

EXPERIMENT NO: 12

STUDY OF RESPIRATION

PRINCIPLE

Cellular respiration is a set of metabolic reactions and processes that take place in the cells of organisms to convert biochemical energy from nutrients into adenosine triphosphate (ATP), and then release waste products. The reactions involved in respiration are catabolic reactions, which break large molecules into smaller ones, releasing energy in the process, as weak so-called "high-energy" bonds are replaced by stronger bonds in the products. Respiration is one of the keyways a cell releases chemical energy to fuel cellular activity. Cellular respiration is considered an exothermic redox reaction which releases heat. The overall reaction occurs in a series of biochemical steps, most of which are redox reactions themselves. Although cellular respiration is technically a combustion reaction, it clearly does not resemble one when it occurs in a living cell because of the slow release of energy from the series of reactions.

Nutrients that are commonly used by animal and plant cells in respiration include sugar, amino acids and fatty acids, and the most common oxidizing agent (electron acceptor) is molecular oxygen (O_2). The chemical energy stored in ATP (its third phosphate group is weakly bonded to the rest of the molecule and is cheaply broken allowing stronger bonds to form, thereby transferring energy for use by the cell) can then be used to drive processes requiring energy, including biosynthesis, locomotion or transportation of molecules across cell membranes.

PROCEDURE

Aerobic respiration in plants can be experimentally proved with the help of a simple apparatus like:

- (i) Respiroscope which consists essentially of a stout vertical tube which is bent into a bulb at the one end or,
- (ii) With the help of a long-necked round-bottomed flask fitted with a centrally-bored cork at the mouth through which passes a glass tube.

The Respiroscope or the inverted flask is fixed vertically to a stand and a few germinating gram seeds or flower petals are placed in the bulb of the respective or in the inverted flask plugged

with cotton at the base the vertical tube of the Respiroscope or inverted flask is dipped just below the surface of water or mercury in a beaker.

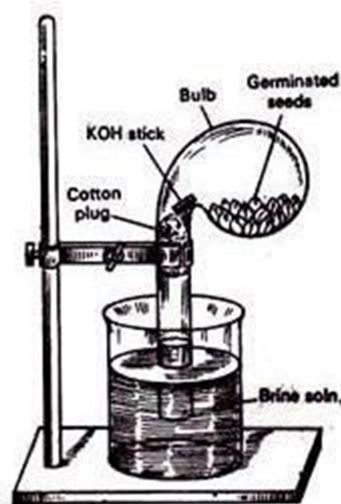
A few caustic potash (KOH) pellets are introduced in the bent portion of the Respiroscope or in the long neck of the round bottom flask and kept in position with loosely held cotton wool. Care should be taken that respiratory materials and KOH pellets do not come in contact. Precautions should be taken that the free end of the tube does not touch the bottom of the water or mercury trough. Fittings must be air-tight to avoid any leakage.

OBSERVATION

The apparatus is allowed to stand for a few hours when it is seen that water or mercury has risen in the vertical tube of the apparatus proving the production of partial vacuum.

INTERFERENCE

Due to respiration of germinating seeds or flower petals CO_2 has been released which is at once absorbed by KOH pellets. Thus the partial vacuum produced by the absorption of O_2 by the respiring material could not be filled up by the released CO_2 . Hence, water or mercury is drawn upward into the tube.



RESULT