**Modeling in AP Biology INCOMPLETE**

**Theme(s): I - Science as a Process**

**V -Relationship of Structure to Function, Regulation**

**VIII - Science, Technology and Society**

**Topics: I B. Membranes (with link to Kidney Physiology)**

**Title: Movement of molecules across a semi-permeable membrane.**

**Authors: Kimbell Reitz, John Gensic**

**Engagement:**

Kim needs a kidney transplant. The kidney is an important organ that removes impurities from the blood. This helps the blood to maintain proper balance of salts, glucose, water (for proper blood volume and blood pressure), and nitrogenous wastes such as urea. Mammals have two kidneys and we can live with just one but, when disease or injury has left both kidneys non-functioning, or functioning inadequately, medical science must step in. This is the role of dialysis. Patients on dialysis must spend many hours a week hooked up to the machine and wait for it to cleanse the blood. Dialysis is usually not a permanent solution. At some point, the patient typically needs a transplant.

Watch video of dialysis session.

<http://youtu.be/E8Uj-C1-HyU> (9 min 12 seconds)

**Leading Questions(s):**

What does dialysis do for the people who need this treatment?

**(Whiteboard - predict and discuss)**

Which particles will move through the dialysis bag?

Which particles will not?

How can we measure this?

What is the difference in the particles that cross the membrane and those that don’t?

**Summary of Investigation:**

The students will set up a dialysis model using dialysis tubing and a beaker. Because iodine will change it’s color as it diffuses into the starch they will be able to visualize that the starch will not move across the membrane.They will use be able to see that the iodine diffuses because of the color of iodine. The will also be able to measure this by using the vernier probes to measure the conductivity of the solution. They will share their observations with the class and model what they think happened on the white boards.

**Equipment Used:**

Dialysis tubing Salt Solutions of 1%, 5%, and 10%

thread Dropper pipet

rubber bands Starch

Iodine 400 mL Beakers

distilled water LabQuest and LabQuest App

Conductivity Probe Test Tubes

**Description of Procedure, notes (teacher manual)**

After introducing the story and showing the video the teacher will instruct the students that they will be setting up a model system of dialysis.

The teacher will show the students the available materials and how to set up the dialysis tubing. Demonstrate for the students the reaction between iodine and starch. Allow the students to work in their groups to produce a prediction and hypothesis.

The students will share their predictions with their whiteboards.

When done, the students will whiteboard the results and share them with the class in a board meeting.

**Student instructions:**

**Set up the Vernier Probe**

1. Set selector switch on the side of the Conductivity Probe to the 0-2000 uS/cm range. Connect the conductivity probe to LabQuest and choose New from the File menu. If you have an older sensor that does not auto-ID, manually set up the sensor.
2. On the Meter screen, tap Rate. Change the data-collection rate to 0.2 samples/second and the data-collection length to 60 seconds.

**Follow up Questions:**

Relate back to dialysis.

**Journal:**

The students should be moving into report writing. So, in the journals have the students write:

Title

Question

Prediction

Hypothesis

Materials

Procedure

Data

Results

Conclusion - The conclusion should answer the question “What does dialysis do for the people who need this treatment?”. The question should be answered using the observations and results from the experiment.

The teacher should model this on the board and briefly describe what should go into each section. This is not a formal report so it should not be graded. The teacher should give feedback in order to provide the student with information necessary to develop better report writing skills in the future.