

NOTE: Make sure to sign up for the computer lab beforehand. You need two days to thoroughly look at the molecules. Download the FREE Netscape Plug-in beforehand and familiarize yourself with it. Have students go directly to the computer lab for class. There are two possible ways to use this program, on-line and off-line. If using the on-line version each computer needs to have access to the Internet. If your computer lab does not and you will be using the program off-line, you will need to download and install all the programs beforehand (see **Protein Explorer Setup**).

TITLE OF LESSON

Biology Unit 1 Lesson 10 – Protein Explorer and Observation of Molecules
How do things flow in and out of a cell?

TIME ESTIMATE FOR THIS LESSON

One class period

ALIGNMENT WITH STANDARDS

California – Biol CB 1; IE 1

MATERIALS

Protein Explorer Instructions handout – Student Page
computer lab, preferably with Internet access
Netscape 4.7 installed on computers
Chime plug-in, from the Internet – <http://www.mdlchime.com/chime/>
Protein Explorer web site – <http://molvis.sdsc.edu/protexpl/index.htm>
Fourmols file – <http://www.umass.edu/microbio/rasmol/distrib/fourmols.exe>

LESSON OBJECTIVES

- To revise the first draft of a five paragraph essay
 - To learn how to download and install a plug-in
 - To learn to use a computer program to observe molecules and membranes
 - To understand molecular form and interactions by rotating molecules in 3D
 - To familiarize yourself with the program and how the molecules appear
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EXPLANATION OF LESSON

Today, students will be revising their partner's essay. They will also be writing the second draft of their essay tonight for homework.

Students will also be using the Protein Explorer web site to visualize molecules, ATP, DNA, proteins and a lipid bilayer. Protein Explorer is a web site that was prepared by investigators so that a person can observe molecules in which the crystal structure is known. It contains images of molecules, proteins, and nucleotides, as well as systems such as lipid bilayers, which can be rotated and zoomed by students to help visualize and understand molecules and systems in the cell. With this program students can see all the structures by rotating the molecule. Each molecule has a special color. For example, carbon is gray, oxygen is red, and nitrogen is white. You can change the form of the projection from one of a backbone to ball and stick to spacefill. This system is well designed to help one imagine the structures and molecules in cells.

See the handout **Protein Explorer Setup** for more instructions on downloading and installing the program. Protein Explorer can be used on-line or off-line. If your school does not have Internet access for the students or there are problems with firewalls, then follow the directions in the **Protein Explorer Setup** for downloading and installing and have the tech person do so before class. Make sure you have photocopied the handout **Protein Explorer Instructions** for each student, as they will be downloading the plug-in called Chime to each of their computers today if working on-line. Because they will have to register to download the plug-in, giving their first

and last name and email address, you will need to check with your on-site technology person to make sure that it is acceptable at your school site. If it is not, have your tech person install the program to each computer prior to class and follow the off-line instructions. Familiarize yourself with the program before class, as you will be teaching students how to download it (if using on-line) and use it today (for both on-line and off-line).

NOTE: Whether working on-line or off-line you must download the Fourmols.exe file (which contains ATP, DNA and a protein) before class begins. It can be directly downloaded by entering the following URL:
<http://www.umass.edu/microbio/rasmol/distrib/fourmols.exe>.

The students will use the **Protein Explorer Instructions** handout on how to use the program in the following class, too. So remind them to bring it to class with them.

FOCUS AND MOTIVATE STUDENTS – WARM UP ACTIVITY

- 1) **Homework Check** – Initial all highlighted and annotated **Chime Licensing Agreement** handouts. Make sure students have a big YES or NO at the top. Stamp/initial complete first drafts of Lab Report 1.
 - 2) **Agenda** – Have students copy the agenda you have posted.
 - 3) **Peer Revision** – Have students take out the first draft of their Lab Report #1. They should also take out their **Lab Report #1 Requirements** sheet. Have them switch Lab Reports with a partner. Tell them they will have 20 minutes to complete STEP 4 of their **Lab Report #1 Requirements**. Then let them work. The instructions are clearly written out in their **Lab Report #1 Requirements** sheet. At the end of 20 minutes call time. Tell students they will be required to write their second draft tonight. Have them put their Lab Reports away.
 - 4) **Computer Lab Protocol** – Ask students NOT to turn on their computers until you instruct them to. Remind them of the computer lab etiquette you have established and the consequences for misbehavior.
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ACTIVITIES – INDIVIDUAL AND GROUP

1. **No Signature** – Ask all students who have a big NO at the top of their **Chime Licensing Agreement** handout to sit at the computers where you have already downloaded Chime and installed Protein Explorer. Ask them to state their reasons for not wishing to agree to licensing for this product. If they have a good argument, praise them for it. If their reasoning lacks a solid foundation and is not specific, point that out too. In either case, tell them they will walk through all of the steps, but they will not be required to fill out the licensing agreement. Tell them they are walking through the process of downloading and installing to learn how to do it, as they may be required to do something similar in the future.
2. **Deconstructing Agreements** – Ask students to take out their annotated **Chime Licensing Agreement**. Ask students what some of their questions were. Try to field as many as possible. Ask them what they notice about the agreement first. Students may say that it is difficult to understand because of the way it is written. Ask them how they figured out what the general idea is. Then ask them what they're agreeing to in order to use this product. (You will need to read this ahead of time and figure out what the bottom line is so that you can help students here.) Ask how many students would normally skip this reading on a web site and go directly to downloading? Ask why? Many students may say because it is tedious and they really don't care. Ask why then do companies post them. It is in good faith that companies post them so that if anyone were to do anything illegal with their product, they would have cause for action because of the agreement made by the party using it. In other words, they are covering themselves, covering their butts so to speak. So why is it important to read what you are agreeing to? Because what if it says, we are going to use the information you give to us to sell to other companies, or, the program you are installing contains a smaller program that surveys your hard drive and sends us all of the information on your computer or...anything basically. So always read the fine print.
3. **Download** – Hand out **Protein Explorer Instructions**. Tell students that in order for them to run today's program, they will first have to download a plug-in called Chime to their computer. Tell them the handout has specific instructions on how to do this. Walk the students through the handout, waiting for each person in the room to complete each step of the process. Read the specific step; then have the students complete the step on their computer. Make sure that when you get to the process of registering, you speak to the students about providing information about themselves when it is not required. Especially since they are teens (the most

targeted audience), you should ask them to think about what they're providing large companies with when they disclose personal information, including age, tastes, habits, hobbies, address (never!), phone number (never!), email address, and any other information that is asked of them. What do companies do with that information?

4. Discuss – When you have finished downloading and installing all of the necessities, ask students what they think are the advantages to looking at molecules in 3D instead of flat images seen in books. They should get that they will be able to rotate molecules to have a closer look at structure and function.
 5. View and Record Instructions – Have each student take out a separate sheet of paper. At the top, they should write the title *Protein Explorer and Observation of Molecules*. Then have them split the page in half. On the left hand side, they should write molecule name and sketch. On the right hand side, they should write structure and function. Tell them as they view each molecule, they will need to write the molecule name in the left hand side and draw a sketch of it. Then in the right hand side they will need to describe the molecule's structure and its function. They should add any new vocabulary they encounter while working with the program. Explain they will have the rest of the period to work on this. They must view all of the molecules by the end of the period. You will be collecting their notes for credit at the end of the period.
 6. Partners – Have them choose a partner and sit with them at a computer. Tell them you will be walking them through the rest of the lesson today.
 7. Protein Explorer – Tell the students you will begin by viewing molecules in the program and learning how to use the various buttons and the mouse to observe them. Have the students get out their **Protein Explorer Instructions** handout. Review with them the instructions titled LEARNING HOW TO USE PROTEIN EXPLORER. Ask if anyone has any questions. Field all questions.
 8. Independent Work – Have the students begin working.
 9. Repeats – They should repeat some or all of the steps with the file 1d66 (DNA with a protein attached) and bilagram (a section of a lipid bilayer), fill out their observation sheet and tell what molecule they think they are.
 10. If Time Permits – Allow them to explore the molecules with the program until 10 minutes before the end of class. If some students have completed their observations, they can open 1hho, a protein.
 11. Discuss – Take 5 minutes at the end of class to discuss what they've seen. What can the students tell you about structure and placement after seeing these images? Have students turn in their notes. Tell them to go directly to the computer lab tomorrow. Remind them of their homework. You may not finish viewing all of the images in this lesson today. That is okay, as they will be in the computer lab tomorrow and will have time to finish.
 12. Clean Up – Leave a few minutes for the students to clean up and shut down the computers.
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HOMEWORK

- 1) Write draft 2 of your Lab Report.
 - 2) Read chapter 10 to 12, pp. 51-64 of *The Double Helix*. Write out the main ideas in these chapters. Tell whether you agree or disagree with them and why.
 - 3) Make flash cards on all the topics studied up to this point.
 - 4) Remind students to bring the **Protein Explorer Instructions** handout to the following class since it has the instructions on how to use the program.
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GROUP ROLES

Pair work

DOCUMENTATION FOR PORTFOLIO

None

