TENDER HEART HIGH SCHOOL

CLASS – 9 BIOLOGY

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CHAPTER - 4 ABSORPTION BY ROOT - Processes involved.

This lesson is for Class 9 for the subject of Biology Topic - Osmosis which is covered in chapter 4 - Absorption by Roots - processes involved starting on Page No 37 of your text book titled - Concise Biology - Selina Publications and is being submitted to you on **01.10.2024**

Dear students in the last class we have learnt what osmosis is. Osmosis is the movement of water molecules from the region of their higher concentration to the region of their lower concentration through a semipermeable membrane. Now let us understand the process of osmosis through an experiment. **EXPERIMENT 2 [Fig 4.4]**

Aim - To demonstrate the process of osmosis using cellophane paper.

Procedure - Take a thistle funnel. Cover the mouth of thistle funnel with a cellophane paper [which is semipermeable] You may use egg membrane or animal bladder. Fill the inverted thistle funnel with concentrated sugar solution and immerse in a beaker containing water Mark the level of sugar solution in the thistle funnel. This is experimental setup For control set up take plain water both in beaker and the thistle funnel and mark the level of water in thistle funnel.

OBSERVATIONS -

Experimental set up - Level of sugar solution rises

Control set up - Level of water remains unchanged.

Also the level of water in the beaker of experiment -al set up will drop slightly and the water in the beaker of experimental set up is not found sweet.

Inference - In experimental set up water from the beaker passes through the cellophane paper [which acted as semipermeable membrane] into the thistle funnel resulting in rise in water level in the thistle funnel. This demonstrates endosmosis.

Also cellophane paper acting as semipermeable membrane allows only the water molecules to pass through it and not the sugar molecules That is why the water in the beaker doesnot taste sweet.

MODIFIED VERSION OF EXPERIMENT - 2

Instead of plain water in beaker if we take sugar solution only in the beaker as well then also osmosis will occur. Osmosis will occur where ever we have two solutions with different concentrations.

So if thistle funnel has 70% sugar & 30% water and beaker has 30% sugar and 70% water osmosis will continue. in which water will move from area of its more concentration i.e. beaker to the area of its less concentration i.e. thistle funnel and thus resulting in rise in the level of thistle funnel.

SIMILAR EXPERIMENT [Fig 4.5]

Fig 4.5 showing the experiment to demostrate osmosis by using Visking bag containing sugar solution

CLASS - 9 BIOLOGY

CHAPTER - 4

TEACHER - Ms Nidhi Rana

In the same experiment instead of using a thistle funnel we can take a long glass capillary tube and tie a knotted visking bag at its one end. which is already filled with sugar solution. Now immerse the visking bag in a beaker containing water. Mark the level of water in capillary tube. After an hour, you will observe the level of water in capillary tube has risen This is because of osmosis the water molecules from the beaker have entered inside the visking bag.

CONCLUSION - From the above demonstrated experiments on osmosis we can say -

(i) Osmosis can only occur between two liquids of different concentrations.

This is because osmosis is movement of water molecules from its high to low concentration i.e. two areas should have different concentrations of water. If we have same concentration of water in both sides then osmosis will not occur.

SOLUTION A 60% sugar + 40% water } **OSMOSIS**
SOLUTION B 30% sugar + 70% water } **OCCURS**

In above case Sol A has 40% water and solution B has 70% water i.e. different concentration of water hence osmosis occurs. Water will move from solution B to solution A

Now if we have

SOLUTION A 20% sugar + 80% water } **OSMOSIS**
SOLUTION B 90% sugar + 10% water } **OCCURS**

Again osmosis will occur. Water moves from solution A to solution B.

CLASS-9 BIOLOGY
CHAPTER - 4
TEACHER - Ms Nidhi Rana

SOLUTION A 50% salt + 50% water } **OSMOSIS DOES**
SOLUTION B 50% salt + 50% water } **NOT OCCUR**

In this case because the concentration of water in both solutions is same [ie 50%] so there will be no net movement of water Hence no osmosis will take place.

(ii) Second most important thing in osmosis is semipermeable membrane. The two solution (of different concentrations) should be separated by semipermeable membrane. This is because in osmosis there is movement of only water molecules, solute [sugar salt etc.] will not move. Hence a semi permeable membrane is required which allows only water molecules to pass through it and not the solute particle.

How Long will the osmosis continue ?

Theoretically osmosis should continue till the concentrations of water molecules become equal on both sides of the semipermeable membrane But practically it stops much before that. To understand the reason just take the example of the experiment on osmosis (discussed previously) In the experiment the column of sugar solution in thistle funnel keeps on rising upwards due to influx of water from the beaker But with this rise in 'water level', the 'weight' of this column of solution also increases. This increase in weight of rising column reduces further osmosis. A stage of equilibrium is reached where no osmosis occurs even if the concentration of water is not equal on either side of the semipermeable membrane

This is because though the water molecules from the beaker tend to force upward through the semipermeable membrane, but the weight of solution from above does not allow them and holds them downwards.

OSMOTIC PRESSURE [Fig 4.7]

In the same experimental set 4.4. an airtight piston bearing some weight was introduced in the thistle funnel. This results in No osmosis to occur [As indicated by no rise in water level in piston because there was no entry of water from beaker into thistle funnel.]

From this we can define osmotic pressure as- Osmotic pressure is the minimum pressure that must be exerted to prevent the passage of the pure solvent into the solution when the two are separated by semipermeable membrane.

Osmotic pressure of a solution is a measure of its tendency to take in water by osmosis Thus osmotic pressure is equal to weight or pressure required to nullify osmosis

With this I am ending todays discussion children. Kindly go through the detailed explanation and with reference to the given explanation you are required to answer the following Home assignment questions

HOME ASSIGNMENT -

Students are required to answer the following experiment based question [based on Osmosis Experiment 2 (Fig 4.4) and Osmotic Pressure [Fig 4.7] as -

CLASS-9 BIOLOGY

CHAPTER - 4

TEACHER - Ms Nidhi Rana

A Experiment 2 [Fig 4.4 Page 40 of text book]

Q1 What is the aim of the experiment?

Q2 Name the process depicted and define it

Q3 What is the result of the experiment as observed?

Q4 Name the semi permeable membrane which can be used in the experiment?

Q5 What is the control for experimental setup?

B Experiment 3 [Fig 4.7 Page 42 of text book]

Q1 What is the aim of the experiment?

Q2 Name the process depicted and define it

Q3 What is the result of the experiment as observed?

Q4 What is the purpose of piston and weight used in the experiment?