Name_____Date of Data Collection_____

Class Period _____ Lab Days/Period_____ Teacher_____

Safety in the Biology Laboratory

New York State Learning Standards Annotation: MST 1, KI 2, 2.2a, 2.3a, 3.1a; MST 4, KI 6, 6.1a; Appendix A

Background: If there is one thing that can ruin a biology laboratory experiment or experience, it is the simple act of an accident or incident affecting a student, class, or the entire school. As such, there are certain rules and regulations that MUST be followed to ensure that everyone and everything remains safe. Completing the laboratory is a good way to make yourself aware of the hazards that may exist and be proactive with respect to your well-being and the safety of your fellow students.

Purpose: The purpose of this laboratory experience is:

-to make certain you know and agree to follow the rules and regulations that help keep the biology laboratory a safe place to work and gain knowledge.

-to identify hazards and to implement a plan to react and respond to a hazardous condition if it presents itself.

-to agree with your teacher and your school that you will make your laboratory experience a positive learning time where you can gain valuable knowledge that supports the classroom curriculum.

-to agree that you will complete the 1,200 minutes of lab as well as the required New York State Education Department's mandated laboratory experiences in a timely fashion.

Materials: The following materials are needed to complete this laboratory experience:

lab papers pencil, pens

Procedure: The following procedure is utilized to perform this experience:

1. General Rules: After each of these rules, initial in the space provided to show that you have read and understand the rule.
2. Lab Safety Symbols: Identify each of the laboratory safety symbols. Initial in the appropriate space to indicate that you understand are willing to take the appropriate precautions when working with these materials.
3. Lab Completion Agreement: Read and sign, and have your parent or guardian read or sign, the attached laboratory completion agreement. Initial each appropriate space where indicated.

Lab Safety Dos and Don’ts for Students

Use this handy checklist to acquaint students with safety dos and don’ts in the laboratory.

Conduct

- Do not engage in practical jokes or boisterous conduct in the laboratory.
- Never run in the laboratory.
- The use of personal audio or video equipment is prohibited in the laboratory.
- The performance of unauthorized experiments is strictly forbidden.
- Do not sit on laboratory benches.

General Work Procedure

- Know emergency procedures.
- Never work in the laboratory without the supervision of an instructor.
- Always perform the experiments or work precisely as directed by your instructor.
- Immediately report any spills, accidents, or injuries to your instructor.
- Never leave experiments while in progress.
- Never attempt to catch a falling object.
- Be careful when handling hot glassware and apparatus in the laboratory. Hot glassware looks just like cold glassware.
- Never point the open end of a test tube containing a substance at yourself or others.
- Never fill a pipette using mouth suction. Always use a pipetting device.
- Make sure no flammable solvents are in the surrounding area when lighting a flame.
- Do not leave lit Bunsen burners unattended.
- Turn off all heating apparatus, gas valves, and water faucets when not in use.
- Do not remove any equipment or chemicals from the laboratory.
- Store coats, bags, and other personal items in designated areas.
- Notify your instructor of any sensitivities that you may have to particular chemicals.
- Keep the floor clear of all objects (e.g., ice, small objects, spilled liquids).

Housekeeping

- Keep work area neat and free of any unnecessary objects.
- Thoroughly clean your laboratory work space at the end of the laboratory session.
- Do not block the sink drains with debris.
- Never block access to exits or emergency equipment.
- Inspect all equipment for damage (cracks, defects, etc.) prior to use—do not use damaged equipment.
- Never pour chemical waste into sink drains or wastebaskets.
- Place chemical waste in appropriately labeled waste containers.
- Properly dispose of broken glassware and other sharp objects (e.g., syringe needles) immediately in designated containers.
- Properly dispose of weigh boats, gloves, filter paper, and paper towels in the laboratory.

Apparel in the Laboratory

- Always wear appropriate eye protection (i.e., chemical splash goggles) in the laboratory.
- Wear disposable gloves, as provided in the laboratory, when handling hazardous materials. Remove the gloves before exiting the laboratory.
- Wear a full-length, long-sleeved laboratory coat or chemical-resistant apron.
- Wear shoes that adequately cover the whole foot. Low-heeled shoes with non-slip soles are preferable. Do not wear sandals, open-toed shoes, open-backed shoes, or high-heeled shoes.
- Avoid wearing shirts exposing the torso, shorts, or short skirts; long pants that completely cover the legs are preferable.

- Secure long hair and loose clothing (especially loose long sleeves, neck ties, or scarves).
- Remove jewelry (especially dangling jewelry).
- Synthetic fingernails, which are made of extremely flammable polymers, are not recommended in the laboratory.

Hygiene Practices

- Keep your hands away from your face, eyes, mouth, and body while using chemicals.
- Food and drink, open or closed, should never be brought into the laboratory or chemical storage area.
- Never use laboratory glassware for eating or drinking purposes.
- Do not apply cosmetics while in the laboratory or storage area.
- Wash hands after removing gloves and before leaving the laboratory.
- Remove any protective equipment (i.e., gloves, lab coat or apron, chemical splash goggles) before leaving the laboratory.

Emergency Procedure

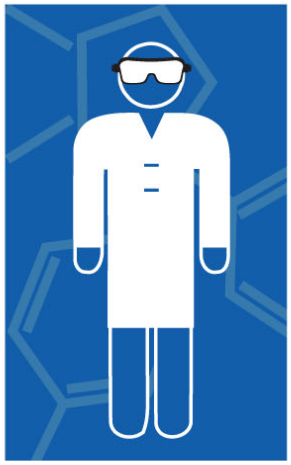
- Know the location of all the exits in the laboratory and building.
- Know the location of the emergency phone.
- Know the location of and know how to operate the following:
    - Fire extinguishers
    - Alarm systems with pull stations
    - Fire blankets
    - Eye washes
    - First aid kits
    - Deluge safety showers
- In case of an emergency or accident, follow the established emergency plan as explained by the teacher and evacuate the building via the nearest exit.

Chemical Handling

- Check the label to verify it is the correct substance before using it.
- Wear appropriate chemical resistant gloves before handling chemicals. Gloves are not universally protective against all chemicals.
- If you transfer chemicals from their original containers, label chemical containers with the contents, concentration, hazard, date, and your initials.
- Always use a spatula or scoopula to remove a solid reagent from a container.
- Do not directly touch any chemical with your hands.
- Never use a metal spatula when working with peroxides. Metals will decompose explosively.
- Hold containers away from the body when transferring a chemical or solution from one container to another.
- Use a hot water bath to heat flammable liquids. Never heat directly with a flame.
- Add concentrated acid to water slowly. Never add water to a concentrated acid.
- Weigh out or remove only the amount of chemical you need. Dispose of any excess in the appropriate waste container.
- Never touch, taste, or smell any reagents.
- Never place a container directly under your nose and inhale the vapors.
- Never mix or use chemicals not called for in the laboratory exercise.
- Use the laboratory chemical hood, if available, when there is a possibility of release of toxic chemical vapors, dust, or gases. When using a hood, keep the sash opening at a minimum to protect yourself and to ensure efficient operation of the hood. Keep your head and body outside of the hood face. Place chemicals and equipment at least six inches within the hood to ensure proper air flow.
- Clean up all spills properly and promptly.
- Dispose of chemicals as instructed.
- When transporting chemicals (especially 250 mL or more), place the immediate container in a secondary container or bucket (rubber, metal, or plastic) designed to be carried.

Name_____Date of Data Collection_____

Class Period _____ Lab Days/Period_____ Teacher_____



Lab Safety Rules

Science labs offer great opportunities for learning, teaching, and research. They also pose hazards that require proper safety precautions.

Stay safe when conducting your labs by following these guidelines.

Dress appropriately

Tie back long hair, and wear suitable gloves, goggles, and other protective equipment.

Proper supervision

Don't perform lab experiments without instructor supervision (unless given permission to do so).

Know location of emergency numbers & safety equipment

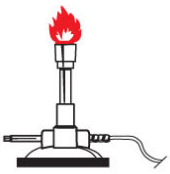
Know the location of safety equipment and emergency phone numbers (such as poison control) so you can access them quickly if necessary.

No food

Don't eat or drink in the lab—and never taste chemicals.

ID hazards

Identify hazardous materials before beginning labs.

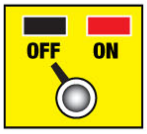


Be attentive

Be attentive while in the lab. Don't leave lit Bunsen burners unattended or leave an experiment in progress.

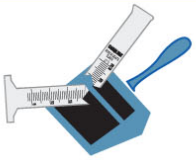
Be careful when handling hot glassware

Turn off all heating appliances when not in use. Keep flammable objects away from your workspace.



Keep a clean workspace

Don't obstruct work areas, floors, or exits. Keep coats, bags, and other personal items stored in designated areas away from the lab. Don't block sink drains with debris.



Handle glassware carefully

Properly dispose of anything that breaks. Report cuts, spills, and broken glass to your instructor immediately.

Clean up

After completing the lab, carefully clean your workspace and the equipment, and wash your hands.

Sources: Carolina Biological Supply Company. "Lab Safety Dos and Don'ts for Students." http://www.carolina.com/teacher-resources/Interactive/lab-safety-instructions/tr11076.tr.

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Name_____Date of Data Collection_____

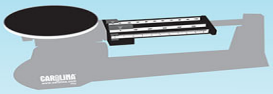
Class Period _____ Lab Days/Period_____ Teacher_____

Scientific Measurements

Mass

Mass is the amount of matter in an object.

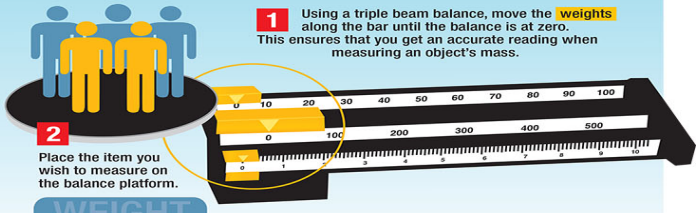
What do you use to measure mass, and what is the unit of measure?



You can measure mass using a **triple beam balance**, which is a mechanical device with a pan on one side (for holding the item) and a beam segmented into three parallel beams (each holding one weight) on the opposite side. The standard unit of measure for mass is the **kilogram**.

1 Kilogram	=	1,000 Grams

How to measure mass:



1. Using a triple beam balance, move the **weights** along the bar until the balance is at zero. This ensures that you get an accurate reading when measuring an object's mass.
2. Place the item you wish to measure on the balance platform.
3. Slide the **weights** along the scale until the scale is balanced at zero.
4. The resulting number plus the unit of measure (usually grams) is the object's mass.

Things to know:

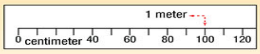
Although they sound similar, mass and weight are not the same. **Weight** measures the pull of gravity on an object. **Mass** measures the amount of matter in an object.

Length

Length is the distance from one point to another.

What do you use to measure it, and what's the unit of measure?

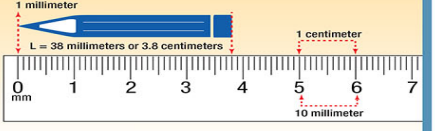
You can measure length using a **meter stick** or **metric ruler**, which is a straight-edged strip of wood marked off incrementally in centimeters and sometimes millimeters. The standard unit of measure for length is the **meter**.



1 Meter	=	100 Centimeters
1 Centimeter	=	10 Millimeters

How to measure length:

1. Place the object you wish to measure along the straight edge of a meter stick or metric ruler so that the object's edge is in line with the zero mark.



3. Note the point at which the object ends, and take your measurement here. The corresponding number and the unit of measure (centimeters, millimeters, etc.) is the length of the object.

Things to know:

Significant figures are the digits that contribute to the precision of a number. All nonzero numbers are significant figures, and all zeros in between nonzero numbers are significant. Because it shows more significant figures, a measuring stick divided into millimeters will be more precise and give more accurate measurements than a measuring stick divided into centimeters.

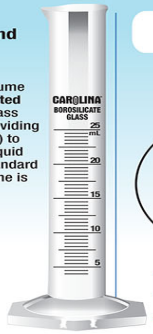
Volume

Volume is the amount of space an object takes up.

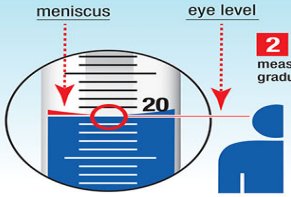
What do you use to measure volume, and what is the unit of measure?

You can measure the volume of liquids using a **graduated cylinder**—a plastic or glass container marked with dividing lines (usually by milliliter) to indicate the amount of liquid contained within. The standard unit of measure for volume is the **liter**.

1 Liter	=	1,000 Milliliters



How to measure volume:



1. Place a graduated cylinder on a flat surface.
2. Pour the liquid you wish to measure into the graduated cylinder.
3. Take a reading from the lowest point of the meniscus. If you're using a standard 100-mL cylinder, round your answer to the nearest milliliter. That number, plus the unit of measure, is the liquid's volume.

Things to know:

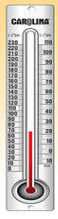
You can find a liquid's volume by locating the lowest point of the meniscus. The **meniscus** is the curved surface of liquid in a container, occurring as a result of the attractive force between the water molecules and glass.

Temperature

Temperature is how hot or cold an object is.

What do you use to measure temperature, and how is it measured?

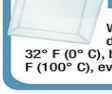
You can measure temperature using a thermometer, which is a glass tube containing a liquid (typically mercury) that rises and falls according to temperature changes. Temperature is measured in degrees **Fahrenheit (°F)** or, in the case of science, degrees **Celsius (°C)**.



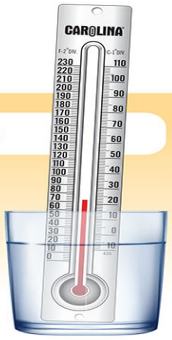
How to measure temperature:

Things to know:

1. Place the thermometer in the liquid or substance that you wish to measure.
2. Find the point at which the red line of the thermometer stops.



Water takes on different forms at different temperatures. It freezes at 32° F (0° C), becoming a solid, and boils at 212° F (100° C), evaporating and becoming a gas.



Sources:
- Purdue University Department of Chemistry. "Significant Figures." http://chemed.chem.purdue.edu/genchem/topicreview/bp/ch1/sigfigs.html.
- University of Illinois at Urbana-Champaign Department of Physics. "Q & A: How does water turn into a gas?" https://van.physics.illinois.edu/qa/listing.php?id=1516.
- University of South Carolina Aiken Department of Chemistry and Physics. "Significant Figures—Rules." http://www.usca.edu/chemistry/genchem/sigfig.htm.

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Class Period _____ Lab Days/Period_____ Teacher_____

How to Measure the Volume of Liquids

You have a cold.

The fast-acting cold medicine you need to take comes in liquid form. You pull out the bottle and read the instructions on the back to find the correct dosage: 20 mL.

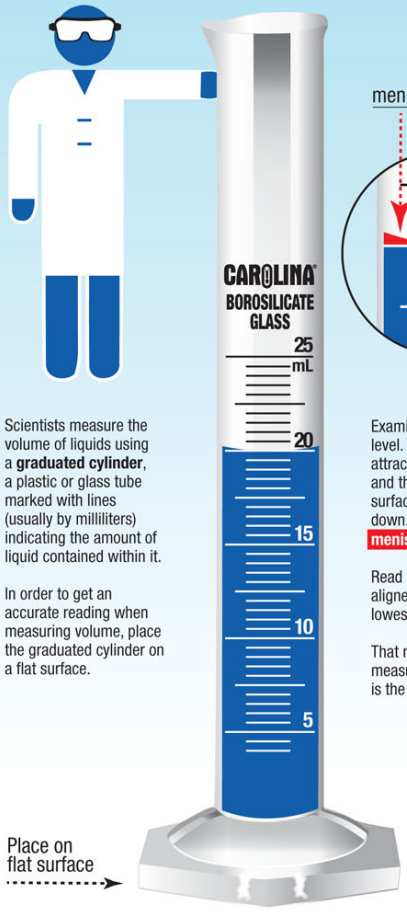
But the dosing cup is gone. How can you be sure you're getting the right amount?

By understanding a certain form of measurement:

volume.

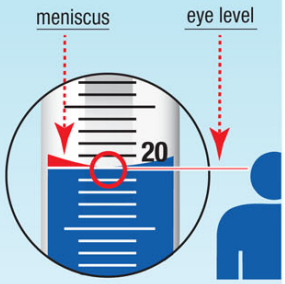
Volume is the amount of space occupied by a substance. The liter is the basic unit of volume in the metric system.

1	=	1,000
Liter		Milliliters



Scientists measure the volume of liquids using a **graduated cylinder**, a plastic or glass tube marked with lines (usually by milliliters) indicating the amount of liquid contained within it.

In order to get an accurate reading when measuring volume, place the graduated cylinder on a flat surface.



Examine the liquid at eye level. You'll see the force of attraction between the water and the glass causes the surface of the liquid to curve down. This curve is called the **meniscus**.

Read the numbered mark aligned with or below the lowest point of the curve.

That number, plus the unit of measure (usually milliliters), is the liquid's volume.

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Class Period _____ Lab Days/Period_____ Teacher_____

Lab Completion Agreement

For entry into a State Regents examination, a student must complete a minimum of 1200 minutes of hands-on laboratory with satisfactory lab reports **AS WELL AS** complete each of the four New York State Mandated Labs that have been or will be conducted throughout the academic year. Questions on the Regents Examination given in June will be geared towards the State Mandated Labs listed. Therefore, students MUST complete those labs. The lab reports must be kept on file for at least six months after the State Regents examination as per Commissioner's Regulation [100.5, (b)(7) (iv)(d)]. Therefore, it is CRUCIAL that your student make a concerted effort to get these lab assignments turned in for grading.

I hereby agree that I will:

1. Satisfactorily complete a minimum of 1200 minutes of laboratory time and the requisite paper documentation (lab reports) for each to be turned in and filed by my teacher.
2. I understand that it is the policy of the instructor to have students complete more than the required 1200 minutes and I will complete ALL laboratory experiments as result.
3. I will complete, in duplicate, all of the mandated laboratory experiences that the New York State Education Department provides for inclusion on the Regents Examination.
4. I understand that if at any point during the year that I fall behind in labs or become delinquent in the documentation of those labs that I will be assigned mandatory activity period detentions with my instructor until such time that I am caught up to date. My progress will be monitored by my instructor and it is at his/her discretion that I will be required to attend activity period detentions.
5. I understand it is the right of my parent or guardian to be kept updated on my laboratory performance
6. I understand that I must notify the teacher in writing ahead of time if there is a laboratory experiment that I cannot perform due to medical, social, religious, or philosophical condition or belief. I will also contact the principal ahead of time to discuss the matter and arrange for a mutually agreeable and comparable laboratory experience that reinforces the curriculum.
7. In the event that I am going to be absent for a period of time, I agree to stay during activity period upon returning to complete any laboratory experiments that I have missed.
8. I agree that I understand that all laboratory experiments must be satisfactorily turned in and completed no later than ten (10) days prior to the Regents Examination.
9. I agree that it is my responsibility to turn in all laboratory experiments in a timely manner. If I fail to complete them in a timeframe prescribed by the teacher, it is not the teacher's responsibility to run the laboratory at the end of the year for delinquent students.

Student Signature_____ Date_____

Parent/Guardian Signature_____ Date_____

Name_____Date of Data Collection_____

Class Period _____ Lab Days/Period_____ Teacher_____

Data: The following data was collected during this experience:

-No numerical data was collected.

Conclusion: The following can be concluded from performing this laboratory experience:

Why was this experience given to you?

_____

_____

_____

_____

What did you learn by completing this experience?

_____

_____

_____

_____

Describe a situation that could arise in lab. How would you respond to it?

_____

_____

_____

_____

Why is it crucial to stay up-to-date in lab and turn in your laboratory reports in a timely fasion?

_____

_____

_____

_____

Name_____Date of Data Collection_____

Class Period _____ Lab Days/Period_____ Teacher_____

Analysis Questions: Answer the following questions in the spaces provided:

It is crucial that you understand a few things about this classroom. As such,

1. How do you exit this room in case of a fire or fire drill? What if the entrance is blocked? Describe why each of the following parts of the evacuation procedure is crucial.

_____

_____

_____

_____

b. Why do you need to remain quiet?

c. Why do we stay together and travel as a group?

d. What should you do if you see something "wrong" during a fire drill?

e. When do you re-enter the building?

2. Describe at least three things that you would recognize as being hazards that could exist? What would you do about correcting the hazard?

_____

_____

_____

_____

Student Laboratory Safety Agreement

In order to conduct safe and effective laboratory activities, all students must follow proper laboratory procedures. Please initial each item and sign where indicated.

General Rules

1. Prepare for the lab by reading the instructions and safety information ahead of time. _____
2. Always pay attention to the work—don't fool around in the lab. No horseplay, pranks, or practical jokes. _____
3. Follow all verbal and written instructions given by the instructor. _____
4. Never work in the lab unsupervised or perform unauthorized or unapproved experiments. _____
5. Do not eat, drink, apply cosmetics, manipulate contact lenses, or chew gum in the lab. _____
6. Keep work areas tidy. Keep aisles and exits clear, and move backpacks, jackets, and other personal items out of the way of lab work. _____

Personal Safety

1. Approved eye protection must be properly worn at all times while you perform lab work. _____
2. Wear any additional safety equipment (aprons, gloves, etc.) as directed by the instructor. _____
3. Wear closed-toe shoes, tie back long hair, avoid loose or baggy clothing, and avoid short skirts or shorts while performing lab work. _____
4. Report all accidents, spills, or injuries to the instructor immediately. _____
5. Know the location of, and how to use, all classroom safety equipment. Know the location of the nearest exit. _____
6. Wash hands with soap and water after handling any laboratory materials. _____

Laboratory Safety

1. Consider all lab chemicals and specimens to be dangerous. Do not touch, smell, or taste any chemicals unless specifically instructed to do so. _____
2. Read the label on bottles carefully before using chemicals. Be sure you're using the correct chemical before removing it from the bottle. _____
3. Do not remove chemicals, specimens, equipment, or other supplies from the lab. _____
4. Follow proper procedures when operating a burner or other heat source. Always turn it off when not in use. _____
5. Do not handle broken glass with bare hands. Use a brush and dustpan to clean up broken glass and place in a designated glass disposal container. _____
6. Dispose of all waste materials only as directed by the instructor. _____

Do you have allergies or other medical conditions that your instructor should be aware of?

☐ Yes ☐ No

If yes, please describe.

_____

_____

_____

I have read and fully understand the rules, safety practices, and regulations governing my conduct in the science laboratory. I will abide by these rules to ensure my safety and the safety of all laboratory participants. I will follow all written and verbal instructions given by the instructor and ask questions if I do not understand a direction or procedure. I understand that violation of these rules may result in removal from the laboratory, removal from the science class, a lowered grade, or other consequences as determined by the instructor.

_____

Student Date

_____

Parent/Guardian Date

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Personal Safety

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2. Wear any additional safety equipment (aprons, gloves, etc.) as directed by the instructor. _____
3. Wear closed-toe shoes, tie back long hair, avoid loose or baggy clothing, and avoid short skirts or shorts while performing lab work. _____
4. Report all accidents, spills, or injuries to the instructor immediately. _____
5. Know the location of, and how to use, all classroom safety equipment. Know the location of the nearest exit. _____
6. Wash hands with soap and water after handling any laboratory materials. _____

Laboratory Safety

1. Consider all lab chemicals and specimens to be dangerous. Do not touch, smell, or taste any chemicals unless specifically instructed to do so. _____
2. Read the label on bottles carefully before using chemicals. Be sure you're using the correct chemical before removing it from the bottle. _____
3. Do not remove chemicals, specimens, equipment, or other supplies from the lab. _____
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5. Do not handle broken glass with bare hands. Use a brush and dustpan to clean up broken glass and place in a designated glass disposal container. _____
6. Dispose of all waste materials only as directed by the instructor. _____

Do you have allergies or other medical conditions that your instructor should be aware of?

☐ Yes ☐ No

If yes, please describe.

_____

_____

_____

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_____

Student Date

_____

Parent/Guardian Date

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