TENDER HEART HIGH SCHOOL, SEC-33B, CHD.

CLASS - 9 BIOLOGY DATE 03.07.2024

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CHAPTER 7 - RESPIRATION IN PLANTS

This lesson is for Class IX for the subject of Biology Topic 'Experiments on Respiration' which is covered in Chapter 7 - 'Respiration in Plant' starting on Page No 55 of your text book titled- Concise Biology - Selina Publications and is being submitted to you on 24.07.2023

Dear students in today's class we will discuss some experiments on 'Respiration' Let us start with -

Experiments on respiration in plants -

Experiment 1 AIM - To prove that oxygen is used in respiration

An apparatus is arranged as shown in Fig 7.2 (Page 57) of your text book

Flask A - bean seeds (germinating) placed on wet cotton + a small tube with soda lime (a mixture of NaOH & calcium oxide) Soda lime absorbs CO_2 from air.

Flask B - bean seeds (dead) placed on wet cotton along with some antiseptic (eg. carbolic acid) to avoid bacterial decay + small tube with soda lime.

Both these flasks are connected to the water trough through delivery tubes.

Observation - Delivery tube connected with flask A will show a greater rise in water level than flask B.

Reason - Oxygen is used up by germinating seeds for respiration and the CO_2 released during respiration is absorbed by Sodalime. Hence, a kind of vaccume is created (pressure is lowered inside the flask) which forces the water in delivery tube to rise. In flask B dead seeds do not respire hence no consumption of O_2 and no rise in water level in delivery tube.

To confirm that O_2 is absent in flask A (used up during respiration) bring a burning paper near flask A and introduce it into the flask by removing corks; the flame is immediately put off in flask A.

Control set up - Experimental set up.

In any experiment there are two set ups. Both are identical, in which every conditions is the same except one. The set up in which the condition under study is missing is control setup For example in Experiment 1 'Flask A' is the 'experimental set up' while 'Flask B' is 'control set up'. To elaborate - aim of the experiment is to show that oxygen is used up in respiration Now oxygen can only be used up by living germinating seeds (during respiration) and not by the dead seeds. Hence Flask A with germinating seeds becomes Experimental set up & Flask B with dead seeds forms Control Set up.

Experiment 2. AIM - To prove that CO_2 is produced during respiration in germinating seeds.

Take two flasks as -

Flask A - Place bean seeds (germinating) in wet cotton in a flask

Flask B - Place dead seeds in wet cotton with a little antiseptic (eg. carbolic acid) to prevent bacterial growth

Both flasks are securely corked and kept in room conditions for few days. The gases in each flask are then tested by removing the cork and tilting the flask over a test tube containing lime water and shaking up the test tube

Observation - Gas from flask A would turn the lime water milky while the gas in flask B will show no effect. This is because germinating seeds in flask A have released CO_2 during respiration which turned lime water milky. Dead seeds did not release CO_2

ALTERNATIVE METHOD - To show that CO_2 is produced during respiration in germinating seeds.

An apparatus is arranged as shown in Fig 7.4 (Page 58) of your text book.

The air enters Flask A (with KOH) which absorbs CO_2, then the air enters Flask B (the lime water does not change milky) The air then enters flask C (this air which enters flask C is without CO_2). The germinating seeds respire and release CO_2 during respiration This CO_2 containing air enters flask D Hence the lime water in flask D turns milky

Purpose of KOH - To absorb CO_2

Purpose of Lime water - To test presence/absence of CO_2 Lime water turns milky in presence of CO_2

Purpose of lime water in Flask B - To confirm that the air coming from flask A is CO_2 free

Purpose of Lime water in Flask D - To confirm/test

the presence of CO_2 in the air coming from flask C

Now before going further let us take a short break. Answer the following questions during the break - Based on experiments -

Q1 What is the purpose of soda lime ?

Q2 Give example of the antiseptic being used in experiment to avoid bacterial decay.

Q3 What is the purpose of lime water ?

Break is over children. Listen to the correct answers -

A1. Soda lime absorbs CO_2 from the air.

A2. Carbolic acid is the antiseptic used in the experiments

A3 Lime water is used to detect the presence/ absence of CO_2. Lime water turns milky in presence of CO_2 indicating its presence.

Now let us resume the discussion of experiments on 'Respiration' -

Experiment 3 To prove that CO_2 is produced by green plants during respiration.

Set up an apparatus as shown in Fig 7.5 (Page 59) of your text book

Air enters flask A through Soda lime (which absorbs CO_2) Thus the air entering Flask A is CO_2 free Hence the lime water in flask A doesnot turn milky This CO_2 free air enters the bell jar with the plant Plant is doing respiration and releases CO_2 thus which this air containing CO_2 now passes from bell jar to flask B the lime water in flask B turns milky

Precaution - It is necessary that the experiment is carried out in the dark or the bell jar is covered with a black cloth to prevent photosynthesis so that the CO_2 liberated in respiration is not used up in the synthesis of starch

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Experiment 4. AIM - To show that heat is evolved during respiration

Take two thermoflasks A & B as -

Thermoflask A - Soaked bean seeds (germinating)

Thermoflask B - Dead bean seeds washed with antiseptic to prevent bacterial decay.

Insert a thermometer in each flask and plug their mouths with cotton wool.

Observation Thermometer in flask A will show a higher reading than in flask B.

Reason - Germinating living seeds during respiration give out heat

Experiment 5. AIM To demonstrate anaerobic respiration

Take soaked and peeled pea seeds in test tube. Fill the test tube with mercury and invert it in a beaker filled with mercury. The seeds will be completely surrounded by mercury.

Observation - After few days the level in test tube will fall and a gas gets collected on the top

Reason - The seeds in absence of oxygen (all surrounded by mercury) will start performing anaerobic respiration. As a result CO_2 gets collected on the top. (CO_2 is released as a result of anaerobic respiration)

To confirm that the released gas is CO_2 - Introduce a stick of potassium hydroxide into the test tube which will float up through mercury and on coming into contact with gas KOH will absorb CO_2 and the level of mercury will again rise

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Control set up - A similar set up with dead seeds sterilized with antiseptic can be taken, where no gas will be liberated

Purpose of peeling off seed coat of germinating seeds - it hasten the outward diffusion of CO_2.

Respiration contrasted with photosynthesis -
Respiration and Photosynthesis are distinctly opposite processes as -

Respiration

$$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O + \text{Energy released}$$

Photosynthesis

$$6CO_2 + 6H_2O \xrightarrow[\text{Energy consumed}]{+\text{Solar}} C_6H_{12}O_6 + 6O_2$$

More differences between photosynthesis and respiration are listed out in Table 7.2. at Page 60 of textbook

Respiration in plants Vs Respiration in animals.

1) In plants there is no gaseous transport, the respiratory gases diffuse in and out of cell by simple diffusion whereas in animals blood circulates to transport respiratory gases.
2) End product of anaerobic respiration -
   In plants - Ethyl alcohol or Ethanol
   In animals - Lactic acid.
3) In plants respiration process produces little heat as compared to plants.

Dear Students with this I am ending todays discussion Kindly go through the given explanation and with reference to the detailed explanation answer the following home assignment questions in your notebooks

Home Assignment

Q1 Learn and write the differences between aerobic and anaerobic respiration in notebook. [given on Pg. 57]
Q2 Do the following Review Questions in notebook -
E. Structured / Application / skill Type
Q No 1, 2, and 4.