Date - 2077/11/10

EXPERIMENT NO. 9

NAME OF EXPERIMENT: TO PREPARE CO_2 gas AND STUDY ITS PROPERTIES

APPARATUS REQUIRED

1. Woulfe's bottle
2. Thistle funnel
3. Corks
4. Delivery tube
5. Gas jar

CHEMICALS REQUIRED

1. Marble chips
2. Dilute hydrochloric acid
3. A piece of magnesium ribbon
4. Lime water
5. Sodium hydroxide

THEORY

Carbon dioxide gas is prepared by reacting the marble chips with dilute hydrochloric acid and the gas is collected by upward displacement of air since it is water soluble and heavier than air.

$$CaCO_3 + 2HCl \longrightarrow CaCl_2 + H_2O + CO_2\uparrow$$

i.e. $$CO_3^{2-} + 2H^+ \longrightarrow H_2O + CO_2\uparrow$$

PROCESS

A clean Woulfe's bottle was taken and few ~~chips o~~ pieces of marble chips were added. A thistle funnel was fitted to the bottle. A glass tube was bent twice at right angles. This delivery tube was fitted to the bottle. The apparatus was made airtight

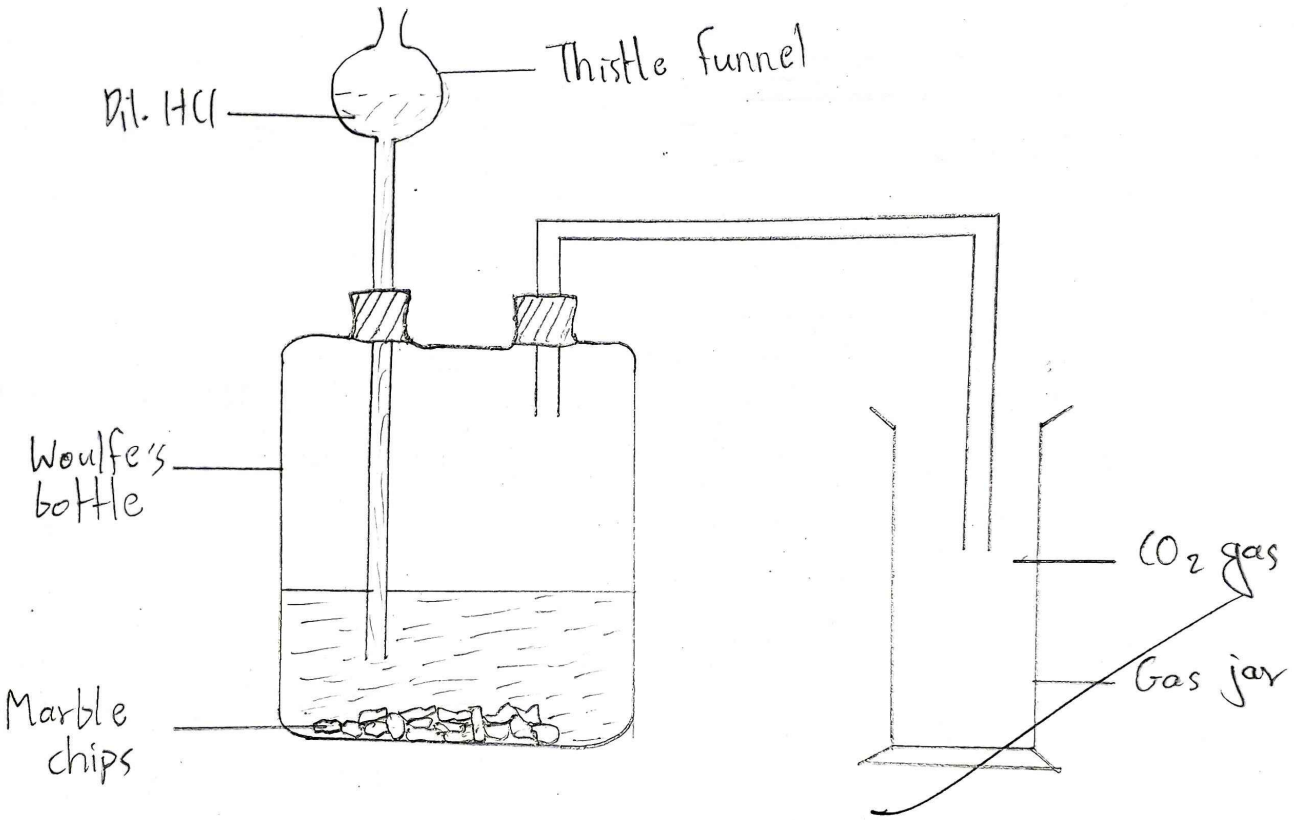

fig. Laboratory preparation of carbon dioxide gas.

and dil. hydrochloric acid was poured into the bottle from the thistle funnel. A few drops of conc. hydrochloric acid was added to increase the rate of chemical reaction. The gas was collected by upward displacement of air. Its properties was studied by performing following experiments.

OBSERVATIONS

Experiment	Observation	Inference
1. The colour and odour of the gas was noted.	1. Colourless, odourless	1. The gas is colourless and odourless.
2. A lighted candle or match stick was introduced into a jar of CO_2.	2. The gas did not burn and the candle was extinguished.	2. The gas neither burns nor supports combustion.
3. The gas jar full of gas was inverted over water in a water trough and it was shaked by moving jar up and down under water.	3. Water was risen up in the jar very slowly.	3. The gas is slightly soluble in water.
4. A moist blue litmus paper was tested with the gas.	4. Blue litmus turns faint blue.	4. The gas is weekly acidic.
5. The gas was passed into a test tube	5. The lime water was turned milky.	5. Formation of insoluble calcium

containing 1 ml of lime water.		carbonate.
6. The CO_2 gas was passed continuously to that milky solution.	6. Disappearance of milky colour into the clear colourless solution.	6. Formation of insoluble calcium bicarbonate.
7. The clean solution obtained in (6) was boiled.	7. White turbidity reappears.	7. Formation of calcium carbonate by the decomposition of calcium bicarbonate.
8. To test tube full of CO_2, few drops of caustic soda was added and the mouth of test tube was closed with thumb. Then, the test tube was shaked and it was opened under water kept in water trough.	8. Water was risen up in the test tube.	8. Caustic soda solution is an absorbent of CO_2.
9. A piece of burning magnesium ribbon was introduced into a jar of CO_2.	9. Magnesium ribbon burns more briallianly in the atmosphere of CO_2. A white substance and black flakes of carbon are seen inside the jar.	9. CO_2 supports the burning of magnesium. It oxidises magnesium.

CONCERNED REACTIONS

Expt. no. 4: $CO_2 + H_2O \longrightarrow H_2CO_3$

Expt. no. 5: $CO_2 + Ca(OH)_2 \longrightarrow CaCO_3\downarrow + H_2O$
white ppt

Expt. no. 6: $CaCO_3 + H_2O + CO_2 \longrightarrow Ca(HCO_3)_2$
soluble (colourless)

Expt. no. 7: $Ca(HCO_3)_2 \xrightarrow{\Delta} CaCO_3\downarrow + H_2O + CO_2$
white ppt

Expt. no. 8: $2NaOH + CO_2 \longrightarrow Na_2CO_3 + H_2O$

Expt. no. 9: $CO_2 + 2Mg \xrightarrow{\Delta} 2MgO + C$
white black

RESULT

Carbon dioxide gas was prepared and its properties were studied.

PRECAUTIONS

1. The tip of the thistle funnel should be dipped into the solution.
2. The apparatus should be air-tight.
3. All the glasswares should be handled with care.
4. The edge of the delivery tube should be cut smoothly and it should not be dipped into the solution.