

1-4 Tools and Procedures



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1-4 Tools and Procedures ➔ A Common Measurement System



What measurement system do most scientists use?

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1-4 Tools and Procedures ➔ A Common Measurement System

A Common Measurement System

Scientists need a common system of measurements in order to replicate each other's experiments.

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Most scientists use the metric system when collecting data and performing experiments.

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1-4 Tools and Procedures ➔ A Common Measurement System

The metric system is a decimal system of measurement whose units are based on certain physical standards and are scaled on multiples of 10. Because the metric system is based on multiples of 10, it is easy to use.

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1-4 Tools and Procedures ➔ A Common Measurement System

A revised version of the original metric system is called the International System of Units, or SI.

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Common Metric Units

Length	Mass
1 meter (m) = 100 centimeters (cm) 1 meter = 1000 millimeters (mm) 1000 meters = 1 kilometer (km)	1 kilogram (kg) = 1000 grams (g) 1 gram = 1000 milligrams (mg) 1000 kilograms = 1 metric ton (t)
Volume	Temperature
1 liter (L) = 1000 milliliters (mL) 1 liter = 1000 cubic centimeters (cm ³)	0°C = freezing point of water 100°C = boiling point of water

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Analyzing Biological Data

Scientists collect data to find out whether certain factors change or remain the same.

Often, the simplest way to do that is to record the data in a table and then make a graph.

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Computers help scientists to gather, analyze, and present large quantities of data.

Analyses of data are used to make predictions about complex phenomena.

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Laboratory Techniques

Cell Cultures

To obtain enough material to study, biologists sometimes place a single cell into a dish containing a nutrient solution.

The cell is able to reproduce so that a group of cells, called a **cell culture**, develops from the single original cell.

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Cell cultures can be used to:

- test cell responses under controlled conditions
- study interactions between cells
- select specific cells for further study

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Cell Fractionation

Biologists often use a technique known as **cell fractionation** to separate the different cell parts.

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Cells are broken into pieces in a special blender.

The broken cell bits are added to a liquid and placed in a tube.

The tube is inserted into a centrifuge that spins, causing the cell parts to separate, with the most dense parts settling near the bottom of the tube.

A biologist can then remove the specific part of the cell to be studied by selecting the appropriate layer.

Working Safely in Biology

Scientists working in a laboratory or in the field are trained to use safe procedures.

Laboratory work may involve contact with dangerous materials or organisms.

Follow safe practices.

- Study the safety rules.
- Read all the steps and safety precautions.
- Follow your teacher's instructions and textbook directions exactly.
- If in doubt, ask your teacher for an explanation.
- Wash your hands thoroughly with soap and warm water after every scientific activity.

Remember you are responsible for your own safety as well as that of your teacher, classmates, and any live animals you handle.

1-4 Section QUIZ

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Section QUIZ

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1-4 Section QUIZ

- 1 A single measurement system is commonly used in science because
- A a. it allows scientists to easily replicate one another's experiments.
- b. basic units of mass, length, and volume are unrelated to one another.
- c. more kinds of measurements can be made.
- d. computers can store large amounts of scientific data.



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- 3 A device that separates cell parts is a
- A a. centrifuge.
- b. cell culture.
- c. light microscope.
- d. electron microscope.



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- 4 A technique in which cells are grown in a nutrient solution is known as
- a. staining.
- b. cell fractionation.
- A c. cell culturing.
- d. cell fertilizing.



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- 5 When you work in a biology laboratory situation, your first priority should be to
- a. make sure all materials are available.
- b. modify any instructions that do not make sense.
- A c. familiarize yourself with all safety rules before beginning to work.
- d. know ahead of time what kinds of results to expect.



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END OF SECTION