Name:_____
Date:_____Period:____

Kool-Aid Solutions Lab

Purpose:

- To calculate the amount of solute needed to make various concentrations of Kool-Aid and use your calculations to make each solution.
- To calculate and then dilute a concentrated Kool-Aid solution to obtain two diluted concentrations.
- To use the five senses (even taste and touch!) to compare Kool-Aid solutions of varying molarities.

Preparation of Lab Solutions: (Your procedure will be slightly different)

- The amount of solute needed is calculated and then obtained using a balance.
- The solute is placed in a volumetric flask, which has a mark on the neck of the bottle.
- Solvent (typically water) is added to fill the bulb of the flask.
- The top is placed on the flask and the solution is mixed to obtain a homogeneous mixture.
- Solvent is then added to reach the mark on the neck of the flask and the solution is mixed well.
- The solution is labeled with its concentration using the units of molarity (M).

Materials & Equipment:

- Electronic balance (covered with plastic)
- Clear plastic cups (sub for volumetric flasks)
- Paper cups (to drink from)
- Masking tape
- Sharpie
- Kool-Aid powder with plastic spoons
- Coffee stirrer
- Distilled water

Safety Considerations: Since you will be tasting the solutions prepared in this lab, you may not use any laboratory equipment throughout the procedures. You will create and mix all of your solutions in the clear plastic cups and then transfer a bit to your individual paper cups to taste each solution. Everything you make in this lab can be poured down the drain. You should save the clear plastic cups for the next group to create their solutions, but your paper drinking cups can be thrown in the trash.

Pre-Lab Questions:

1) Why are you not using any laboratory equipment in this lab?

2) What equation will you use to calculate the amount of solute needed for each solution?

3) What equation will you use to calculate the amount of solvent to add for the dilutions?

4) Kool-Aid is mostly sugar, so you can assume its chemical formula is $C_{12}H_{22}O_{11}$. Calculate the molar mass of Kool-Aid.

5) Complete all calculations in both data tables. Show all your work in the appropriate boxes and put a BOX around your final answer to each calculation. Make sure to include units and obey significant figure rules.

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Procedures:

1) Place a plastic cup with one line on the balance and tare the balance.
2) Add the calculated amount of Kool-Aid powder to the cup for the 0.10 M solution.
3) Take the cup off the balance and add water to reach the 100-mL line on the cup.
4) Stir your solution with a coffee stirrer until all the powder has dissolved.
5) DO NOT DRINK YET!
6) Repeat steps 1-5 for the 0.40 M and 0.70 M solutions.
7) After all three solutions have been prepared, record your observations of each in the data table, including how they taste. Remember, you must pour a small amount of the solution into your paper cup to taste it. Do NOT drink from the plastic cups.
8) Answer the questions under the data table before moving on to Step 9.
9) Place the plastic cup with three lines on the balance and tare the balance.
10) Add the calculated amount of Kool-Aid powder to the cup for the 1.0 M solution.
11) Take the cup off the balance and add water to reach the 100-mL line on the cup.
12) Stir your solution with a coffee stirrer until all the powder has dissolved.
13) Pour a TINY amount into your paper cups and then bring the volume of the solution back up to 100-mL. Record your observations of this solution in the data table.
14) Dilute the 1.0 M solution to create a 0.80 M solution by adding enough water to reach the second line. You should have already calculated the total volume of water in your Pre-Lab.
15) Pour a TINY amount of this solution into your paper cups and then bring the volume of the solution back up to the second line. Record your observations of this solution in the data table.
16) Dilute the 0.80 M solution to create a 0.50 M solution by adding enough water to reach the third line. You should have already calculated the total volume of water in your Pre-Lab.
17) Pour a TINY amount of this solution into your paper cups and then bring the volume of the solution back up to the second line. Record your observations of this solution in the data table.
18) Answer the questions under the data table before moving on to the conclusion and application questions.

Data & Observations:

	Solution 1 100.0 mL of **0.10 M**	Solution 2 100.0 mL of **0.40 M**	Solution 3 100.0 mL of **0.70 M**
Calculate the **moles** of Kool-Aid powder needed			
Calculate the **mass (g)** of Kool-Aid powder needed			
Observations (including taste)			

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1) What is the solvent for each solution that you prepared? _____
2) What is the solute for each solution that you prepared? _____
3) Which concentration that you tested was closest to the ideal concentration of Kool-Aid? What was wrong with each of the other solutions? Include the specific molarities that you are discussing in your answer. *(complete sentences)*

	Concentrated Solution 100.0 mL of **1.0 M**	Dilution 1 **0.80 M**	Dilution 2 **0.50 M**
Calculate the **moles** of Kool-Aid powder needed			
Calculate the **mass (g)** of Kool-Aid powder needed			
Calculate the **additional volume (mL)** of water needed		*Starting with 100.0 mL of 1.0 M solution	*Starting with solution from Dilution 1
Observations (including taste)			

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1) Use your observations to explain what happens when you go from a 1.0 M to a 0.50 M solution of Kool-Aid. *(complete sentences)*

2) From your dilutions, how does the amount of Kool-Aid powder compare to the amount of water as you go from the concentrated solution to the final solution? *(complete sentences)*

Conclusion & Application: Show all your work for each calculation below. Put your final answer in a BOX.

1) Define the term "solution" in your own words. *(complete sentences)*

2) If you wanted to make Kool-Aid ice cubes, would you need to be slightly above or slightly below $0^{o}C$? Why? *(complete sentences)*

3) Calculate the molarity of a solution that contains 4.0 g of NaOH in 500.0 mL of solution.

4) If 500.0 mL of 2.0 M HCl is diluted with water to a volume of 1.0 L, what is the molarity of the new solution?

5) How many moles of KNO_3 are required to make 0.50 L of a 2.0 M solution?

6) Which is more concentrated: 200 mL of a solution containing 4 moles of NaOH OR 500 mL of a solution containing 8 moles of NaOH?