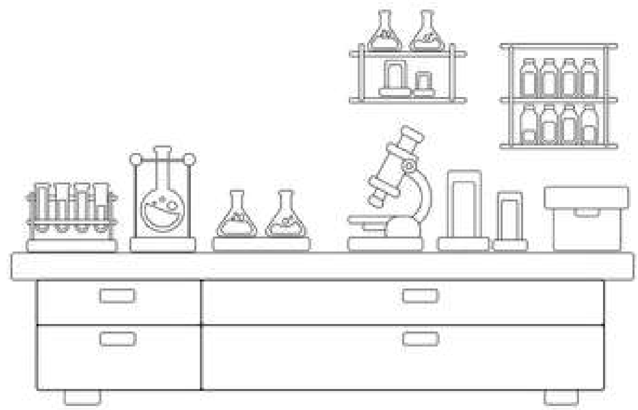
NAME: ________________________________

Vitamin C Project

Lab Safety



Welcome to the science lab, where the magic of discovery happens! In this special space, scientists conduct experiments to explore and understand the world around us. The lab is a place for hands-on learning, where we **observe**, **measure**, and **analyze** everything from tiny particles to the vastness of outer space.

To make the most of your time in the lab, remember these key behaviors: **safety first**—always follow safety guidelines:

- Listen and follow instructions carefully;
- Practice teamwork with your lab partners;
- Keep the lab clean and organized;
- Stay quiet and focused during experiments;
- Resist the temptation to eat anything, even if it looks yummy;
- Never play with the lab chairs;
- Remember to keep your safety glasses and lab coat on
- Keep your hair tied back.

And now, for a bit of humor to help you remember what not to do: picture trying to conduct an experiment while wearing a lab coat backward, with your safety goggles perched on your forehead like a headband, all while attempting to snack on a suspicious-looking substance! While these examples might sound amusing, they highlight the importance of staying focused, following safety protocols, and keeping distractions at bay in the lab. **So, put on your lab coat, embrace your inner scientist, and get ready for an exciting journey of exploration and discovery!**

Figure 1: Disaster in the lab!!!!

Look closely at the picture above. Can you find at least 10 mistakes these students are making?

1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

Determining Independent and Dependent Variables in an Experiment

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In a science lab, understanding dependent and independent variables is like being a detective solving a mystery. **The independent variable** is the investigator – it's the one we change or control to see what happens. For example, if we want to know how sunlight affects plant growth, sunlight is our independent variable because we can adjust or change it. On the other hand, **the dependent variable** is like the clue we're investigating – it's what we **observe and measure** to see how the independent variable affects it. In the plant growth experiment, the height of the plants would be our dependent variable since it depends on the amount of sunlight they receive. So, by carefully choosing and observing these variables, we become science detectives, uncovering the connections and solving the mysteries of the natural world!

<u>Practice:</u>

Scenario 1: Growing Mold on Bread

In this experiment, you want to investigate how varying levels of moisture affect the growth of mold on bread. By controlling the amount of moisture , you can observe and measure the resulting mold growth. It's like playing detective with different clues to understand the conditions mold prefers!

- Independent Variable: ____
- Dependent Variable: ____

Scenario 2: Dissolving Sugar in Water

In this sweet experiment, you're curious about how the temperature of water affects the speed of sugar dissolving. Adjusting the water's temperature allows you to measure and observe the time it takes for sugar to completely dissolve. It's like exploring a mystery in your own sugar-filled laboratory!

- Independent Variable: ____
- Dependent Variable: ____

Scenario 3: Planting Seeds in Different Soils
Imagine you're a detective studying how different soils influence plant growth. By using various types of soil, you can keep an eye on the height of the growing plants. It's a green investigation into the best soil for your little plant detectives to thrive!

- Independent Variable: ____
- Dependent Variable: ____

Making Observations To Spot Chemical Changes

In the exciting world of science, we often encounter **changes** in matter, and two types stand out: **chemical changes** and **physical changes**. Imagine you have a delicious piece of toast – spreading butter on it is a physical change because the bread's appearance changes, but it's still bread. Now, picture mixing baking soda and vinegar to create fizzing bubbles. This is a chemical change!

Chemical changes happen when new substances are formed, like when ingredients combine to make a cake. To spot physical changes, think about alterations in size, shape, or state of matter (solid, liquid gas) without forming something entirely new. For instance, imagine breaking a chocolate bar into smaller pieces – it's still chocolate but in a different shape.

So, keep your eyes wide open during kitchen adventures or other everyday activities, and you'll be a keen observer of the fascinating differences between chemical and physical changes!

Can you think of three more chemical and physical changes?

Chemical Change	Physical Change

There are 5 questions you can ask yourself to help determine if a chemical change is taking place:

Question	Example
Did it fizz or bubble?	An excellent example is dropping a Mentos candy into a bottle of soda. The rapid fizzing and bubbling occur because of a chemical reaction between the carbon dioxide in the soda and the surface of the Mentos.
Did it change colour?	Think about when an apple turns brown after being sliced; this color change suggests a chemical reaction with the air.
Was there heat released or absorbed?	Burning wood is a great example – it not only changes color but also produces heat, showing that a chemical reaction is occurring.
Has a new substance been produced?	Think about the process of baking a cake. When you mix flour, eggs, sugar, and baking powder, a delicious cake batter is formed. As you bake it, it transforms into a fluffy and scrumptious cake.
Was there a change in smell?	Consider the process of food rotting, such as a piece of fruit left uneaten for too long. Rotting fruit releases distinct and often unpleasant odors.

Read each scenario. Decide whether a physical or chemical change has occurred and give evidence for your decision.

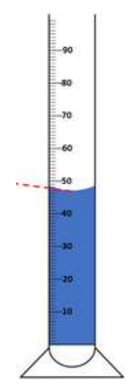
	Scenario	Physical or chemical change?	Evidence…
1.	You want to make popcorn. You put a bag in the microwave for 2 minutes and POP POP POP! The bag is now full of delicious popcorn, ready to eat.		
2.	You want to put butter on your popcorn so you melt some in the microwave. The solid butter is now liquid. YUM!		
3.	In a firework show, fireworks explode and give off heat and light of all colours.		
4.	In science class your teacher shows you how to make a volcano erupt by adding vinegar and baking soda. Lots of bubbles are produced		

Measuring Volume

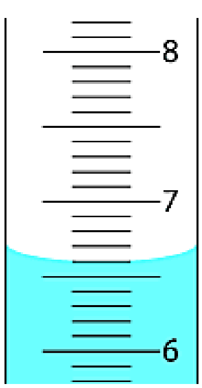
In the science lab, measuring volume is like using a special detective tool. We use tools such as **graduated cylinders** for liquids or rulers for solids to figure out how much space things take up. **Why is this important?** Well, it helps us be precise in our experiments, compare different substances, and keep track of our findings. Imagine making cookies without knowing how much flour to add – measurements in the lab are like our recipe for success, ensuring safety, accuracy, and lots of exciting discoveries!

A graduated cylinder is like a ruler for liquids! It is used to measure the VOLUME of a liquid. You will be using a graduated cylinder that measures volume in milliliters (mL). Did you know that a Stanley Cup can hold 1183 mL of liquid?

Scientists are very careful when they measure with a graduated cylinder. There are very special steps they need to take to read it properly. Look at the picture on the right, notice how the liquid is **curved.** This is called the **meniscus**. When recording the measurement you must always read the value from the lowest point of the meniscus.



Example:



1. Determine what each line represents.

From 6 mL to 7 mL is a change of 1 mL

There are 10 lines between 6 mL and 7 mL.

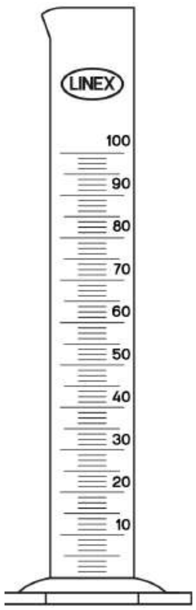
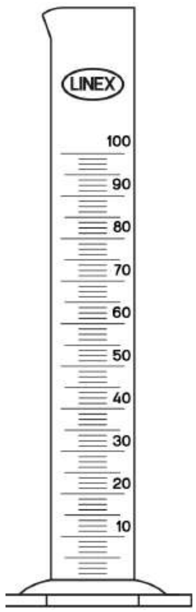
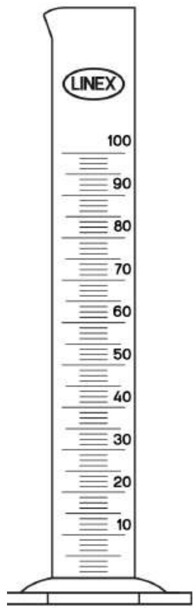
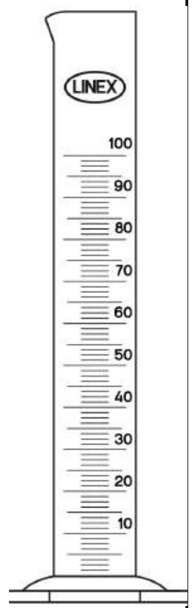
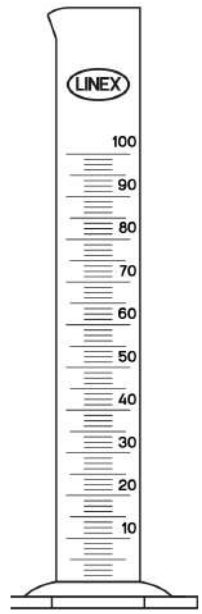
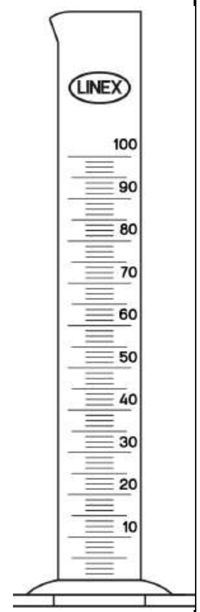
1mL ÷ 10 = 0.1 mL → each line is 0.1 mL

2. Count the number of lines the liquid reaches above 6 mL

The meniscus is 6 lines above the 6 mL mark.

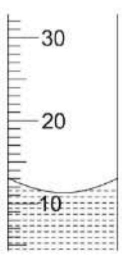
3. Volume reading: 6.6 mL

Time to practice in class!
6 graduated cylinders are set-up in the classroom, go to each station, draw what you see and then determine the volume.

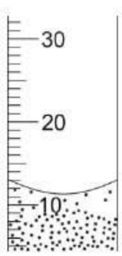
Station	A	B	C	D	E	F
Drawing						
Volume (mL)						

<u>More practice:</u> Write the volume beside each graduated cylinder:

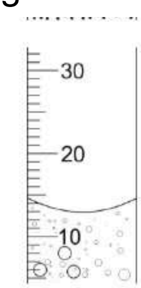
1. ______ ml



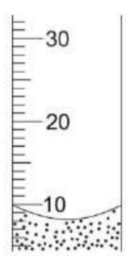
2. ______ ml



3. ______ ml



4. ________ ml



In the science lab, sometimes we choose to use a **disposable pipette** instead of a graduated cylinder. Why? Well, droppers are handy when we need to add small, precise amounts of liquids to our experiments. They're like the "mini chefs" of the lab, allowing us to carefully control the amount of a substance we're using. So, whether we're conducting intricate experiments or crafting precise mixtures, disposable droppers are our go-to helpers in the lab!

<u>Time to practice!!!</u>

<u>Procedure 1: Foming drops</u>

1. Obtain a beaker of water, a pipette and a graduated cylinder.
2. Put the tip of the pipette into the liquid. Pinch the bulb of the pipette, and slowly release the pressure. Make sure the tip is always in the liquid!
3. Watch the liquid get sucked up into the pipette.
4. Take the pipette of the liquid, but keep it above the beaker. Notice that the liquid stays in the pipette.
5. Slowly pinch the pipette bulb and try to release the liquid back into the beaker, drop-by-drop, adjusting pressure as needed.
6. Repeat steps 1-6 three times.

<u>Procedure 2: Determining the number of drops needed to transfer 1 mL</u>

1. Put the tip of the pipette into the liquid. Pinch the bulb of the pipette, and slowly release the pressure. Make sure the tip is always in the liquid!
2. Watch the liquid get sucked up into the pipette.
3. Take the pipette of the liquid, and move it over the 10 mL graduated cylinder.
4. Add one drop of water to the graduated cylinder at a time. Count the number of drops needed for the meniscus to reach 1 mL.
5. Record the number of drops in Data Table 1.
6. Empty the graduated cylinder back into the beaker.
7. Repeat steps 1-6 three times.

Data Table 1: Number of drops in 1 mL of water

	Trial 1	Trial 2	Trial 3
Number of drops			

Data Table 2: Determining the AVERAGE volume of 1 drop from the pipette using class data

Volume of liquid (mL)	Class average number of drops	Volume of one drop (mL)
1		

Calculations:

1. Class average number of drops:

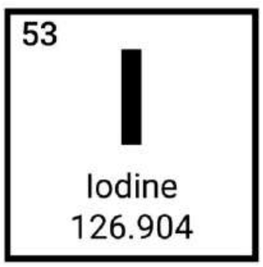
2. Volume of one drop:

Understanding the Chemicals: Vitamin C, Iodine and Starch

Vitamin C:

Vitamin C is a superhero nutrient that our bodies need to stay healthy. Also known as ascorbic acid, it helps our immune system fight off germs and keeps our skin, bones, and muscles in tip-top shape. You can find vitamin C in tasty fruits like oranges, strawberries, and kiwi. Imagine it as a shield that protects our bodies and keeps them strong. It's like having a tiny health guardian in every bite of these delicious fruits!

Iodine:



Iodine is a special element that our bodies need but can't make on their own. We get it from foods like seafood and iodized salt. This superhero element plays a crucial role in our thyroid gland, which is like the boss of our metabolism. Just like how a conductor guides an orchestra, iodine helps our thyroid keep our energy levels in harmony. Without enough iodine, our thyroid can't do its job properly, and we might feel tired or have trouble staying warm. So, thanks to iodine, we can keep our energy levels in tune!

Starch:

Starch is like the fuel our bodies need for energy. It's a complex carbohydrate found in foods like potatoes, rice, and pasta. Think of starch as tiny energy-packed soldiers that break down into sugars during digestion. These sugars provide the energy we need to play, learn, and grow. Just like filling up a car with gas before a long journey, our bodies store starch for when we need a burst of energy. So, the next time you enjoy a plate of spaghetti or a baked potato, remember that you're fueling your body with the power of starch!

Chemical reactions between Iodine & Starch; Iodine & Vitamin C

When iodine meets starch, it creates a magical transformation that we can actually see. Imagine starch as a blank canvas and iodine as a color-changing paint. When iodine mixes with starch, it turns into a deep blue or black color, creating a visible reaction. It's like a secret handshake between the two – only starch and iodine can create this unique color change.

On the other hand, vitamin C doesn't join this color-changing party. Iodine **prefers** to react with vitamin C, and will do so before even trying to react with starch. Unfortunately, when vitamin C encounters iodine, it doesn't cause any color change. That means that we won't be able to SEE evidence of the chemical reaction, but that doesn't mean it isn't happening!!

Make predictions:

Based on the reading above, predict what you would observe in each situation:

Situation	Prediction
Iodine is dropped on a potato.	
Iodine is dropped on an orange slice.	
Starch is added to orange juice. Then you add some iodine.	

Find evidence (in the lab):

Time it out, and see if your predictions are right!
Use the pipette to add 1-2 drops of iodine on/in each object or solution.

Test	Observations
Iodine + potato	
Iodine + starch solution	
Iodine + orange slice	
Iodine + vitamin C solution	
Iodine + starch solution + Vitamin C solution	

Determining which Orange Juice has more Vitamin C

Material:

- EmergenC solution
- Iodine solution (0.04%)
- Starch solution (1.0 %)
- Freshly squeezed orange juice
- Tropicana Orange juice (no pulp)
- Oasis - shelf stable - orange juice
- Beakers (3 for samples, 3 for tests, 3 for solutions)
- Graduated cylinder (3, 1 for each sample)
- Disposable pipette (3)

Safety reminders:

- Always wear gloves, goggles and a lab coat.
- Keep your hair tied at all times.
- Do not touch your face with your hands.
- Do not eat or drink in the lab.

Procedure 1:

1. Take the beaker with fresh orange juice. Slowly pour it into the graduated cylinder, until you reach 10 mL.
   If you go over, it is okay, pour some back in the beaker and try again!
2. Pour the 10 mL of orange juice into the **clean empty** beaker labeled “fresh orange juice”.
3. Use the pipette to collect some starch solution. Add an entire pipette full of starch solution into the 10 mL of fresh orange juice. Put the pipette back into the starch solution beaker.
4. Use a clean pipette to collect some iodine solution.
5. SLOWLY add one drop at a time of iodine solution into the starch and orange juice beaker. Make sure to count every drop! Lightly swirl the beaker to make sure everything is mixing.
6. Stop adding iodine solution when you observe a **complete** colour change. *If the colour disappears after the solution is swirled, keep adding iodine!*
7. Record the number of drops added in the data table.
8. Repeat steps 1-7 with the next orange juice sample.

Procedure 2: Reversing the colour change

1. Fill a pipette with EmergenC solution.
2. Add drops of EmergenC solution to the now-blue-fresh orange juice. (no need to count the drops this time)
3. Swirl the beaker. Keep adding the EmergenC solution until you observe a complete colour change.

Data Table 1: Number of drops needed to fully react all the vitamin C

Type of orange juice	Number of drops added	Colour observed
Fresh Orange Juice		
Tropicana (no pulp)		
Oasis - stable shelf life		

Data Table 2: Class averages

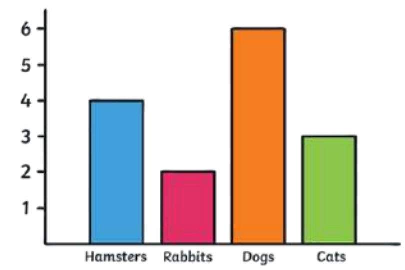
Type of orange juice	Average number of drops added
Fresh Orange Juice	
Tropicana (no pulp)	
Oasis - stable shelf life	

Calculation:

1. Average number of drops added:

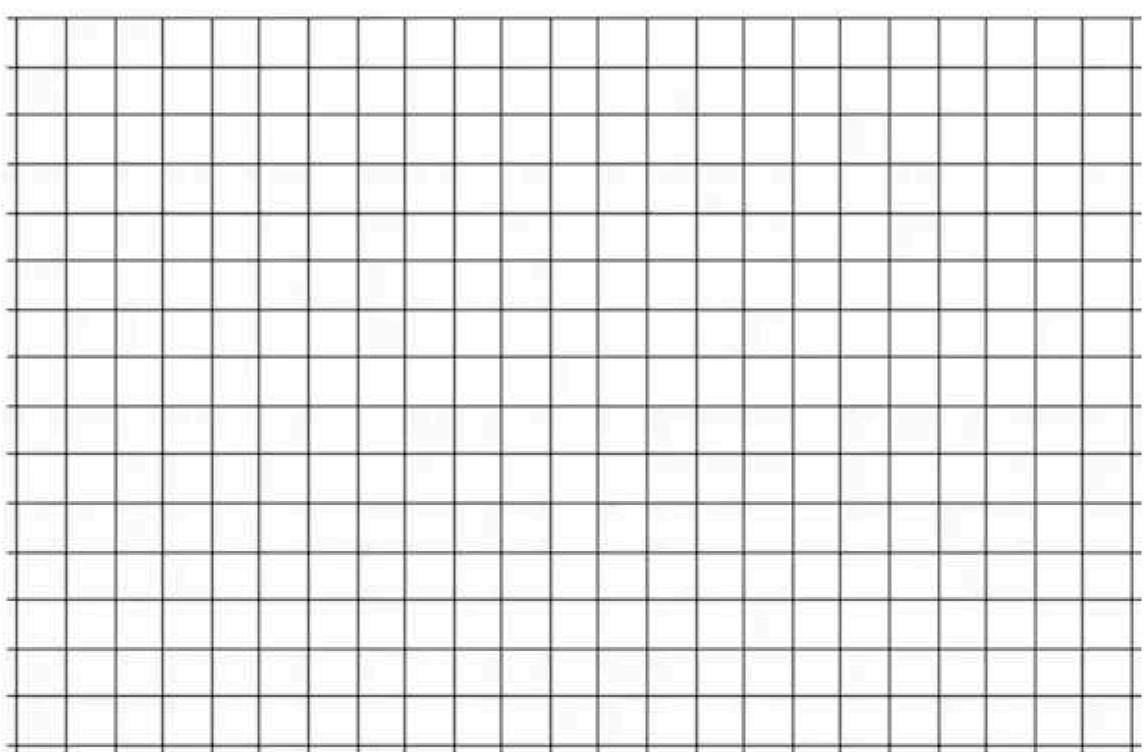
Graphical Representation of Data

Graphs are like magical storytellers that help us understand and share information in a much clearer way. Imagine you have a bunch of numbers or data about how many books different students read each month. Instead of just listing the numbers, you can use a graph to show this information visually.



Graphs, like bar graphs or line graphs, make it easy to see patterns, trends, and comparisons between different sets of data. They turn numbers into pictures, helping us spot the most and least popular months for reading at a glance. So, graphs are like friendly guides that turn boring data into colorful stories, making it easier for us to understand and share information with others!

Make a bar graph to represent the relationship between the average number of iodine drops added and the type of orange juice:



Analysis of Results and Learning

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1. **Explain 3 different ways you made sure you were being safe in the lab.**

   a. ____
   ____

   b. ____
   ____

   c. ____
   ____

2. **Determine the dependent and independent variables of the experiment you did.**

   Independent Variable:

   ____

   Dependent Variable:

   ____

3. **Did a chemical change occur in the experiment you did?**

   ____

   What evidence supports your claim?

   ____
   ____

4. **Why didn't the orange juice-starch solution turn blue right away when iodine was added.**

____

____

____

5. **Which type of orange juice had the most vitamin C?**
   Claim: ____

   Evidence: ____

   ____

   ____

   Reasoning: ____

   ____

   ____

6. **What was your favourite part of this project?**

____

____

____