

Mandatory experiment 26.1**(a) To prepare a sample of carbon dioxide****(b) To examine the properties of carbon dioxide**

Apparatus required: dropping funnel; Buchner flask; delivery tubing; gas jars; gas jar covers; (or boiling tubes and stoppers); cardboard, test-tube rack; test-tubes; tapers

Chemicals required: hydrochloric acid (dilute); limewater, marble chips; litmus paper or litmus solution

(a) To prepare a sample of carbon dioxide**Method**

1. Set up the apparatus as shown in Fig. 26.1.
2. Allow the dilute hydrochloric acid to fall on the marble chips. Note that a rapid 'fizzing' begins as soon as the acid and the marble come in contact.
3. Add a little hydrochloric acid from time to time to keep the reaction going, i.e. to keep the marble fizzing.
4. Collect three jars of the gas. Check that each gas jar is full by slowly lowering a lighted taper into it. If the jar is full, the taper will be extinguished at the mouth, Fig. 26.2.

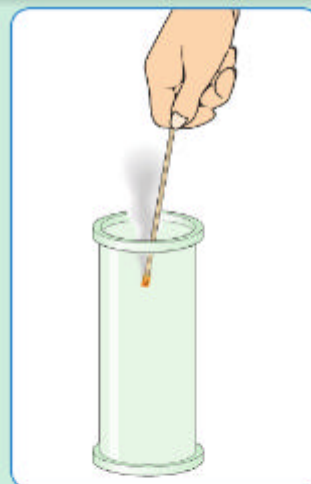


Fig. 26.2 A lighted taper is used to check if the gas jar is full of carbon dioxide. The lighted taper goes out (is extinguished) if carbon dioxide is present.

(b) To examine the properties of carbon dioxide**Method**

1. Note that carbon dioxide is a **colourless, odourless and tasteless** gas.
2. Place a lighted taper in a jar of the gas. Note that it goes out.

We conclude that **carbon dioxide does not support combustion**, i.e. carbon dioxide does not allow substances to burn in it.

3. Testing for carbon dioxide. The characteristic test for the presence of **carbon dioxide is that it turns limewater milky**. Bubble carbon dioxide through a test-tube containing limewater. Limewater is a solution of a substance called calcium hydroxide. It is observed that the limewater turns milky, Fig. 26.3.

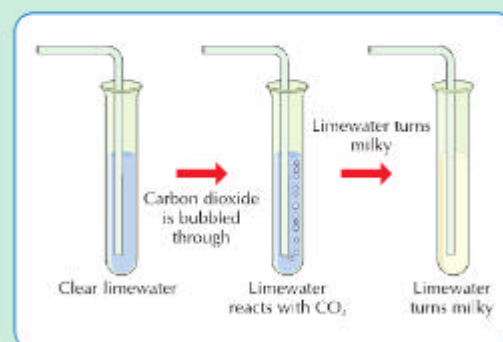
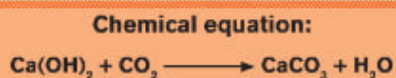
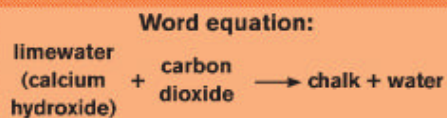


Fig. 26.3 Carbon dioxide turns limewater milky. The milky colour is due to the fact that chalk is formed. This is the characteristic test for the presence of carbon dioxide.

The milkiness is caused by the formation of chalk. The chemical name for chalk or limestone is calcium carbonate. This does not dissolve in water. The following is the reaction that occurs:



4. Carbon dioxide is more dense than air. Pour carbon dioxide from one gas jar into another. Test each gas jar for the presence of carbon dioxide using a lighted taper or limewater, Fig. 26.4.

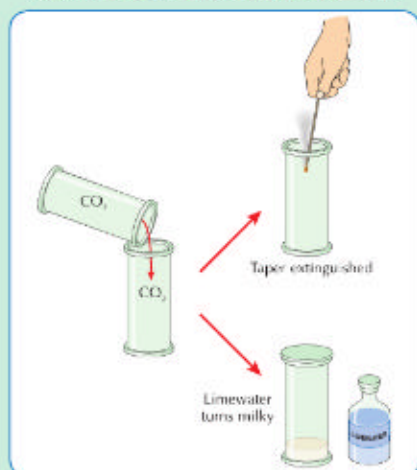


Fig. 26.4 Carbon dioxide is more dense than air and may be poured from one container to another. We test for the presence of the gas in the lower gas jar using a lighted taper or limewater.

Another way of demonstrating that carbon dioxide is more dense than air is shown in Fig. 26.5.

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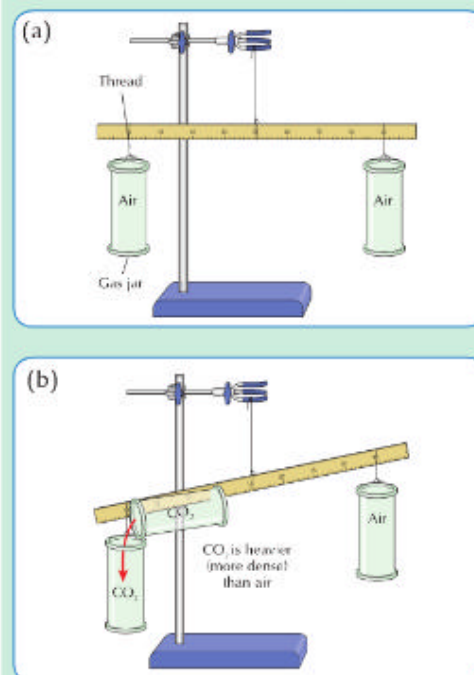


Fig. 26.5 This experiment shows that carbon dioxide is more dense than air.

Also, since carbon dioxide is more dense than air, it may be poured down on a lighted night light. Since carbon dioxide does not support combustion, the candle is extinguished, Fig. 26.6.



Fig. 26.6 This experiment shows that carbon dioxide is more dense than air. It also shows that carbon dioxide does not allow substances to burn in it. The carbon dioxide flows down and puts out the flame of the night light.

5. **Carbon dioxide dissolves slightly in water to form an acidic solution.** Bubble carbon dioxide through water to which a few drops of litmus solution have been added, Fig. 26.7. The litmus solution turns red. Alternatively, a piece of blue litmus paper could be placed in the test-tube of water. The litmus paper changes from blue to red. As stated in the last chapter, the acid formed is called carbonic acid.



Fig. 26.7 Carbon dioxide dissolves in water to form an acid (carbonic acid). Therefore, the blue litmus indicator turns red when carbon dioxide is bubbled into the water.

The physical and chemical properties of carbon dioxide are summarised in Table 26.1.

PHYSICAL PROPERTIES	CHEMICAL PROPERTIES
1. Colourless, odourless, tasteless gas	1. Does not support combustion
2. Slightly soluble in water	2. Turns limewater milky
3. More dense than air	3. Dissolves in water to form carbonic acid