Name: _____ Class: _____

Materials Needed:
LaMotte Test Kit
pH test strips
7 X 250 ml beaker
Metal scoopula
3 watch glasses or weigh boats (for sample prep)
Digital scale (for sample prep)
2 x 10 mL pipet/pump (for sample prep)
1 gal distilled water (for sample prep)
safe drinking water reference sheet

Optional:
Coliform Test Kit
E. coli K12 sample from Carolina Biological (or another supplier)

Teacher Set Up:

A. Teachers will need to pre-make each water sample for student testing and label the containers accordingly. Label each one A-G. *if doing the Coliform test- contaminate one or more samples with *E. coli* K-12.
    1. Dissolve 2 grams of coffee grounds in 200 ml of distilled water.
    2. Dissolve 30 grams of baking soda & 10 ml of Windex in 200 ml of distilled water.
    3. Dissolve 20 ml of white vinegar in 200 ml of distilled water.
    4. Dissolve 3g of Miracle-Gro plant food in 200 ml of distilled water.
    5. Dissolve 2 Alka-seltzer tablets in 200 ml of dissolved water.
    6. Place one teabag of Celestial raspberry zinger tea in 200 ml of distilled water.
    7. Dissolve one Cascade Dishwashing pod into 200 ml of distilled water.

B. At each station give student groups access to the Lamotte kit, the Coliform kit materials, and pH indicator paper or a pH probe along with the student lab sheet.

C. Go over the following scenario with students and answer any questions they may have to get them started. It might be useful if your school can't afford multiple coliform kits to do that part as a demo with each liquid.

Scenario:
You find yourself stranded in the woods after getting lost on a hike. Having hiked over 10 miles you are super thirsty. Luckily, you see an abandoned cabin. You enter the cabin and see several jars of liquids.

1. First, observe each jar of liquid your group has been given and record any observations you noticed that would give you clues about whether the water was safe or unsafe to

drink. Be thorough in your description, including as many adjectives as you can think of to describe the sample. Use good lab safety techniques with each sample.

	Sight	Smell	Would you drink this? Why or why not?
Sample A			
Sample B			
Sample C			
Sample D			
Sample E			
Sample F			
Sample G			

2. Use the provided testing equipment to gather additional data about each sample.

	pH	Dissolved Oxygen (ppm)	Nitrate (ppm)	Phosphate (ppm)	Chromium (ppm)	Ammonia (ppm)
Sample A						
Sample B						
Sample C						
Sample D						
Sample E						
Sample F						
Sample G						

3. Water quality is regulated by the Environmental Protection Agency. Laws have been passed (Clean Water Act, Safe Drinking Water Act) to protect citizens. The FDA regulates bottled drinking water. The CDC provides information about drinking water from several sources.

   According to an expert at the Missouri American Water Company, the below document illustrates the recommended levels for drinking water.

   Drinking Water Reference Sheet

   Please compare these values with the values tested above. Highlight any level that is too high in pink. Highlight any level that is too low in yellow. Highlight any level that meets the recommended standard in green.

	pH	Dissolved Oxygen (ppm)	Nitrate (ppm)	Phosphate (ppm)	Chromium (ppm)	Ammonia (ppm)
Sample A						
Sample B						
Sample C						
Sample D						
Sample E						
Sample F						
Sample G						

4. The EPA considers total coliforms a useful indicator of other pathogens for drinking water. To determine safe drinking water, a bacterial test needs to be conducted. Use the provided bacterial test kit and testing reference guide to record the presence of coliform bacteria.

Sample	Color	Presence of bubbles?	Gel location	Presence of coliform bacteria
Sample A				
Sample B				
Sample C				
Sample D				
Sample E				
Sample F				
Sample G				

For more information on coliform bacteria:
https://www.epa.gov/dwreginfo/revised-total-coliform-rule-and-total-coliform-rule

5. **<u>Evaluation time!</u>** Now that you have collected qualitative and quantitative data on all samples, please rank the samples in order of "safest" to "most dangerous" to drink.

Ranking	Sample	Evidence or Reasoning
1 (safest)		
2		
3		
4		
5		
6		
7 (most dangerous)		

Answers:
Depending on setup and student evidence, however, coffee and tea should be the safest to drink and ranked higher than others. Miracle-Gro and dishwasher detergent should be the most dangerous!