

# THE BEVERAGE FACTORY

AN INTRODUCTION TO THE SCIENTIFIC METHOD

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# Teacher's Information

The Beverage Factory can be used as an introduction to the scientific method. It starts with a hypothesis for the question: What is the ratio of favor, sugar, and water for the best tasting beverage?

## ACTIVITY ONE:

Students are asked to count the number of 1/4 tsp measures it takes to fill the other measuring spoons. The counts are compared and differences are discussed. A standard procedure for measuring is developed.

## MATERIAL:

- Set of measuring spoons
- Container of sugar

## ACTIVITY TWO:

Students mix goo using different size measures to see if the same proportion mixed with different size measures will yield the same results.

## MATERIAL:

- Set of measuring spoons
- Container of white glue
- Container of water
- Container of borax solution.
- 1 oz plastic cups

Note: Mix 1/4 cup of borax (20 Mule Team available in most markets) to 1 qt of water.

## ACTIVITY THREE:

Students are asked to develop a method for finding the formula for the beverage. During a discussion they are introduced to the scientific method.

## MATERIAL:

- Scientific Method handout
- Lab Report worksheet

## ACTIVITY FOUR:

Students are told that they will be developing a formula for a new beverage. They will start with a hypothesis, a guess, as to how much of each ingredient is add to the mix. They mix it and taste it to see if they were correct. The hypothesis is modified and a new mix is made. This continues until student are satisfied with the taste of the beverage.

Put one package of Kool-Aid into a 1 oz cup for each group of four students. Cover the cup with a lid. Distribute a cup of flavor (Kool-Aid), formula chart, container of sugar, container of water, stirring stick, set of measuring spoons, mixing cup, and four 1 oz cups to each group. Students record ratios and results for each mix as they try to find the best tasting beverage. The ratios are multiples of the single unit used for the flavor. Mixes are made in the mixing cup and each persons tastes the mix using a 1 oz cup. Student list the best mix from each group.

**MATERIAL:**

- Unsweetened Kool-Aid
- Set of measuring spoons
- Stirring stick or spoon
- 1 oz plastic cups with lids
- Container of sugar
- Large container of water
- 8 oz plastic cup for mixing
- Formula chart
- Lab report worksheet

**ACTIVITY FIVE:**

The teacher should mix the taste test formula from each group and have one member from each group taste each and choose the best mix.

**MATERIAL:**

- Unsweetened Kool-Aid
- Set of measuring spoons
- Stirring stick or spoon
- 1 oz plastic cups with lids
- Container of sugar
- Large container of water
- 8 oz plastic cup for mixing
- Formula chart

**ACTIVITY SIX:**

Students graph their mixes. The teacher supplies the ratio from the Kool-Aid package. The class compares student results to the Kool-Aid recommendation.

**MATERIAL:**

- Formula chart
- Graph paper
- Colored pencils
- Rulers

Note: Kool-Aid ratio is 1 flavor, 38 sugar, 307 water.

**ACTIVITY SEVEN:**

Students compare mix ratios for another product given the recommended ratio and sample mixes. They comment on what the result would be.

**MATERIAL:**

- Product Review sheet

## ACTIVITY EIGHT:

Students are asked to develop a formula for making gummy candy using fruit juice and gelatine. This lab revisits the beverage lab. Student, again, guess at a formula and practice the scientific method.

### MATERIAL:

- Fruit juice in a container (Apple Juice works well)
- Unflavored gelatin in a 1 oz container with lid
- Set of measuring spoons
- Stirring stick or tooth pick
- Petri dish
- Large container of water
- Source for hot water
- 8 oz plastic cup for mixing
- Candy formula chart
- Lab report worksheet
- Source for hot water (coffee maker will work)

Note: Always soften the gelatine with hot water before the juice is added to make the candy.

## ACTIVITY NINE:

Students experiment with goo to find a procedure to color it and produce rainbow goo.

### MATERIAL:

- Set of measuring spoons
- Stirring sticks or tooth picks
- White glue
- Water
- Food coloring
- Borax solution
- 1 oz plastic cups with lids
- Goo worksheet

## ACTIVITY ONE

# MEASURE IT

### MATERIALS:

Per group  
Set of measuring spoons  
Stirring stick  
Container of sugar



### PROCEDURE:

1. Tell students that they will be developing a formula for a new beverage.
2. To insure quality control, all measurements are to be referenced to one scoop of flavor.
3. Have students convert each of the spoons in the measuring spoon set to units of the smallest scoop by counting how many small scoops it takes to fill each of the other scoops.
4. Repeat step 3 for each student in the group.
5. Have students compare results. Are they all the same? Why not?
6. Discuss a standard method for measuring.
7. Use the stirring stick to level the measure and repeat steps 1 - 5.
8. Once the correct proportion is established, have students mark each spoon with the equivalent of the unit measure. ( $1/4$  tsp = 1,  $1/2$  tsp = 2, 1 tsp = 4, 1 tbl = 12)

## ACTIVITY TWO

# HOW BIG A MEASURE?

### **MATERIALS:**

Per group  
Set of measuring spoons  
Stirring sticks or tooth picks  
White glue  
Water  
Borax solution  
1 oz plastic cups with lids  
Goo mix worksheet



### **PROCEDURE:**

1. Tell students that they will be mixing the new beverage using the measuring spoons. The actual beverage will be mixed in very large amounts.
2. Ask if there will be a problem when their small measures will be convert to large measures.
3. Discuss the issue of proportion. What is mixed in miniature should be the same as the same proportions in a larger scale.
4. Have students test this by mixing goo.
5. Use the three smallest mixing spoons to mix the goo.
6. Have three students in a group use a different measuring spoon and put one spoon of water and white glue into a 1 oz cup. Mix well. Add one spoon of borax solution and mix.
7. Compare the results. Are they the same?

## ACTIVITY THREE

# THE SCIENTIFIC METHOD

### **MATERIALS:**

Per student  
Scientific Method handout  
Lab Report worksheet



### **PROCEDURE:**

1. Tell students that they will be working as scientists as they develop a formula for a new beverage.
2. Ask what they would do to find the formula using the flavor, water, and sugar.
3. Discuss their ideas.
4. Tell them that scientists use a procedure called the scientific method to solve problems.
5. Read and discuss the scientific method handout.
6. Tell students that scientists keep records and report on their findings. That way other scientists can check their hypothesis.
7. Review the lab report worksheet.

## **ACTIVITY FOUR**

# **WHAT'S THE FORMULA?**

### **PREPARATION:**

Put one package of Kool-Aid into a 1 oz cup for each group of four students. There are about five mixes in a package.

### **MATERIALS:**

Per group

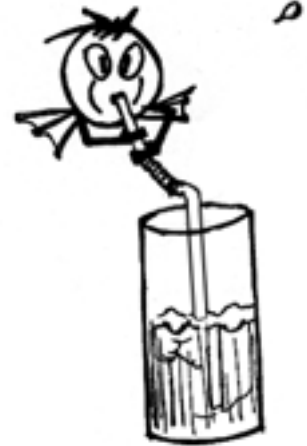
Unsweetened Kool-Aid in a 1 oz container with lid  
Set of measuring spoons  
Stirring stick or tooth pick  
1 oz plastic cups  
Container of sugar  
Large container of water  
8 oz plastic cup for mixing  
Formula chart

### **PROCEDURE:**

1. Tell students that they will be developing a formula for a new beverage.
2. To insure quality control, all measurements are to be referenced to one scoop of flavor.
3. Have students mix flavor, sugar, and water and record the results for each mix on the formula chart.
4. Remind students to always use one measure of flavor. Change the sugar and water only.
5. Have students record their best formula and list the best formula for each group. All groups should record all the best mixes on the formula chart.
6. Have students compare results. Are they all the same? Why not?

## ACTIVITY FIVE

# TASTE TEST



### **MATERIALS:**

- Per group
  - Unsweetened Kool-Aid in a 3/4 oz container with lid
  - Set of measuring spoons
  - Stirring stick or tooth pick
  - 1 oz plastic cups
  - Container of sugar
  - Large container of water
  - 8 oz plastic cup for mixing
  - Formula chart

### **PROCEDURE:**

1. Tell students that they will be tasting all the best mixes.
2. Have students calculate a five scoops of flavor mix using their best mix.
3. Have students mix flavor, sugar, and water for the mix to be used in the taste test.
4. Mark each cup of mix with a number for each group.
5. Have students taste each mix and pick the one they like the best.
6. Tally votes for each mix and graph results.
7. Discuss the difference in taste and how a company could use the data collected.

# ACTIVITY SIX

## GRAPH IT

### MATERIALS:

Per group  
Graph paper  
Formula chart  
Colored pencils  
Rulers

### PROCEDURE:



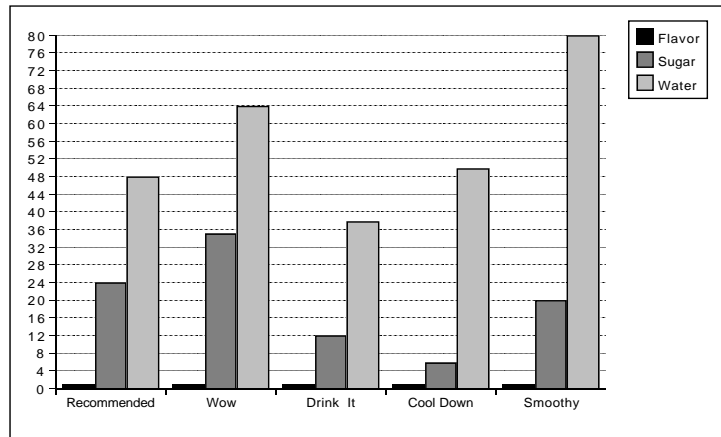
1. Have students graph the formula for each group's best mix.
2. Give students the formula Kool-Aid uses. (1 flavor - 38 sugar - 307 water)
3. Have students add this to their graph.
4. Compare the group's formula to the Kool-Aid formula.
5. Discuss what each ingredient does to the taste of the beverage. (Too little sugar vs too much sugar, too little water vs too much water)

# ACTIVITY SEVEN

## CHECK IT OUT

### **MATERIALS:**

Per student  
Product Review sheet



### **PROCEDURE:**

1. Have students comment on the taste of each product compared to the recommended mix.
2. Discuss the results
3. Discuss the differences in mixes compared to the differences in the best mixes in the class.
4. Discuss how a company might develop a formula with mass appeal.

## ACTIVITY EIGHT

# CANDY MAKER

### **MATERIALS:**

Per group

- Fruit juice in a container
- Unflavored gelatin in a 1 oz container with lid
- Set of measuring spoons
- Stirring stick or tooth pick
- Petri dish
- Large container of water
- Source for hot water
- 8 oz plastic cup for mixing
- Candy formula chart



### **PROCEDURE:**

1. Tell students that they will be experience with fruit juice to find a formula for making gummy candy.
2. Have students mix the candy in the petri dish.
3. Tell students to soften the gelatin with hot water before mixing it with the juice.
4. Have students record their best mix.
5. Compare results.
6. Have students sample each mix and pick the one they like the best.
7. Tally votes for each mix and discuss the results.

## ACTIVITY NINE

# SHADES OF GOO

### **MATERIALS:**

Per group  
Set of measuring spoons  
Stirring sticks or tooth picks  
White glue  
Water  
Food coloring  
Borax solution  
1 oz plastic cups with lids  
Shades of Goo worksheet



### **PROCEDURE:**

1. Tell students that they will be coloring the goo they made earlier.
2. Have students use the same formula, 1 water to 1 glue to 1 borax.
3. Ask students at what point in the process would they add the color.
4. Have students test this by mixing goo and record the results.
5. Compare the results. Are they the same?
6. Have students mix a pink and a red goo. How much color is needed for each?
7. Ask students how would they mix rainbow goo.
8. Have students create rainbow goo.

## How many 1/4 tsp scoops will fill each measure?

Each member of the group count how many small spoon scoops it takes to fill the other spoons.

Student 1

1/4 tsp	1/2 tsp	1 tsp	1 tbl
<b>1</b>			

Student 2

1/4 tsp	1/2 tsp	1 tsp	1 tbl
<b>1</b>			

Student 3

1/4 tsp	1/2 tsp	1 tsp	1 tbl
<b>1</b>			

Student 4

1/4 tsp	1/2 tsp	1 tsp	1 tbl
<b>1</b>			

Are all the results the same? \_\_\_\_\_

Why? \_\_\_\_\_

Use leveled measure and recount how many small spoon scoops it takes to fill the other spoons.



Level each measure with a stirring stick.

1/4 tsp	1/2 tsp	1 tsp	1 tbl
<b>1</b>			

Mark each spoon with the number of small scoops list in the last box.

# GOO MIX

You have been assigned the job of finding out if the same proportion mixed with different size measures will yield the same results. You will be mixing goo. The mixture will be mixed three times with three different measuring spoons. You will compare the mixtures to see if they are the same. Always mix the glue and water before adding the borax solution.

1. Put one measure of glue into a one once cup.
2. Add one measure of water and mix well.
3. Add one measure of borax solution and mix.
4. Compare the results.

Measure	Water	Glue	Borax	Results
1/4 tsp	1	1	1	
1/2 tsp	1	1	1	
1tsp	1	1	1	

Where they all the same? \_\_\_\_\_

---

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# The Scientific Method

**Step 1:**

State the problem or question.

You cannot solve a problem until you know exactly what it is.

**Step 2:**

Form a hypothesis.

A possible solution to the problem or question is...

**Step 3:**

Procedure for testing the hypothesis.

What steps will you take to test the hypothesis?  
Explain the experiment.

**Step 4:**

Gather data.

Experiments are done to gather data. It is very important that good observations and records are made during an experiment. Keep track of measurements and results of the procedure.

**Step 5:**

Draw conclusions from the data.

The data is used to form conclusions after the experiment. The simplest form of conclusion will be “yes” the hypothesis was correct, or “no” the hypothesis was not correct.

If the hypothesis is incorrect, you must find out what was wrong with it. This will lead to the formation of a new hypothesis.

Test your new hypothesis.

Continue this process until the problem is solved!

Final conclusion: State the correct hypothesis and use data from the experiment to support the statement.

# The Scientific Method

## Lab Report

### Step 1:

State the problem or question. \_\_\_\_\_

\_\_\_\_\_

### Step 2:

Form a hypothesis. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

### Step 3:

Procedure for testing the hypothesis. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

### Step 4:

Gather Data. Attach data to this page.

### Step 5:

Draw conclusions from the data. Was the hypothesis correct? \_\_\_\_\_

If not, state a modified hypothesis and retest.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Final Conclusion: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

# Beverage Factory

## Formula Chart

Your assignment as a member of the product development team is to find the best tasting mix for our new beverage. Always use a single unit (measure) of flavor for each mix. Add sugar and water and list each amount in the chart below. Taste each mix and record the results on the chart.

Mix	Flavor Units	Sugar Units	Water Units	Results
Number 1	1			
Number 2	1			
Number 3	1			
Number 4	1			
Number 5	1			
Number 6	1			
Number 7	1			
Number 8	1			
Number 9	1			
Number 10	1			

Once you have found the best mix, record the formula in the best mix box.

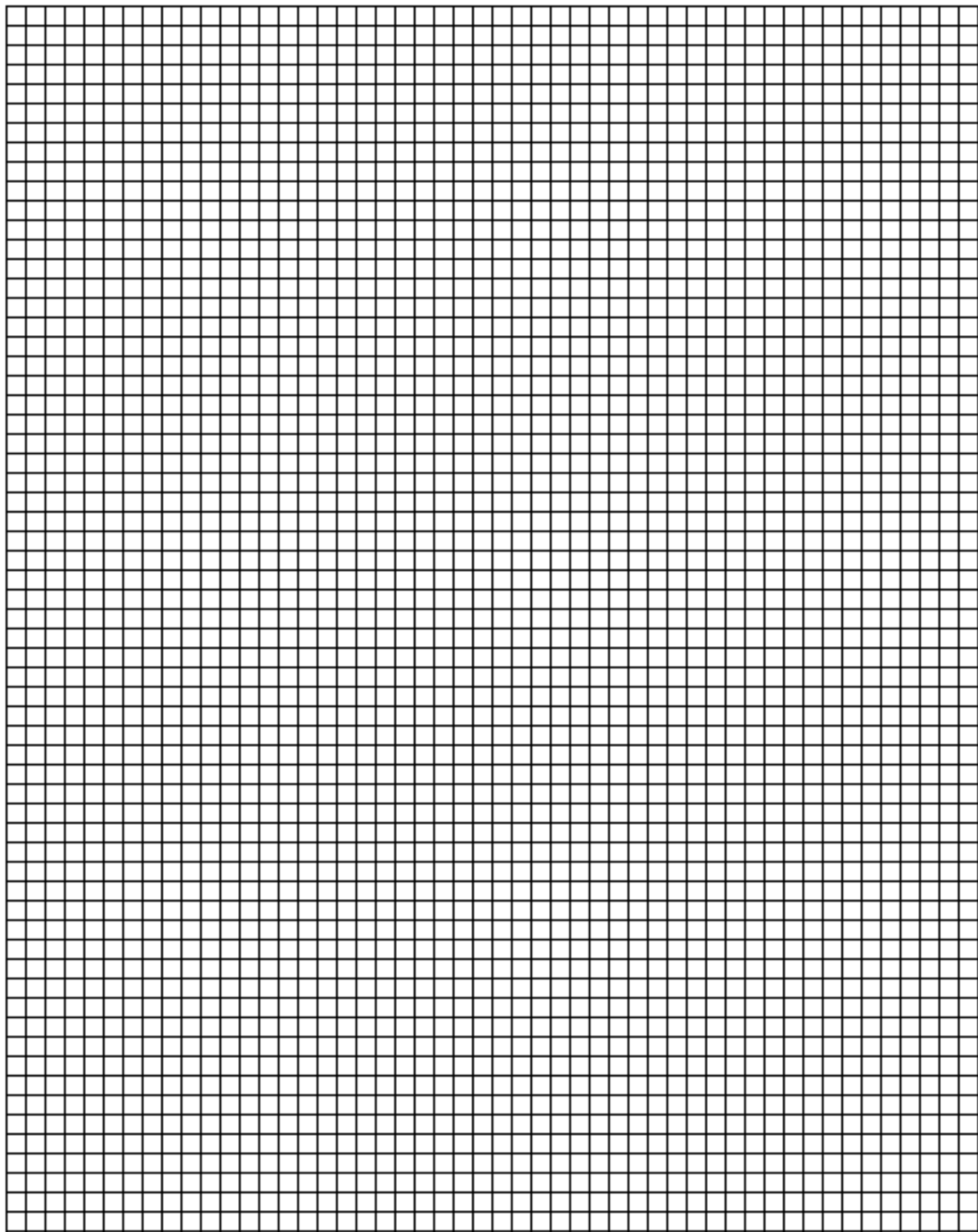
Flavor Units	Sugar Units	Water Units
1		

Record the best mix from other groups for a taste test. Choose a representative from your group to taste the mixes from all the groups.

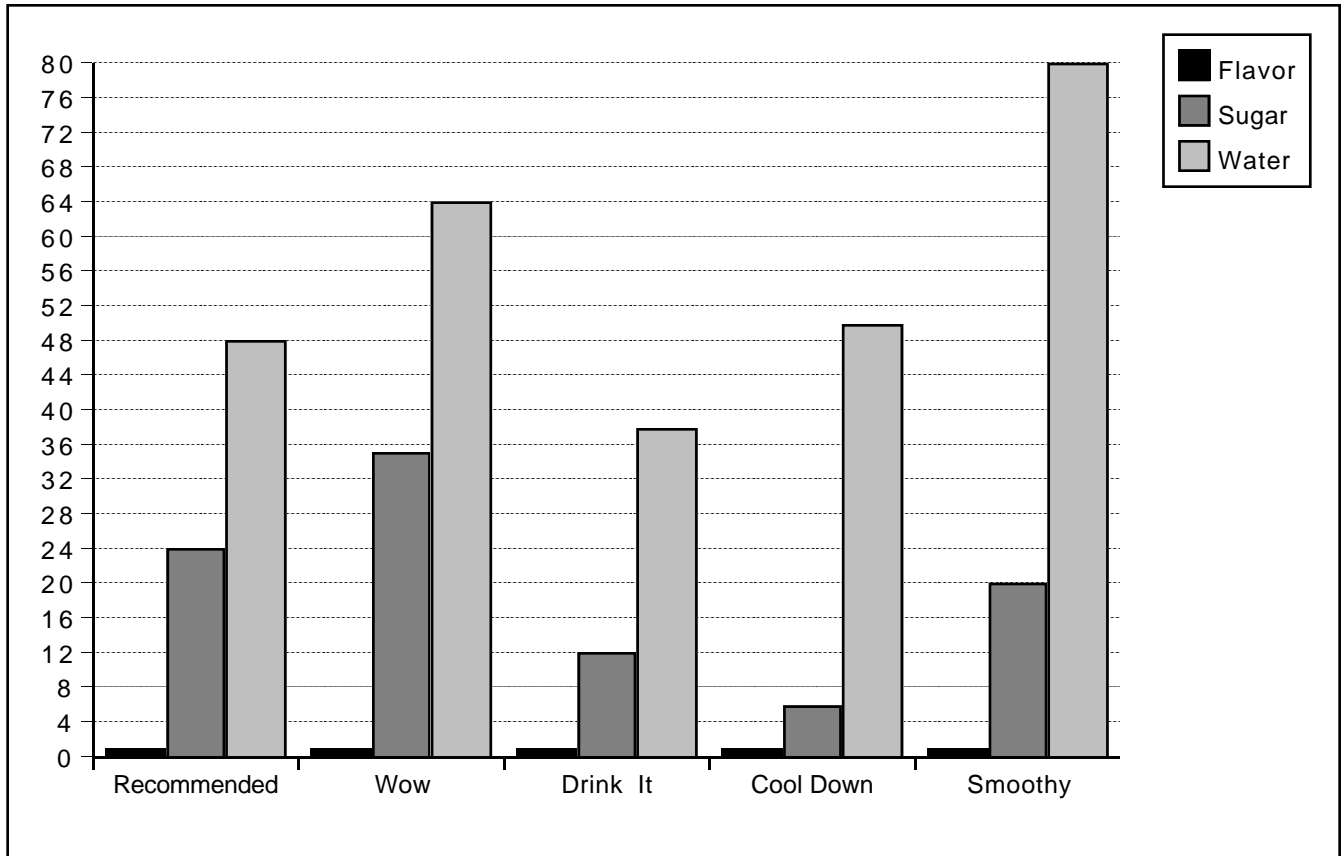
Flavor Units	Sugar Units	Water Units
1		
1		
1		
1		
1		
1		
1		

Calculate a 5 flavor unit mix for your best formula to be used in the taste test. Each measure should be 5 times the best mix.

Flavor Units	Sugar Units	Water Units
5		



# Product Review



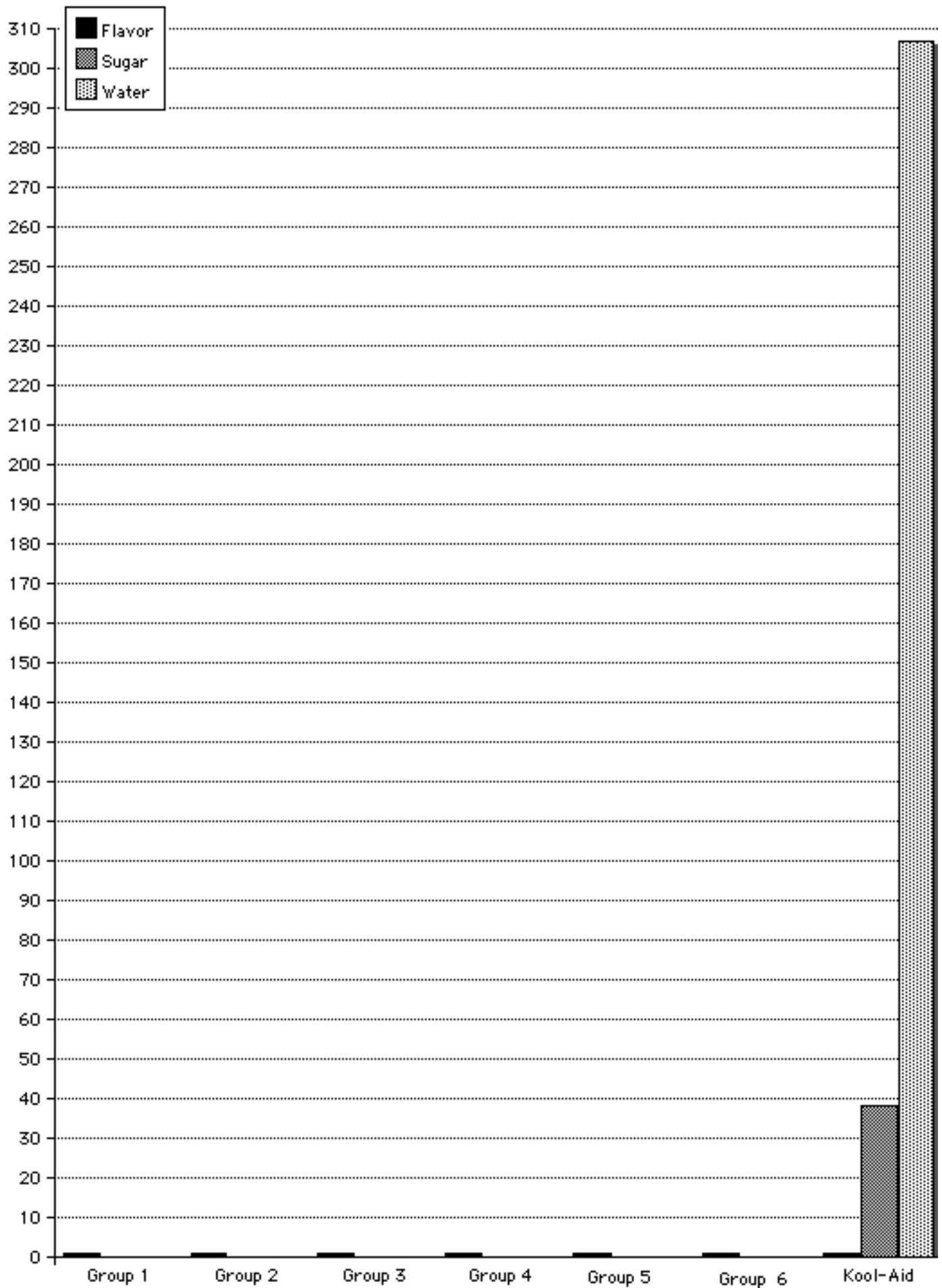
Comment on how each mix would taste compared to the recommended mix.

Wow

Drink It

Cool Down

Smoothy



# Candy

## Formula Chart

You have been assigned the job of finding the best formula for making gummy candy. The company knows the ingredients, but does not know how to mix them. You are to experiment with the material to find the correct proportions. We have provided you with a chart to collect data and have listed some ideas of different mixes. Start with those mixes and continue experimenting with ideas of your own. Always soften the gelatine with hot water before you mix the candy.

### Gel Mix

### Candy Flavor Mix

Water	Gel	Juice	Results
1	1	10	
2	1	12	
3	1	15	

### BEST MIX

#### Gel Mix

#### Candy Flavor Mix

Water	Gel	Juice

# Shades of Goo

You have been assigned the job of coloring goo. You will mix the goo using the 1/4 measuring spoon.

Remember to mix the glue and water first.

Measure	Water	Glue	Borax
1/4 tsp	1	1	1

Question 1: When do you add the color? \_\_\_\_\_

\_\_\_\_\_

Try it. Did it work? \_\_\_\_\_

Question 2: How much color is needed to make pink goo? \_\_\_\_\_

\_\_\_\_\_

Try it. Did it work? \_\_\_\_\_

Question 3: How much color is needed to make red goo? \_\_\_\_\_

\_\_\_\_\_

Try it. Did it work? \_\_\_\_\_

Question 3: How do you make rainbow goo? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Try it. Did it work? \_\_\_\_\_



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