Names _____ Block _____ Date _____

Alien Liquid ("Liquid X") Lab

Station 1 – "The Penny Lab"

*Water displays properties of **cohesiveness**, **adhesiveness**, and **surface tension**. Does Liquid X display these same properties?*

1. *Using a pipet, carefully place drops of each liquid onto a penny.*
2. *Count the number of drops you are able to "pile up" on top of the penny before the liquid spills.*
3. *Record your data and repeat each liquid 3 times. Find the average or mean of your results.*
4. *Clean up.*

Data

Sample	Number of Drops Before Spilling			Mean
	Trial 1	Trial 2	Trial 3	
Water				
Liquid X				

- In this experiment, identify the:
  - Independent variable _____
  - Dependent variable _____
  - **Two** constants _____, _____
- Why was it important to complete multiple **trials** for each liquid? Justify your answer using your data above. _____

  _____
- How does "Liquid X" compare to water?
  - Justify your claim with evidence (data) and reasoning (an explanation).
  - Use the terms "**cohesive**," "**adhesive**," and "**surface tension**" appropriately in your reasoning.

  _____

  _____

  _____

Station 2 – Bubble and Fizz

*Water is a **universal solvent** and makes chemical reactions easier as a result. Does Liquid X display this same property?*

1. *Pour one small scoop of sodium bicarbonate (baking soda) and one small scoop of citric acid into the same paper cup.*
    - Observe what happens and record your observations: _____

      _____
2. *Pour a small amount of Liquid X into the paper cup.*
    - Observe what happens and record your observations: _____

      _____

- A **solvent** is a liquid that dissolves solids. The solid that is being dissolved is the **solute**. The combination of solvent and solute is called a **solution**. In this activity, identify the:
    - Solvent _____ Solute(s) _____
- Considering what you just observed, does Liquid X help chemical reactions to occur quickly?

  _____

  _____
- Cells and living things require many chemical reactions to occur extremely quickly in order to survive. Explain how the "universal solvent" property might help cells and living things survive.

  _____

  _____

Station 3 – Frozen Density

*The solid form of water (ice) is less dense than liquid, causing it to float (**buoyancy**) and protect aquatic life underwater. Does Liquid X display this same property?*

1. *Remove a solid block of Liquid X from the beaker using tongs.*
2. *Carefully drop the block into a beaker of fluid Liquid X. Observe how it behaves.*
3. *Leave the block in the fluid to melt.*

- Record your observations below. Did the solid "Liquid X" float like water, or sink like most other substances on earth? _____
- Explain how this property might help aquatic organisms living in a cold environment.

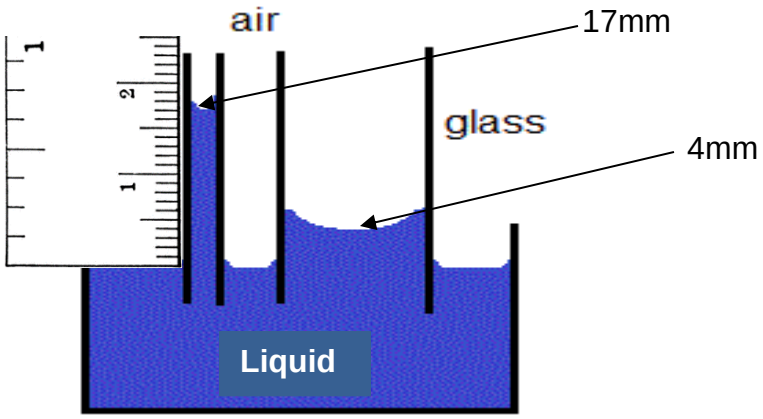
  _____

  _____

Station 4 –Capillary Action vs. Gravity

Water can literally "climb" up thin tubes due to its cohesive and adhesive properties. Does Liquid X display the same ability to defy gravity and perform ***capillary action****?*

1. *Use a ruler to measure how high Liquid X has climbed in each glass capillary tube.*
    - *Use the metric (centimeter) side. Measure each height in millimeters (mm). Count the smallest lines. Don't just read the number on the ruler!*



Data

Tube Inner-Diameter	Height of water inside tube (above liquid in tray)
5.0 mm	
4.0 mm	
3.0 mm	
0.5 mm	

- **Capillary action** is a product of two properties: **cohesion** and **adhesion**. Identify which property (cohesion or adhesion) is responsible for each action:
    - Liquid X can "stick" to surfaces such as glass and plastic. _____
    - Liquid X is attracted to itself and can even pull up on Liquid X molecules below it, against gravity. _____
- On Earth, plants (especially trees) rely on the capillary action of water to move up their stems, from the roots to the leaves. Could Liquid X perform a similar function? Justify your answer with data.

_____

_____

_____

Station 5 – Hot Plate Race

*Water has a **high heat capacity**, which means it doesn't change temperature as much as other substances. Does Liquid X also have this property?*

1. *Record the initial temperature of the sand (red) and Liquid X (blue).*
2. *Turn on each hot plate to a setting of "2" and press "play" in the lower left-hand corner of the LabQuest2 display.*
3. *Wait for the data to generate and record your data below.*
4. *Turn off the hot plates.*
5. *Discard the hot sand and hot Liquid X in the "waste" containers and set up the experiment for the next group:*
    - *200 mL of "fresh" sand in one beaker and 200 mL of "fresh" Liquid X in the other.*
    - *Insert the red channel 1 probe in the sand and the blue channel 2 probe in the Liquid X.*

Data

Sample	Temperature (°C)						
	Initial (0 min)	1 min	2 min	3 min	4 min	5 min	Range
Sand							
Liquid X							

- Identify the essential parts of this experiment:
    - Independent variable _____
    - Dependent variable _____
    - **Two** constants _____, _____
- Which substance changed temperature the most? Justify your claim with evidence.

  _____

  _____
- Which substance has a higher heat capacity? Justify your claim with evidence (data):

  _____

  _____
- Why might this property be important to organisms living in a pond on a sunny day?

  _____

  _____

Station 6 – pH Gizmo (See Attached Explore Sheet)

Station 7 – Acids and Bases

*Water has a **neutral** pH of exactly **7**. How does the pH of Liquid X compare to this and the pH measurements of other common chemicals?*

1. *Remove the pH probe from the white bottle. Rinse with water from the squeeze bottle while holding it over a waste container. Gently blot dry with paper towel.*
2. *Insert the probe into the first sample. Wait for the LabQuest2 to stabilize. Record the pH.*
3. *Remove the probe, rinse with water again, and blot dry again.*
4. *Repeat for each solution, rinsing and drying between each.*
5. *Rinse and dry one more time before replacing the probe in the white bottle.*

Data

Sample	Liquid X	Water	Ammonia	Lemon	Vinegar	Bleach	Milk
pH Meter Measurement							

- Identify each pH measurement method as qualitative or quantitative:
  - pH Paper Strip: _____
  - Digital pH Meter: _____
- Based on what you know about the pH scale, what happens to the pH of liquid if you add:
  - base: Circle one: decreases; increases; stays the same
  - acid: Circle one: decreases; increases; stays the same
- Based on your data and the pH scale shown above, identify each of the following as usually acidic (A), basic (B), or neutral (N):
  - Cleaning products_____
  - Sour substances _____
  - Carbonated drinks _____
- Based on your observations from stations 5 and 6, are biological fluids such as blood and saliva more likely to be strongly acidic, neutral, or strongly basic. Explain your answer using observations and data from the lab.

_____

_____