Educational Innovations Inc®

#SM-200

Serpent Skin©

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Serpent Skin©

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Crinkled Dialysis Tubing

Dialysis tubing can be used to simulate cell walls/cell membranes. The microscopic pores provide a passageway for select sized molecules to diffuse from a greater to a lesser concentration; passive transport of larger molecules is inhibited. Yes, you have a semipermeable membrane. Water and other small molecules have the ability to diffuse both ways and to establish an equilibrium. The equilibrium may be measured by changes in: concentrations, osmotic pressure, color, volume, and mass. Activities can be designed to be specific or a combination of these changes.

The use of "Serpent Skin" provides tubing which is much easier to use than dialysis tubing. The usual dialysis tubing is flat and has to be wet to use. The open tubing makes it easier to fill with a variety of materials, especially dry.

The activities which you can develop using "Serpent Skin" is limited only by your comfort level of exploration. The expense of teacher/student designed explorations may also be a challenge.

Exploration Purpose: Demonstration of Water Pressure

Materials:

* Serpent skin
* Scissors
* Wire twists
* Clear Plastic Cups with Caps
* Thread
* Funnel
* Straws
* Soil Moist
* Seeds
* Oat Bran
* 5-Grain Hot Cereal

Procedure:

1. Pull a section of Serpent Skin and make a knot, then cut off a section.
2. Stuff tubing, toward knotted end, with material.
3. Insert clear straw in open end and secure tubing onto straw.
4. Place entire apparatus in cup with water.
5. Repeat with other material.
6. Record your observations.

In But Not Out

Water Molecules Pass Through a Variety of Membranes

Hypothesis:

There are conditions in nature which retain water and build pressure on membranes.

Purpose:

Design an exploration that may demonstrate how water molecules may be collected in a porous container and be kept there.

Materials:

* Serpent Skin
* Soil Moist (Crosslinked Polyacrylamide)
* String
* Scissors
* Plastic Cup
* Scale or Balance
* Measuring Tape

Procedure: (This is how it might be set up)

1. Measure out a 6-inch piece of Serpent Skin and tie one end off.
2. Place 10 grams of soil moist into the tube made from the Serpent Skin.
3. Seal opening and measure length, circumference, and mass of tubing.
4. Place your sealed tubing into a beaker containing water.
5. Record all of your measurements.
6. Make observations every 15 minutes and record.
7. Graph your results, demonstrating the changes that have taken place over a period of time.

Discussion:

1. Crosslinked Polyacrylamide is capable of absorbing many times its weight in water.
2. When placed in a dry environment, the water is released.
3. The Serpent Skin permits water to go both ways, why is not evident during the exploration.
4. Variables might be suggested to increase the speed of water uptake.

Water Rock Volcano
Serpent Skin is Forced to Erupt Water Rocks

Hypothesis:

Water pressure may force larger molecules to erupt through a designed opening.

Purpose:

Design an exploration that will demonstrate water pressure on crosslinked polyacrylamide.

Materials:

* Serpent Skin
* Soil Moist
* String
* Scissors
* Tall Plastic Cup with Plastic Cover
* Clear Straws
* Spoon

Procedure: (This is how it might be set up)

1. Measure out a 6-inch piece of Serpent Skin and tie one end off.
2. Place 20 grams of soil moist into the Serpent Skin tube.
3. Place straw into open end, about 1/2-inch in., and tie tubing securely around straw.
4. Push straw through center of cover.
5. Place your sealed tubing with protruding straw in tall cup containing water.
6. Record your observations
7. Graph your results, recording height attained in straw and amount of erupted water rocks.

Discussion:

1. Soil Moist is capable of absorbing an enormous amount of water.
2. As Soil Moist erupts, it loses moisture.
3. Using a longer or shorter straw might be something to consider.
4. Covering straw with gauze before inserting into open end might prove interesting.

Slow Iodine Clock

Molecules Vary in Size and Larger Molecules are Easier to Contain

Hypothesis:

A solution containing iodine molecules can be used to demonstrate that they are constantly moving to attain equilibrium.

Purpose:

Design an exploration that will demonstrate the movement of iodine molecules from an area of higher concentration to one of lower concentration.

Materials:

* Serpent Skin
* 1% Aqueous Solution of Iodine
* 1% Soluble Starch Solution
* String or Twist-Tie
* Scissors
* Clear Plastic Cup
* Funnel (optional)

Procedure: (This is how it might be set up)

1. Measure out a 6-inch section of Serpent Skin and tie one end off.
2. Place 10 ml of starch solution into the Serpent Skin tube.
3. Seal open end and rinse off outside of tubing.
4. Place water in beaker and add enough iodine solution to color the water.
5. Place rinsed tubing containing starch solution into iodine colored water and make your observations.
6. Graph your result demonstrating the changes that have taken place over a period of time.

Discussion:

1. Serpent Skin is selective, for it permits small molecules to pass through, but not larger ones.
2. The iodine molecules attach to the starch molecules.
3. Starch molecules are not permitted to pass out through the dialysis tubing.
4. Place the entire, still sealed, tubing into hot water and make a new hypothesis.

In, Up, and Out
Serpent Skin is Selective to Concentrations

Hypothesis:

The less concentrated a water solution, the less solute, the quicker it moves toward higher concentrations and more solute.

Purpose:

Design an exploration that will demonstrate movement of both solvent and solute through membranes at different rates.

Materials:

* Serpent Skin
* String
* Scissors
* Clear "Karo" Syrup
* Tall Plastic Cup with Plastic Cover
* Clear Straws
* Funnel
* Red Food Dye
* Ruler

Procedure: (This is how it might be set up)

1. Measure out a 6-inch piece of Serpent Skin and tie one end off.
2. Place 20 ml of clear Karo syrup into tubing.
3. Place clear straw into open end, about 1/2-inch in, and tie tubing securely around straw.
4. Rinse off the outside of the tubing.
5. Push straw through center of cover. Rinse off any spills.
6. Place your sealed tubing with protruding straw in tall cup containing water.
7. Record your observations.
8. Graph your results, recording height attained in straw.
9. Graph and predict when level will completely disappear from straw.

Discussion:

1. How might you determine if Karo came out of the Serpent Skin?
2. What happened to the color in the clear straw?
3. What can you predict about the differences in size of molecules that are capable of passing through the Serpent Skin?
4. If you had Soil Moist in the Serpent Skin, and red dyed Karo syrup outside, what might you hypothesize?

