**Diffusion and Osmosis**

Aim

* To model the cell membrane using dialysis tubing
* To determine the permeability of the ‘membrane’ to certain chemical molecules

Equipment

* Dialysis tubing
* One-holed rubber stopper fitted with a thistle funnel
* Rubber bands
* 100 mL measuring cylinders
* Permanent markers and scissors
* Solution: starch, potassium iodide, concentrated glucose, dilute glucose
* Distilled water
* Dye or food colouring
* Glucose testing tapes

Method

1. Cut off 15 cm of dialysis tubing and then open the tubing by holding it under water while rubbing it between your fingers. Firmly tie a knot at one end.
2. Fit the open end of the tubing over the rubber stopper and secure with rubber bands.
3. Repeat steps 1 and 2 so that you have sets of tubing with rubber stoppers attached.
4. You will set up one pair of solutions (1 & 2, 3 & 4 or 5 & 6) as directed by your teacher. See the table on the next page for a list of solutions.
5. Pour the solution listed in the second column into the funnel until the dialysis tubing is full. There should be no air bubbles. Allow some solution to remain in the fine end of the thistle funnel.
6. Wash the tubing to remove excess or spilt solution from the outside of the tubing and also check for leaks.
7. Fill the measuring cylinder or beaker with the correct solution from the third column in the table.
8. Lower the tubing into the cylinder until the level is at the top of the stopper and then support it with a retort stand. Do not allow the tubing to sit on the bottom of the cylinder. Place a mark on the funnel stem to indicate the starting level of the solution in the tubing. If you set up tubes 3, 4, 5 or 6, use glucose testing tape to determine the approximate glucose concentration in the measuring cylinder. Record the initial values.
9. After 24 hours record the change in the level of solution in the tubing. Also record any other observations. If you set up tubes 3 and 4, then use glucose testing tape to determine if any glucose moved into the distilled water. If you set up tubes 5 and 6, determine if the glucose concentration has changed.
10. Swap results with other groups until you have results for all tubes.

Solutions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Tube number | Solution in the dialysis tubing | Solution in the measuring cylinder | Height change in tube (cm)  Up = positive  Down = negative | Net movement |
| 1 | Distilled water plus potassium iodide | Starch solution |  |  |
| 2 | Starch solution | Distilled water plus potassium iodide |  |  |
| 3 | Distilled water | Dilute glucose solution plus dye |  |  |
| 4 | Dilute glucose solution plus dye | Distilled water |  |  |
| 5 | Dilute glucose solution | Concentrated glucose |  |  |
| 6 | Concentrated glucose | Dilute glucose solution |  |  |

Questions

1. List the molecules that were able to pass through the dialysis tubing.
2. Why was the membrane permeable to these molecules and not others?
3. Which tubes illustrate the process of osmosis?
4. Which tubes illustrate the process of diffusion?
5. Describe what happened in tube 1.
6. Describe what happened in tube 6.
7. Using tubes 5 and 6 as examples, explain the meaning of the terms hypotonic and hypertonic.
8. Explain why facilitated diffusion cannot occur across dialysis tubing.