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Topic: Lipid Lab – Hydrogen Bonding

Summary: Students examine the properties of water by dropping water onto a penny.

Goals & Objectives: Students will be able to explain how the cell membrane, a lipid, can be used to separate the cell from its environment to run its own metabolism.

Time Length: 60 minutes

NGSS Standards: *HS-PS3-5.* Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.

Materials:

- Pipettes – one for every two students
- Pennies – one for every two students
- Paper towels – one for every two students
- Small (50 mL) beakers with water – one for every two students

Procedures:

1. Students get the supplies. Students place the paper towel on top of their desk and place the penny on top of the towel. Students use their pipettes to collect water from the beaker and then slowly place the same size of water drops onto their penny. It is important that the students do this slowly so that water can easily bead up onto the penny. Students will continue adding water in the same location of the penny until the water spills over the side. Students record their results in the data table provided in the handout. The same student then dries off the penny and repeats two more times.

2. Once three trials have been complete by one student; their partner then tries three times, recording their data each time in the data table. Students then calculate the averages from their trials and their partner's trials. Students are to share their averages and you display the averages on the white board or overhead projector so all the students can write down the averages. Students are to bar graph their data before finishing the analysis and conclusion questions.

Editable DOCX File and Answer Key:

Available at www.ngsslifescience.com

Name: _____ Row: _____

Date:_____ Period:_____

Lipid Lab – Hydrogen Bonding

Background: Water molecules stick together because of a **hydrogen bond** holding two water molecules together. Water molecules are polar because there is an uneven sharing of the electrons between the oxygen and hydrogen atoms. This unequal sharing of electrons causes a *positive charge at the hydrogen atoms* and a *negative charge at the oxygen atom*. The hydrogen atom of one water molecule attracts the oxygen of another water molecule. Oil is a type of lipid, which is nonpolar.

Materials:

2 Pipettes	Penny	Paper Towel
Water	2 Beakers	Oil

Procedures:

1. You and your partner will conduct two trails each. Go get the supplies listed above from the teacher. Place your paper towel on top of a level surface. Place your penny on top of the towel.
2. Use your pipette to collect water from the beaker. Slowly place the same size of water drops onto your **clean penny**. Continue adding water in the same location until the water spills over the side. Record your results in the data table below and write your observations.
3. Dry off your penny and repeat for trail two.
4. Use the other pipette to collect oil from the 2nd beaker. Slowly place one drop of oil onto a penny making any **oily penny**. Count the number of drops of water that can stay on the oily penny. Record your results in the data table below and write your observations.

Hypothesis: If I drop water onto a penny that is _____, then the water will slide off with _____ drops when compared to the clean penny.

Experimental Data:

	Clean Penny	
	Me	Partner
Trial 1		
Trial 2		
Sum		
Averages		

Water Only Observations

_____

_____

_____

_____

	Oily Penny	
	Me	Partner
Trial 1		
Trial 2		
Sum		
Averages		

Water & Oil Observations

_____

_____

_____

_____

_____

Analysis:

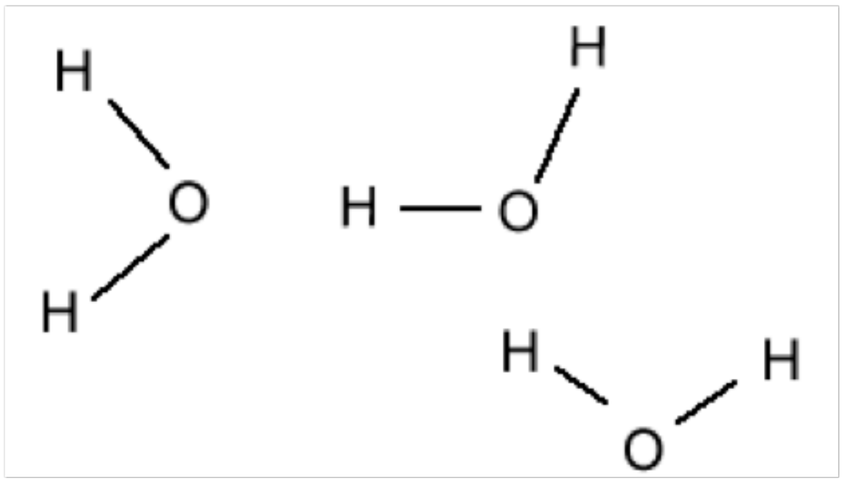
1) Independent variable: _____

Dependent variable: _____

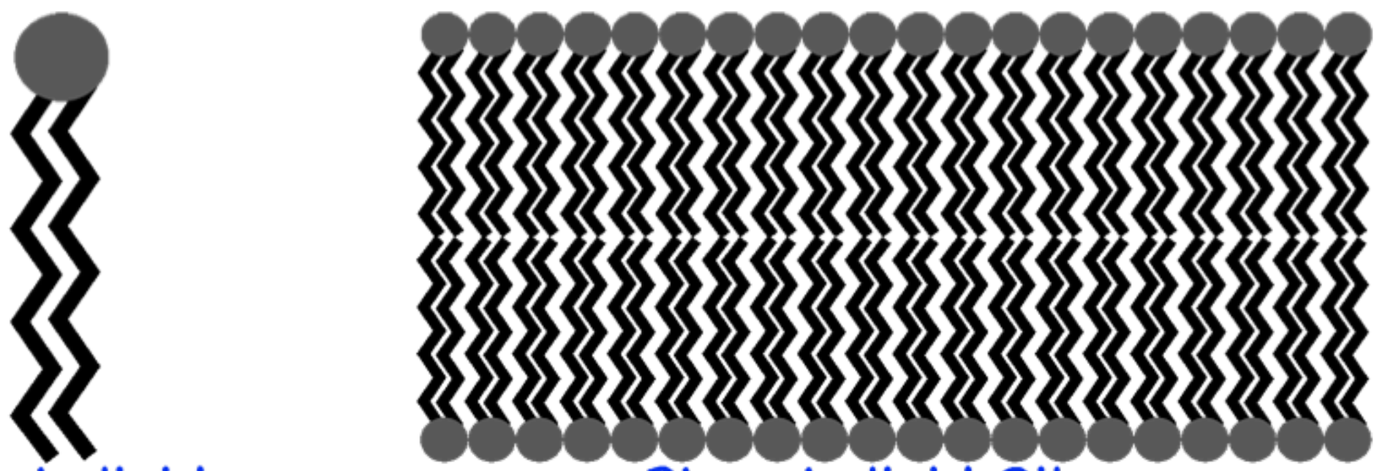
Constants: _____ _____

Control Group: _____

2) The oxygen atom in a water molecule unequally pulls the electron from the hydrogen atoms, making water polar. Write a + symbol next to the slightly positive region of each atom and a − symbol next to the slightly negative region of each atom. Circle the location of *two* hydrogen bonds using the three H_2O molecules below.



3) Label the phospholipid bilayer below. Label "polar" and "non polar" next to the cell membrane phospholipid bilayer based on your predictions and knowledge that your body is about 80% water.



Phospholipid Phospholipid Bilayer

4) Explain why water molecules do not mix with oil. _____

_____

Conclusion: (confirm or reject) _____

Explain how the structure of the cell membrane (phospholipid bilayer) is used to separate the chemical reactions (metabolism) inside a cell from its surroundings.

_____

_____