and Cement.

- In construction of roads used to compress the sand.

V. FISHING

- It is used for fishing
- Used for artificial fish pond.

ENERGY

Moving water used to generate electricity (H.E.P)

SOLUBILITY OF DIFFERENT SUBSTANCE IN WATER

1. Water as universal solvent dissolve many substance (solute) like:

- Common salt.
- Liquid soap.
- Sodium carbonate.

Sir-Robert

0624-2547-57

2. All substance which does not dissolved they dissolved in organic substance.

Eg:

- (i) Propane Used to dissolved cooking oil.
- (ii) Ethanol Used to dissolve glue and printing ink.

11

Example-03

- Identify the process that involves conversion of water from Vapour to Liquid.

- (a) Condensation
- (b) Precipitation
- (c) Evaporation
- (d) Transpiration.

A

Example-04

Fresh water constitute about — percent of the total water on earth.

- (a) 87
- (b) 97
- (c) 3
- (d) 12

G

Example-05

Water can pass from atmosphere to land and back into the atmosphere, what term represent this sequence.

- (a) Water purification
- (b) Precipitation
- (c) Water Cycle.
- (d) Evaporation.

C

Example-06

What is the form of water when precipitation occurs:

- (a) Rain and clouds
- (b) Rain, hail and snow
- (c) Water ice
- (d) Snow and Hail

B

Example-07

(12)

- Describe physical and chemical properties of water.

WATER TREATMENT AND PURIFICATION

→ Water should be treated and purified before it can be → clean and safe for use.

DOMESTIC WATER PURIFICATION

- The following method used to treat water.

- (a) Boiling.
- (b) Uses of purifiers.
- (c) Uses of Commercial filter.

Sir - Rakesh
084254157

(A) BOILING

→ Untreated water boiled for 5 minutes to kill bacteria & filtrated by using clean cloth.

(B) USES OF PURIFIER

→ Recommended amount of chemical purifiers such as WATER GUARD or AQUA GUARD. In liquid or tablet form putted in a specific amount of water then shaken or stirred well and left to settle for twenty minutes before it can be safe for drinking.

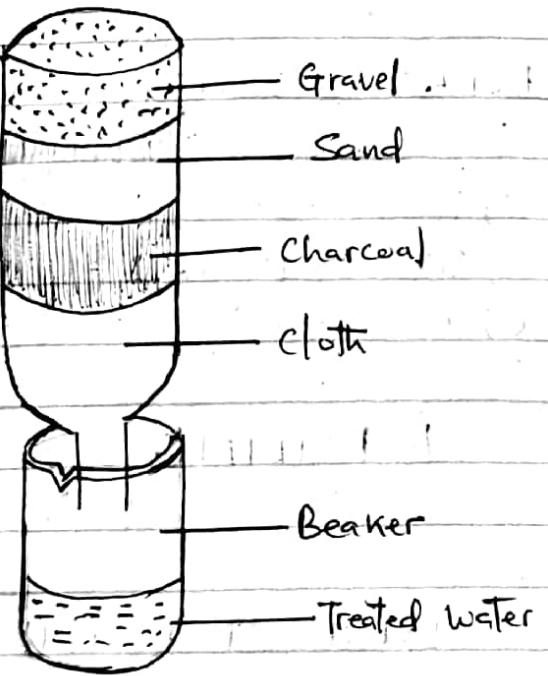
(C) USES OF COMMERCIAL FILTER

What is Commercial filter?

(13)

- Commercial filter is a system which contains two or more filter element/media through which the water passes to be cleaned.

SIMPLE WATER FILTER



PARTS OF CERAMIC WATER FILTER (SIMPLE FILTER)

- It has got four main materials

- Gravel
- Sand
- Charcoal
- Cloth

FUNCTIONS

(14)

(A) GRAVEL

- Used to trap all visible floating substances

(B) SAND

- Used to filter the smaller suspended particles

(C) CHARCOAL

- Used to kill some of the harmful bacteria

(D) CLEAN CLOTH

- Used to filter the tiniest particles.

URBAN WATER TREATMENT

- Tap water used in urban is usually obtained from sources such as rivers, streams and lakes which are not treated.

PROCESSES TREATMENT OF URBAN WATER

(a) Screening

(b) Reservoir

(c) Primary filtration

(d) Secondary filtration

(e) Disinfection / chlorination

(f) Storage

(A) SCREENING

- This process involves the removing of floats substance.

(15)

(B) RESERVOIRS

- This process involves the storing of water at high up so it flows through gravitation (atm ospheric pressure).

(C) PRIMARY FILTRATION

- This process involves

- Filtrated water comes from reservoirs through coarse sand (filter medium) to remove particles
- Addition of aluminium Sulphate to water comes from reservoir to remove smaller particles which was not filtrated at course of sand.

(D) SECONDARY FILTRATION

- This process involve filtrated water comes from primary filtration through finer sand (filter) medium to remove smallest particles.

(E) DISINFECTION

- This process involves put disinfection to water comes from Secondary filtration to kill harmful bacteria.

(F) STORAGE

- This process involves to store soft water (comes

from disinfection / chlorination) ready for use

SIGNIFICANCE OF WATER TREATMENT

(16)

- To kill harmful micro organisms such as bacteria.
- To make water safe and clean.
- To make minerals such as Iron, Sulphur.
- To remove the particles such as dust and sand.
- To make water safe for use.
- To remove human made chemical pollutant.

CHEMICAL TESTS FOR WATER:

- Using Anhydrous Copper(II) Sulphate.
→ Water turns white anhydrous Copper(II) Sulphate to blue.
- Using Cobalt Chloride.
→ Water turns blue Cobalt chloride paper to pink.
- Litmus paper
→ Water is Neutral to litmus paper.

N.B.

- Diseases like Amoebic dysentery, cholera and diarrhoea are caused by using contaminated water.

DISTRIBUTION OF EARTH'S WATER

(7)

WATER	PERCENTAGE
Fresh water	3%
Salt water	97%
Ground water	30.1%

Example - 08

FTNA - 2019

(a) Give three chemical tests for water and show the results obtained in each.

(b) i) Differentiate water treatment from water purification.

ii) Why drinking water should be treated or purified? Give two reasons.

iii) How can drinking water be treated or purified.

Answer

(a) Refer to notes (Page - 76)

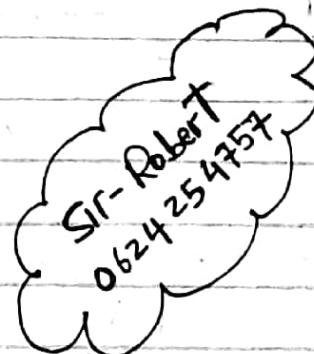
(b) i) Water treatment is the process by which harmful microorganisms in water are killed using chemicals while water purification is the process by which impurities in water are removed.

ii) Drinking water should be treated and purified so as:

- (a) To remove micro organisms that cause disease
- (b) To remove impurities that contaminate water.

iii) Ways of purifying (treating water).

- (a) Chlorination
- (b) Sedimentation
- (c) Filtration
- (d) Aeration
- (e) Flotation



Example - 09

FTNA - 2021

→ Which of the following are the products of the reaction of sodium metal with water?

- (a) Sodium oxide and hydrogen gas
- (b) Sodium hydroxide and water
- (c) Sodium oxide and water vapour
- (d) Sodium hydroxide and hydrogen gas

A

Example - 10

→ In what system through which water is continually moving above and below the earth?

Ans: Hydrological cycle.

MORE EXAMPLES

(11) How can you separate each of the following mixtures?

- (i) pure water and muddy water
- (ii) Kerosene and water

(12) PRE-NETTA-II-MUSTI-2021.

→ Give two chemical tests for water and show results obtained for each.

(13) KIBETA-II-CLUSTER-2021

(a) Define the following terms

- (i) water treatment.
- (ii) water purification.

(b) List four (4) economic uses of water.

(c) What are the importance of water treatment and purification? Give two (2) reasons.

(14) During large scale treatment of water, what two chemicals are added at various stages? explain their use.

(15) With clear diagram explain the occurrence of water cycle.

Ubn-Academic - centre

Answers

(11) i) Filtration / Decantation followed by distillation.

ii) Layer separation.

(12) i) Copper (II) Sulphate (CuSO4).

→ Water turns ^{Anhydrous} white Copper (II) Sulphate blue.

ii) Cobalt chloride paper

→ Water turns blue Cobalt chloride paper into pink.

(B) a) i) Water treatment is the process of killing harmful micro organisms in water by using chemicals.

ii) Water purification is the process of removing impurities in water.

b) Economic Uses of water

i) Manufacture

ii) Agriculture

iii) Mining

iv) Construction

c) i) To kill harmful micro organisms such as bacteria.

ii) To make water safe for use.

Sir-Robby
0624254257

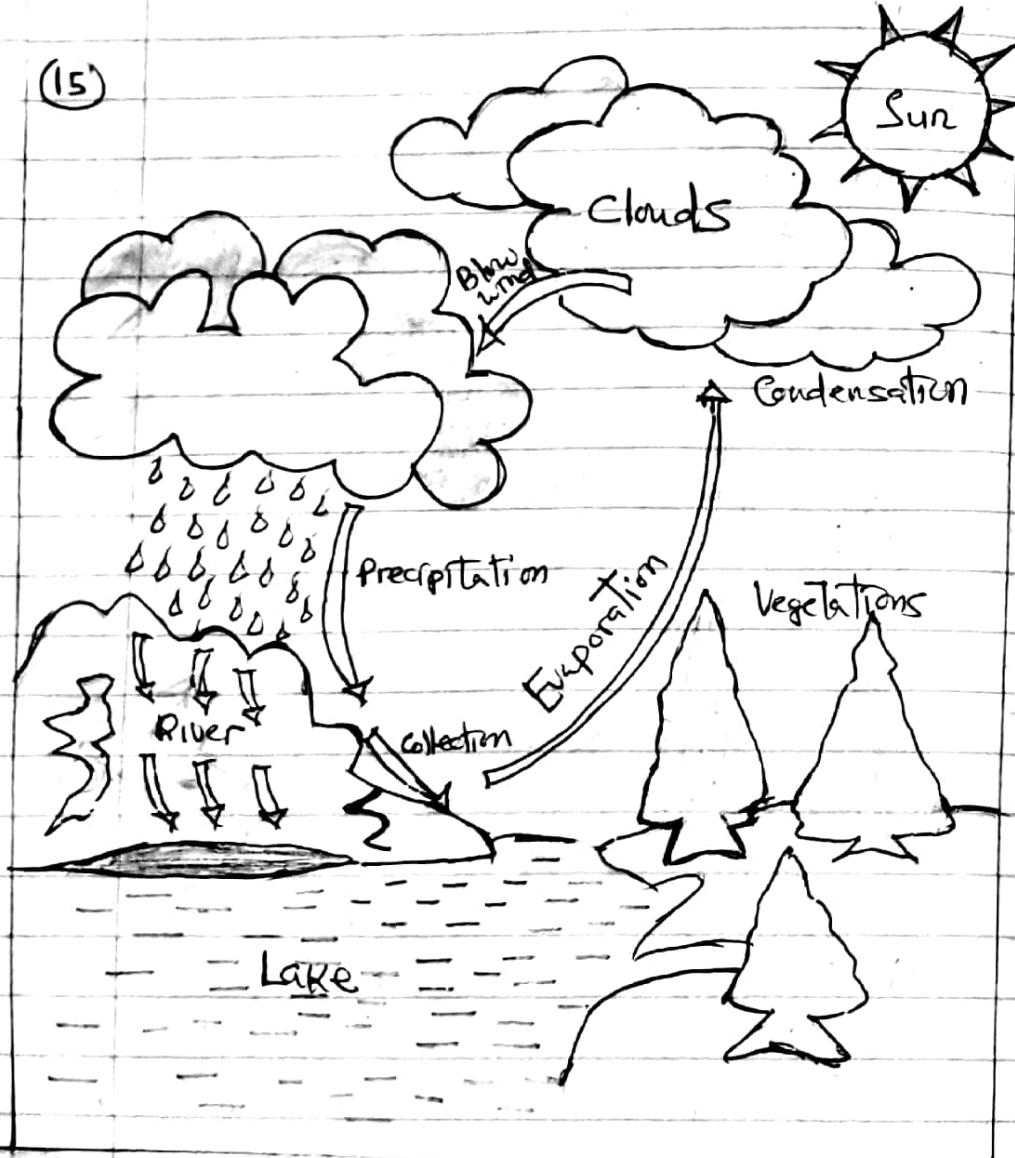
(14) i) Aluminium Sulphate

- To remove smaller particles.

ii) Chlorine

- To kill bacteria.

(15)



(21)

Water Cycle. is the tendency by which water passes from Vapour in the air, to liquid or solid onto the land and back to Vapour form.

The Water cycle has four main stages ; evaporation, condensation, precipitation and collection.

Evaporation. Is the process where by liquid water changes into Vapour or steam. This process can also occur in plants by transpiration

Condensation. This occurs when Vapour meets the cold condition of the atmosphere. After evaporation, the water Vapour in the atmosphere cools into liquid, forming water drops and clouds

Precipitation. This occurs when Condensed atmospheric water falls under gravitational pull from clouds. It occurs in different forms, such as rain, hail and snow.

Collection. After the water falls back to earth through precipitation, it may end up in the oceans, lakes, rivers, ponds or on land.

Therefore; Due to the water cycle people were able to obtain water that can be used for different purpose such as, drinking, fishing and industrial activities.

•END OF TOPIC•