

**Subject- Science**

**Activity 6 (a)- To deduce that our breath contains CO<sub>2</sub>**

**Chapter 6 : Life Processes**

**Class-X**

**Duration-40mins**

**Nature of the Activity-** Group work (Group of 4)

**Learning Outcome-** The students will be able to infer that the amount of CO<sub>2</sub> in exhaled air is more than that in the atmosphere.

**What we have to do?**

To deduce that our breath contains CO<sub>2</sub>. (Qualitative analysis)

**Worksheet**

1. Write the composition of gases in air:

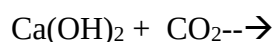
| S.No. | Name of Gas    | Percentage |
|-------|----------------|------------|
| 1.    | Oxygen         |            |
| 2.    |                | 0.035      |
| 3.    | Nitrogen       |            |
| 4.    |                | 0.9        |
| 5.    | Other gases    |            |
| 6.    | Dust particles |            |

2. From the table given above, make a checklist of the gases that are part of
- i) Inhaled Air
  - ii) Exhaled Air

| S.No. | Name of Gas    | Inhaled Air | Exhaled Air |
|-------|----------------|-------------|-------------|
| 1.    | Nitrogen       | √           |             |
| 2.    | Oxygen         | √           |             |
| 3.    | Carbon dioxide |             | √           |

|    |       |  |  |
|----|-------|--|--|
| 4. | ----- |  |  |
| 5. | ----- |  |  |

3. Complete the equation and name the reactants and products :



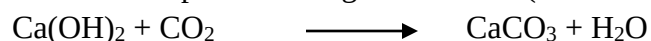
**What do we require?**

- Small beakers (or test tubes)
- Rubber tubes or drinking straws
- Freshly prepared lime water
- 10 ml syringe
- Stop watch

**What do we need to know?**

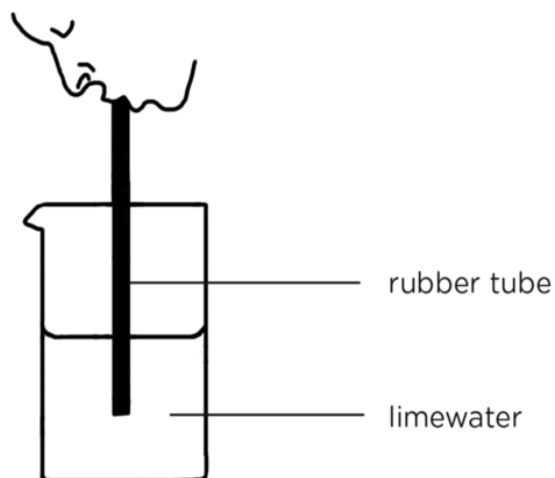
- a) Breathing is a part of respiration. It is a mechanical process. It involves inhalation and exhalation. We are aerobes and breathe in  $\text{O}_2$  and breathe out  $\text{CO}_2$ .
- b) Test for  $\text{CO}_2$

When  $\text{CO}_2$  is passed through lime water ( colourless), it turns milky.



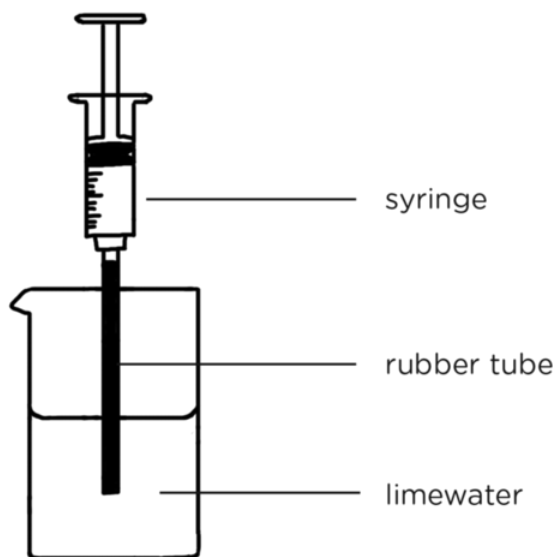
**How will we proceed?**

- **Teacher's activity-** Teacher will give the instructions along with the protocol(Student's activity)  
Teacher will arrange for the materials (10 pairs of beakers, 10 straws and 10 syringes)
- **Student's activity**
  1. Work in groups of four
  2. Mark one beaker A and the other B
  3. Pour clear limewater into each beaker until they are half full
  4. Blow bubbles through the rubber tube into the beaker marked B, as shown in the diagram. Do this for at least 2 minutes. Notice what happens to the clear limewater.



**BEAKER B**

5. Attach a rubber tube to the front of a syringe. Draw air into the syringe from the atmosphere.
6. Place this rubber tube into the beaker marked A and push out the air inside the syringe slowly and carefully into the limewater as shown in the diagram. Notice what happens to the clear limewater.



**BEAKER A**

**What do we observe?**

|                   | Time interval (Seconds) | Intensity |
|-------------------|-------------------------|-----------|
| <b>BEAKER "A"</b> | <b>0</b>                |           |
|                   | <b>30</b>               |           |
|                   | <b>60</b>               |           |
|                   | <b>90</b>               |           |
|                   | <b>120</b>              |           |
| <b>BEAKER "B"</b> | <b>0</b>                |           |
|                   | <b>30</b>               |           |
|                   | <b>60</b>               |           |
|                   | <b>90</b>               |           |
|                   | <b>120</b>              |           |

1. Describe what you observed when you blew air from your lungs through the limewater. What does this mean?
2. Describe what you observed when you used the syringe to bubble air from the atmosphere through clear lime water.
3. Why do you think you observed the above result , when you pushed air from the atmosphere through the limewater(as in Beaker 'A')?
4. Why do you think you observed the above result ,when you exhaled out (as in Beaker 'B')?

### **What have you learnt?**

CO<sub>2</sub> is present in the air, but more CO<sub>2</sub> is released during exhalation.

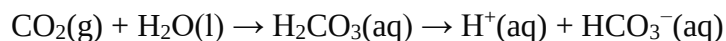
### **What would I like to know ?**

Carbon dioxide dissolves in water

Here is some pure water, which has pH 7, shown by using pH paper and matching the color to the chart on the side of the box.

If I take a straw and blow into the water, what gases are going into the water?

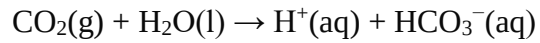
The one I am interested in is carbon dioxide, which can dissolve in water and react to form an acid.



So after I blow into the water several times, I should have a solution which is more acidic than it was before. Let's check by retesting the pH of the solution. It is now down to 5, rather than 7 we began with.

pH 5 indicates that it is an acid, so the carbon dioxide has dissolved in the water and reacted.

Thus my chemical reaction really has made hydrogen ions in the water, meaning that the carbon dioxide gas dissolved and reacted.



What does this mean about rain which passes through air with  $\text{CO}_2$  in it?

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What is acid rain?

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### **Extended Learning-**

Everyone knows that we breathe in oxygen and breathe out carbon dioxide. But that's not technically true. The truth is we breathe in air and breathe out air... so what's the difference?

1. Respiration is a \_\_\_\_\_ process
  - a. Physical
  - b. Chemical
  - c. Biochemical
  - d. Biological
  
2. Which gas makes up ~78% of the air around us?
  - a. oxygen
  - b. carbon dioxide
  - c. nitrogen
  - d. water vapour
  
3. How much of the air we breathe in is oxygen?
  - a. ~16%
  - b. ~21%
  - c. ~50%
  - d. ~78%
  
4. How much oxygen would you find in exhaled air?
  - a. ~0.04%
  - b. ~16%
  - c. ~21%
  - d. ~78%

5. Other than carbon dioxide, which gas would you find more of in exhaled air?
- a. carbon monoxide
  - b. oxygen
  - c. nitrogen
  - d. water vapour
6. What is the chemical test for carbon dioxide?
- a. Relights a glowing splint
  - b. Turns lime water milky
  - c. Burns with a squeaky pop
  - d. Turns universal indicator purple
7. Why does lime water not change when inhaled air is bubbled through it?
- a. The percentage of carbon dioxide is too high
  - b. The percentage of carbon dioxide is too low
  - c. The percentage of oxygen is too high
  - d. The percentage of oxygen is too low
8. Other than carbon dioxide, which gas would you find more of in exhaled air?
- a. carbon monoxide
  - b. oxygen
  - c. nitrogen
  - d. water vapour