Example of report on osmosis and cells

Health & Medicine, Addiction

Abstract

Water is an important chemical owing to its various uses by living things. Most chemical reactions within the bodied of living things require water in order to occur. It is purported that life evolved from water some 3. 8 billion year ago following the organization of inorganic and organic molecule to form as prokaryotic cells. Besides, the well being of a cell is overly dependent of the balance between the water and the dissolved substances in the water. In this regards, the cell can permit water molecules to move in and out of the cell; the process in called Osmosis.

Introduction

In its basic form, osmosis is the movement of solvent molecules from a region of high concentration to a region of low concentration though a semi permeable membrane. The semi permeable membrane that separates the regions with differing concentration in living things is called cell membrane. Notably there are various ways through which osmosis can be studied in the laboratory. One of the most commonly used method in the use of artificial semi permeable membranes in which the membranes are placed in solution of varying concentration and the volume of their content measured after some time. The other method makes use of the microscope in which one is supposed the observed the changes that have under gone real plant or animal cells place in solutions of varying concentrations; professedly this method allow one to have a visual measure of the effect of osmosis which occurs as a result of water imbalance.

Methods

Procedure

Two wet mounts of and Elodea leaf were prepared and mounted on two different slides. The leaf on slide 1 was placed in three drops of the 20% NaCl and allowed to stand for about 10 minutes before being observed and drawn under a light microscope. The leaf on slide 2 was placed in three drops of water and covered with a cover slip and allowed to stand for about 10 minutes before being observed and drawn under a light microscope. Observation of the two leaves was done at 100x and 400x magnification even though drawings were done at 400 x magnification.

Results

Results for exercise 1

Results for exercise 2

Fig. 1: Diagram of the Elodea leaf placed in 20% NaCl

Fig. 2: Diagram of the Elodea leaf placed in Water

Analysis

Analysis of results for exercise 1

A solute can be defined as a substance that dissolves in a solvent. In this experiment, the solute was salt with the solvent being water. As part of the instruction, three samples of water were prepared with beaker 1 having 10% water and 20% of NaCl, beaker 2 had 10% water and 10% NaCl, while beaker 3 had 10% water and 0% NaCl. An Isotonic solution can be defined as a solution in which the concentration of the solute is equal to the concentration of the solvent. And while a hypotonic solution is defined as a solution in which the concentration of solute is higher than the concentration of the

solvent, a hypo tonic solution is a solution with a higher concentration of the solvent compare to the concentration of the solute (Stoker 214). With regards definitions of isotonic solution, hypertonic solution and hypotonic solution, it can be stated that the solution in beaker 1 was a hypertonic solution, the solution in beaker 2 was and Isotonic solution while the solution in beaker 3 was a hypotonic solution.

Differences between cell wall and cell membrane

Analysis of results for exercise 2

The leaf sample that was placed in the hypotonic solution was observed to have increased in size. This is because, the cells, having cell membrane, took in water due to osmosis; during osmosis, water molecules move from a region of low concentration to a region of high concentration. The leaf sample placed in the hypertonic solution was observed to have reduced in size. The cells lost water though osmosis; the concentration of solute inside the cell was lower that the concentration outside the hence, hence water molecules moved outside the cell to counter the imbalance which made the cells reduce in size.

Vacuoles are gas- or liquid-filled vesicles within the cytoplasm of a cell. In some instances vacuoles may be filled with food or metabolic waste. The functions of vacuoles vary with the type of cells in which they are found. Generally, major functions encompass; storage of water, storage of waste materials and maintain the pH of the cell, among other functions.

It should be noted that cells walls are only found in plant cells, bacteria and fungi; animal cells do not have cells walls. However, cells membranes are

found in both plant and animal cells as we as in bacteria and fungi. This means that osmosis occurs in both plant and animals.

Conclusion

Undoubtedly, osmosis involves the movement of water molecule from a region of low concentration to a region of high concentration through a semi permeable membrane. The effect of hypertonic solution on living cells differs from the effect of hypotonic and isotonic solution on the cells of living organisms.

Acknowledgement

I gratefully acknowledge the group members for their helpful comments while doing the experiment and compiling this report.

Photosynthesis and Cellular Respiration

Abstract

Photosynthesis is the process through which green plants, by making use of light energy and water and carbon dioxide, manufacture their own food. The process is of much importance since virtually all living things are dependent on it. It is the organic molecules produced during photosynthesis that carries the energy that other living organisms that are unable to photosynthesize directly or indirectly depend on. Photosynthesis also leads to the production oxygen that is utile is respiration.

Introduction

During photosynthesis, six molecules of Carbon dioxide combine with six molecules of water in the presence of light and chlorophyll to produce

glucose and oxygen. This can be summarized by the equation below;

$6CO_2 + H_2O + \text{Chlorophyll and Light} = C_6H_{12}O_6 + 6O_2$

The function of water in photosynthesis is to provide hydrogen that is used to convert carbon dioxide to glucose.

For green plants found on plant, Carbon dioxide is readily available in air hence can be taken up directly unlike aquatic plants which only find carbon dioxide for use in photosynthesis in the form of weak carbonic acid (the weak carbonic acid is formed as a result of dissolution of carbon dioxide in water). Notably, after the aquatic plants have used the carbonic acid in the surrounding water, the pH of the surrounding water change slightly. Unlike, photosynthesis, respiration uses up oxygen and produces carbon dioxide as a byproduct. Respiration is the process through which living things use break down food materials to produce energy. The Whole process of respiration can be summarized by the equation below.

$C_6H_{12}O_6 + 6O_2 = 6CO_2 + H_2O + \text{energy}$

When viewed critically, respiration is the opposite of photosynthesis.

Method

Procedure for exercise 1

The experiment made use of BTB solution with a pH adjusted to seven. Four tests tubes were then filled with the BTB solution to the brim; two of the test tubes were labeled L (to signify light) while the remaining two were labeled D (to signify dark). To test whether the test tubes used were clean, the BTB solutions in the four test tubes were left to stand for some time to see whether they remain green. The color and pH of the four tubes were then

recorded in the Data chart. Sprigs of Elodea were then added into the BTB solutions in one L test tube and another in one D test tube with the help of forceps and all test tubes corked (inclusive of the test tubes without sprigs of Elodea). The two test tubes labeled D were then stored in the shields of the light table while the two test tubes labeled L were stored in the light holes of the light table and left to stand for some time.

Procedure for exercise 2

The test tubes were numbered from 1 to 7. Having mastered how to assemble the respirator, the experiment was started by filling a small test tube with water to the brim. A large test tube was then inverted over the small test tube that had been filled with water to the brim. A small amount of water was then drawn from each test tube before adding substrates. The small test tube was then inserted all way up a larger test tube and the entire assemblage skillfully inverted so that that the water in the smaller test tube does no pour out. Test tubes 1-6 were then filled with yeast from a well shaken bottle. Test tube 7 was however filled with boiled yeast.

The respirometer was then assembled swiftly by inserting the smaller tube followed by the larger before the respirometer was inverted. This time was noted at “ Time Zero”. The position of the small air bubble trapped in the respirometer was noted using wax pencil. The test tubes 1, 2, 3, 4, 5, and seven were placed in a water bath maintained at 370C while test tube 6 was placed in ice bath maintained at 00C. The increase in the length of the bubble in each set up was measured after 10 minutes. Two more reading were taken at 10 minutes interval.

Procedure for exercise 3

The group observed the classroom model and with the help of the classroom text book, the groups identified different layers that make up the leaf. The cross-section of a typical dicot leaf was then observed and compared with the model. Afterwards, the microscopic observation was sketched. Further, the models of the plant cell and the chloroplasts were observed and with the help of the textbook, components of the cells were identified with particular attention being paid to chloroplast and mitochondria. The chloroplast was then sketched and the stroma, grand, and thylakoid membrane labeled.

Results

Results for exercise 1

The color of BTB solution in the test tube labeled D (with Elodea) changed to yellow while the green color of BTB solution in the test tube labeled D (without Elodea) persisted. Additionally, the color of BTB solution in the test tube labeled L (with Elodea) turned blue while the green color of BTB solution in the test tube labeled L (without Elodea) persisted.

Results for exercise 2

Results for exercise 3

Diagram of a typical dicot leaf model

Diagram of a typical dicot leaf slide

Analysis

Analysis of results for exercise 1

The Elodea in one of the D test tubes was unable to photosynthesize due to lack of light. Instead the Elodea in this test tube respired thereby producing

more carbon dioxide which dissolved in the solution raising the pH (above 7). In pH greater than 7, BTB always changes to yellow. In the same manner, the color of BTB solution in the test tube labeled L (with Elodea) turned blue. This is because there was light hence the Elodea photosynthesized.

Photosynthesis uses carbon dioxide hence the pH of surrounding solution reduces as more carbon dioxide molecules are used in photosynthesis.

Apparently, color changes were also observed in the test tubes that did not have sprigs of Elodea. It should be noted that the photosynthesis and respiration are opposite processes hence their rates of the two cannot be easily compared. Besides, from the experiment, it is very hard to compare the rates of the two in terms of the intensity of the color changes.

The manner in which the pH of water in a lake changes with time is quite interesting. For a lake with algae, the pH of the water varies between mid night and mid day. At midnight, there is no light hence the algae respire. Since Carbon dioxide is produced during cellular respiration, the more and more carbonic acid is formed when the Carbon dioxide continue to be produced. As a result, the pH of the lake falls; the lake becomes more acidic. However, as midday, there is light (optimum light intensity) and the algae photosynthesize using up the dissolved oxygen in the surrounding water. In turn, the concentration of carbonic acid falls and the pH of the lake rise. This can be summarized in the table below.

Analysis of results for exercise 2

One of the conditions for respiration is that there must be food substance to be acted upon. Ideally, respirometer 1 and 2 act as controls for the experiment. Under normal circumstances, any organism is not expected to

respire on water. Besides, respirator two was meant to confirm that the yeast was indeed suited to provide the required results considering that glucose is the simplest simple sugar. Professedly, a small amount of gas was produced in respirometer 1; a possible reason for this is that the water contained some small amounts of dissolved food substances which were acted upon by the yeast. Comparing respirometer 1 through 5 give insight to how the type of substrate varies with the extent of respiration. From the graph, the glucose is the best substrate followed by fructose, galactose and finally maltose (worst). And since yeasts are naturally found in fruits, it is indubitable that it is glucose that I naturally found in yeast's living environment.

In a case where yeast was replaced by either plant or animal cells, there will not be any observable change considering that plant and animal cells are nor adapted to respire anaerobically. Yeasts have a liking for sugary environment; this explains why yeasts are mostly found on fruits. For the yeasts to thrive well, the environment is supposed to be relatively warm. Even for the experiment, is can be seen that yeasts cannot live in extremely cold conditions. In the same light, cellular respiration is greatly dependent on the temperature. Cellular respiration is only effective at optimum temperature. At temperatures lower than the optimum, physiological activity of the organisms reduces and this affects the effectiveness of cellular respiration. Additionally, at temperatures above the optimum temperature, cells of the organisms can be denatured. However, yeast difference from catalase from potatoes because catalase enzymes are aerobes while yeasts are anaerobes.

Answer to the challenge question

In the light for two hours

In the light for two hours

Conclusion

Concisely, depending on the availability of light, the level of carbon dioxide in water varies hence changes in the pH of the solution. In the same way, while looked at in terms of the reagents and products, cellular respiration in basically the reverse of photosynthesis.

Acknowledgement

I gratefully acknowledge the group members for their helpful comments while doing the experiment and compiling this report.

Works Cited

Stoker, H S. General, Organic, and Biological Chemistry. Australia: Brooks/Cole Cengage Learning, 2010. Print.

Biology Practical Lab Manual