Date 5/06/2023

Aim

To show experimentally that carbon dioxide is given out during respiration.

Theory

- All living things show respiration.
- It is a chemical process that occurs inside the cell, hence called cellular respiration.
- It involves the breaking down of food to release energy and carbon dioxide.
- Its reaction is the reverse of photosynthesis.

$$\underset{\text{Glucose}}{C_6H_{12}O_6} + 6H_2O \longrightarrow 6CO_2 + 6H_2O + \text{Energy}$$

- There are two types of respiration in animals: Aerobic and anaerobic respiration.
- Aerobic respiration needs oxygen and anaerobic respiration occurs in the absence of oxygen.
- There are three pathways of respiration as shown left.
- The energy released in cellular respiration is immediately used to synthesise a molecule called ATP.

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- Plants also release CO_2 during respiration.
- The exchange of gases during respiration takes place through small pores on the leaf called stomata.
- Carbon dioxide can be tested by lime water test.
- A freshly prepared lime water is $Ca(OH)_2$ when CO_2 is allowed to pass through it an insoluble compound called $CaCO_3$ is formed which makes the lime water milky.

$$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$$

Lime water — (milky ppt.)

(A) Test for release of CO_2 during respiration in animals

Materials Required

Two test tubes, a cork with two holes, two glass tubes, syringe, lime water.

Procedure

1. Take some freshly prepared lime water in two test tubes A and B.

2.→ Fit cork with two holes in test tubes A and B.
3.→ Fix two glass tubes in this cork of test tube A shown in the figure (drawn on left page).
4→ Exhale air into the test tube and record your observations.
5.→ In another test tube B, which has lime water, pass air through syringe and record your observations.

Observation

- In test tube A, the lime water turns milky sooner than in test tube B.

Conclusion

1→ The exhaled air contains lot of CO_2 which turns lime water milky.
2.→ This proves that during respiration we exhale CO_2 gas.

Precautions

1→ The glass tube should be dipped in the lime water.
2→ The lime water should be freshly prepared.

(B) To test release of CO_2 by plants during respiration.

Procedure

1→ Take two conical flasks, add germinating seeds with little water sprinkled over it.
2→ Fix the mouth of conical flasks with cork in which a bent tube is fixed.
3→ Suspend a small test tube containing KOH solution in it with the help of a thread in conical flask A.
4→ Allow the mouth of the bent tube to be immersed in water in set-up A and in lime water in set-up B as shown left.
5→ Record your observation after few hours

Observations

1. → In set-up A, the water level in the bent tube dipped in beaker increases after few hours.
2. This is because the oxygen present in the conical flask is taken up by germinating seeds and CO_2 released due to respiration is absorbed by KOH present in small tube. Hence, the air pressure in the flask reduces and water level rises.
2. → In set-up B, the freshly prepared lime water turns milky. This due to excess CO_2 released into the test tube during respiration of germinating seeds.

Conclusion

This shows that CO_2 is given out during respiration.

Precautions

1. → Lime water should be freshly prepared.
2. → KOH solution should be freshly prepared.
3. → Germinating seeds should have lot of moisture in them.