

TITLE OF LESSON

Biology Unit 1 Lesson 5 – Fluid Mosaic Model  
*What's physically on the inside/outside of a cell?*

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TIME ESTIMATE FOR THIS LESSON

One class period, plus a few minutes each day for 4 days for the Egg Experiment

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ALIGNMENT WITH STANDARDS

California – Biol CB 1a; IE 1a

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MATERIALS

**Lab 1 Egg Experiment handout** – Student Page

**Egg Experiment Predictions** – Student Page

**Teacher's Notes Lesson 5** – Teacher Page

The following supplies for the egg experiment per student:

100 ml 5% acetic acid or white vinegar

raw egg

enough foil to cover the beaker or plastic cup

100 ml graduated cylinder

1 250 ml glass beaker or plastic cup (big enough to hold an egg)

ruler (metric)

50 cm string

balance (1 for each student if possible or 1 for each 2-3 students)

lab coat

tape and markers to label beakers or plastic cups

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LESSON OBJECTIVES

- To understand the placement of molecules in cells
  - To compare molecule placement and energy conservation
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EXPLANATION OF LESSON

The objective of the lesson is to understand how many factors affect a process. For instance, size, charge, and structure affect a molecule's ability to pass through the membrane. Also, students will learn how the cell has modified its functions to compensate for these differences. Images for this lesson should be available in your textbook, Starr's *Biology Concepts and Applications* or

<http://gened.emc.maricopa.edu/Bio/BIO181/BIOBK/BioBookCELL2.html> or

<http://gened.emc.maricopa.edu/Bio/BIO181/BIOBK/BioBooktransp.html#Carrier-assisted Transport>

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FOCUS AND MOTIVATE STUDENTS – WARM UP ACTIVITY

- 1) Homework Check – Have students take out their homework from last night. Collect their reading homework. Mark in your grade book the students who brought their membrane and the objects that might pass through or might not pass through them. While you are grading, have students do step 2.
- 2) **Agenda** – Have students copy the agenda you have posted.
- 3) Answer Questions – Write the following questions only on the board:
  - a) What are membranes? *Answer: Essentially an extremely thin, transparent fatty film or layer.*
  - b) What are they for?
  - c) Why do you want a plasma membrane? *Answer: To keep things in or to keep things out.*
  - d) If you have a barrier, how do you get things from one side to another? *Answer: Some molecules can directly pass through the membrane, but others need to pass through special doors (pores or*

channels), while very large molecules need to do some remodeling of the membrane to pass through (exocytosis or endocytosis).

Have the students copy the questions on a piece of paper and attempt to answer them. Give them 5 minutes to try to write out their answers. At the end of 5 minutes, call time. Randomly call on students for their answers. If students do not have the above answers, ask them why they gave the answer they did. Often answers will be logical, although they may not match the answers here. Help students to understand how their answer may have been logical, but why it might not work for this particular question.

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#### ACTIVITIES – INDIVIDUAL AND GROUP

1. **Notetaking** – Have the student chosen to take notes on the overhead today get the materials (overhead projector and projector paper and pen) needed while the others prepare their binders. Again, students must listen and write down the most important points of the topic, as they will be expected to do every time there is a lecture portion to the class. They should keep these notes in the notes section of their binder. Tell them to remember to date their notes. Remind them of this now. They are responsible for all things discussed during class time, as they will need the information for their final exam and final project. Quickly remind them of the note taking procedure you taught them in the last lesson. Tell them today it will be their responsibility to demonstrate how well they learned it. Present the material for the lesson. See *Teacher Pages* **Teacher Notes Lesson 5** for key points to cover in your lecture/discussion. Remind students to underline all new vocabulary words and make a list for their binders after class.
  2. **Membranes** – After explaining the concepts of the lesson, have the students bring in their model membranes (sponge, screen, pantyhose, etc). Each student is given a few seconds to demonstrate their membrane and discuss why they chose the item they did to represent a membrane. Then discuss how cell membranes can act as a selectively permeable barrier, i.e. it allows some things to pass through it and others not. Ask how that is possible. List on the board the molecules that can pass directly through the membrane: small hydrophobic molecules like O<sub>2</sub>, CO<sub>2</sub>, N<sub>2</sub>, benzene, small uncharged molecules like H<sub>2</sub>O, glycerol, ethanol (remind them that ethanol is alcohol in beer, wine, etc). List molecules that can't pass directly through the membrane: larger charged polar molecules like amino acids, glucose (sugar), nucleotides, and ions like H<sup>+</sup>, Na<sup>+</sup>, HCO<sub>3</sub><sup>-</sup>, K<sup>+</sup>, Ca<sup>2+</sup>, Cl<sup>-</sup>, Mg<sup>2+</sup>. Ask how charged polar molecules pass through a membrane. Remind them that pores and channels allow sugars, polar water-soluble molecules and charged substances such as ions to pass through the membrane. What are pores and channels? Proteins. Which part of these pores or channels is hydrophilic or hydrophobic?
  3. **Journal 1** – On a separate sheet of paper, ask students to write at least 2 paragraphs explaining how their model membrane mimics a real membrane. If they believe it does not, ask them to explain why it doesn't. Give students 5 minutes to write their paragraphs. At the end of 5 minutes call time and collect their responses.
  4. **Lab 1** – Students will be working through their first experiment today, **Lab 1 Egg Experiment**. This experiment is a modified version of the Egg Lab by The Bio-Web Group. Should you wish to view the experiment in its entirety, please go to [http://www.sidwell.edu/us/science/vlb5/Labs/egg\\_lab/egg\\_lab.html](http://www.sidwell.edu/us/science/vlb5/Labs/egg_lab/egg_lab.html)
  5. **Instructions** – The students will work in their assigned groups to complete this experiment, which will take a few minutes of each class period for 4 days. Ask students to choose group roles (see *Group Roles* below). Hand out **Lab 1 Egg Experiment** (which can be found in the *Student Pages* section of our site). Ask students to read over the instructions quietly. Call for questions. Ask students to predict the outcome for the parameters in each solution. Hand out the **Egg Experiments Predictions** sheet. Review the directions with them. When you have answered all questions, tell students to begin. See **Teacher Graph Results** for examples of graphs depicting predicted and actual results. Explain that predicting the outcome of an experiment is a vital part of the scientific process since it helps the scientist analyze what is known about a system with what may be discovered.
  6. **Homework Review** – At the end of the period, collect all students' lecture notes and grade them tonight. Hand them back to students tomorrow at the beginning of class and have them put them in the correct section of their binder. You will do this for all lecture notes. Make sure you initial their Egg Experiment results for today. Go over their homework assignments.
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#### HOMEWORK

- 1) Read the textbook *Biology Concepts and Applications*, chapter 4, pp. 52-53 and chapter 5, p. 83. If you are using another text, ensure that your students read something about the following concepts: fluid mosaic model and selective permeability of membranes. Summarize the key points/main ideas from your reading.
  - 2) Read chapter 4 to 6 pp. 26-36 in *The Double Helix*. Write out 3 of the most interesting parts of the reading and tell why you found them so interesting.
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#### GROUP ROLES

Recorder – The recorder will write down the results from the egg (osmosis) experiment. All students are recorders today. These records will be placed in the lab section of their binders.

Facilitator – The facilitator will guide the group through the activity and keep them focused on the experiment.

Illustrator – The illustrator will make a diagram of the egg (permeability) experiment and turn it in at the end of the activity for the group (lesson 10).

Manager – The manager will get the materials necessary for the egg (permeability) experiment.

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#### DOCUMENTATION FOR PORTFOLIO

None