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# Science Lab Tools and Equipment

## Science Literacy Article

Scientists use many different types of lab tools and equipment during lab investigations. Therefore, when you test a question and gather data using various lab tools and equipment, in your science classroom, you are doing exactly what scientists do! Science lab tools are generally used for measuring and/or observing particular substances during a lab activity. Some equipment, known as safety equipment, is used for emergency situations that may occur in the lab. All lab tools and equipment have specific purposes and should always be used safely and properly while participating in lab activities.

Almost all lab activities require measuring and/or observing certain substances. Certain lab tools are designed for measuring substances and are used when you need to find and record specific measurements such as mass, volume, length, and force. Examples of lab tools used for measuring are triple beam balances (mass), graduated cylinders (volume), meter sticks (length), and spring scales (force). Some lab tools are designed for observing substances and are used when you need to record specific observations using your senses. Examples of lab tools used for observing are microscopes, hand lenses, watch glasses, and spot plates. Of course there are many other types of tools that can be used during a lab such as test tubes, tongs, thermometers, droppers, and Bunsen burners, to name a few. Lab tools help to gather important data required in order to thoroughly complete lab activities.

While conducting science lab activities there are four main types of safety equipment that can be used in case of emergency. These four pieces of safety equipment are a fire extinguisher, fire blanket, eye wash station, and safety shower. It is crucial to know the location and use of these pieces of safety equipment. A fire extinguisher is used to put out paper fires, trash fires, and larger fires. The nozzle of a fire extinguisher should always be aimed at the base of the flame while in use. It should never be sprayed on a person because it can cause skin and eye irritation, difficulty breathing, and other serious health concerns. A fire blanket is used to smother small fires by removing oxygen from the flame. A person can be wrapped in a fire blanket and rolled to help smother a clothing fire. The eye wash station is used to flush the eyes with water due to a chemical splash or foreign object causing harm. You should flush your eyes with water at the eye wash station for at least 15-20 minutes while keeping your eyes open and rolling them in all directions. The safety shower is used to wash off large chemical spills on the body or clothing. If you spill a large amount of chemicals onto yourself, you should go directly to the safety shower, pull the handle, and completely rinse the harmful substances off of your body. Your teacher will likely review the location and use of specific safety equipment during particular lab activities.

As you have read, it is necessary to know the purpose of specific lab tools and equipment and how to safely and properly use them. It is important to remember that some lab tools and equipment are very expensive, so they must be always handled carefully. Using different lab tools and equipment during lab activities can be exciting and fun, but it also requires great responsibility!

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# Lab Tools and Equipment Question Companion

For 1-5, choose the best answer.

1. Why should you know the location of safety equipment in the classroom?
   a. You should know the location so you can answer questions about them on a test.
   b. You should know the location so you can find them quickly in an emergency.
   c. You should know the location so you can tell others where they go during clean up.
   d. You should know the location so you can order replacements when they expire.

2. What would rulers, electronic scales, and beakers be useful for?
   a. Following all safety rules in the lab.
   b. Observing the chemical properties of substances.
   c. Measuring the mass, length, and volume of substances.
   d. Performing experiments in the lab.

3. How long should you flush your eyes at the eye wash station?
   a. 5-10 minutes
   b. 10-15 minutes
   c. 15-20 minutes
   d. 20-25 minutes

4. Which of the following is a way that lab tools help scientists?
   a. Lab tools help scientists measure substances.
   b. Lab tools help scientists observe substances.
   c. Lab tools help scientists interact with substances.
   d. All of the answers are correct.

5. True or False: Fire extinguishers may be used on a person if they catch fire.
   a. True
   b. False

Fill in the blank(s) with the correct answer for 6-9.

6. A _____ _____ is used to smother small fires on/in objects or on a person.

7. A _____ is a lab tool that helps you see tiny organisms up close.

8. Lab tools help scientists _____ _____ during lab experiments.

9. A _____ _____ is used to rinse off large amounts of chemicals on a person or chemical.

10. Draw a map of your classroom below and label at least 4 safety equipment items.

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# Scientific Method

## Science Literacy Article

It is important to follow an organized set of steps when conducting a scientific investigation. The scientific method is a process of problem solving that is used to explore an observation by gathering and examining evidence in order to answer a question. The main steps of the scientific method include observation, problem, hypothesis, experiment, data and results, and conclusion. Each of these parts of the scientific method help to make problem solving more focused, detailed, and reliable.

The first step of the scientific method is making an observation. An observation is information obtained by using your senses. We make observations every day about the world around us. Many times these observations can be puzzling if it is not known how or why they happen. For example, you notice that your friend's paper airplane flies much farther than yours, but you are not exactly sure why. This curiosity naturally leads to forming a question about your observation.

The next step of the scientific method is identifying a problem. The problem is the question you want answered due to your specific observation. In order to be able to conduct an investigation, the problem must be testable or measureable. It is generally asked in a "who, what, when, where, why, or how" format. It is also important to research any previously discovered information which allows you to then reshape your problem if necessary. For example, "How will the mass of a paper airplane affect the distance it can fly?"

After a problem has been identified, the next step of the scientific method is creating a hypothesis. A hypothesis is a statement about what is expected to happen in the investigation. It must be an explanation or prediction that can also be tested or measured. Generally a hypothesis is written as an "if...then" statement. For example, "If I add mass to a paper airplane, then the airplane will fly a greater distance."

In order to test a hypothesis, the next step of the scientific method is the experiment. The experiment contains a procedure which is a detailed set of organized steps to follow. The steps of the procedure must always be followed in the correct order and you should never skip a step. Experiments should also have three different types of variables. The independent variable is the one factor you manipulate or change in the experiment (i.e. the mass of the paper airplane). The dependent variable is the factor you measure based on how it responds to the independent variable (i.e. the distance the paper airplane flies). The controlled variables are all of the other factors that remain exactly the same each time during an experiment (i.e. the type of paper used, the location within the room, the amount of force used to throw the paper airplane, etc.). A good experiment will require multiple trials of testing which allows the data and results to be more reliable.

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The next step of the scientific method is analyzing the data and results. This is the information that was collected during an experiment. The data and results are often displayed on a data table or graph in order to make the information collected much easier to view and interpret. Some common examples of visuals used to display the data and results include bar graphs, line graphs, pie charts, and spreadsheets.

The final step of the scientific method is the conclusion. It is the final summary of the data and results obtained from the investigation. The conclusion determines if the hypothesis was accurate or not. Whether a conclusion accepts or rejects a hypothesis, multiple experiment trials are always still needed in order to accurately confirm the results and prevent any unreliable data. The entire process of the scientific method will start over again if you choose to construct a new hypothesis or prediction based on the results of your experiment.

As you have read, the scientific method is a necessary process to follow during scientific investigations. It helps to minimize bias while providing an objective view during experimentation. If all of the steps of the scientific method are followed correctly, accurate and reliable results are able to be obtained and duplicated by scientists everywhere!

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# Scientific Method Question Companion

For 1-5, choose the best answer.

1. Which of the choices below could be a scientific problem?
   a. Tomato plants require 8 hours of direct sunlight to thrive.
   b. Plant a tomato seedling 6 inches deep a large pot.
   c. If tomato plants receive 4 hours of direct sunlight, then they will thrive.
   d. How much sunlight do tomato plants need to thrive?

2. What do we call the organized steps taken to answer a scientific problem?
   a. Observation
   b. Conclusion
   c. Experiment
   d. Data Analysis

3. What is one way that scientists ensure reliability in their experiments?
   a. Scientists can perform the experiment before making a hypothesis to ensure they are correct.
   b. Scientists make sure to only use the highest quality tools.
   c. Scientists can run multiple trials of the experiment to verify the results.
   d. Scientists run the experiment only once so they don't get too much data.

4. Which of the following could be the hypothesis in an experiment?
   a. Place 25 mL of baking soda into a beaker with 50 mL of vinegar.
   b. If you add baking soda to vinegar, then a chemical reaction will occur.
   c. Baking soda and vinegar react chemically, as evidenced by the bubbles formed when they are combined.
   d. What happens when you add baking soda to vinegar?

5. True or False: If the hypothesis of an experiment needs to be changed, then the scientific method must be started over again to ensure that the experiment aligns with the prediction.
   a. True
   b. False

Fill in the blank(s) with the correct answer for 6-9.

6. The _____ wraps up the experiment and determines the accuracy of the hypothesis.

7. The _____ _____ is process of problem solving used by scientists all over the world to complete inquiries about the world around them.

8. Bar graphs, line graphs, tables, and charts are all ways that scientists _____ data.

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9. If you have ever looked around you and thought about the way things work, you have made a(n) _____.

10. You set up an experiment to determine the conditions needed to form the gemstones with the most clarity. You gather data from 5 different mines located around the globe, making sure to choose locations that have similar underground temperatures but different soil compositions. You discover that the minerals in the water in these locations is what determines gem clarity, Identify the independent, dependent, and controlled variables in this experiment below.

| **Variable** | **In This Experiment** |
|---|---|
| Independent | |
| Dependent | |
| Controlled | |

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