Edgenuity

Warm-Up | Tools, Technology, and Measurement

Lesson Objectives

- Select and use appropriate tools to perform _____ and collect data.
- Select and use appropriate technology such as _____ and graphing calculators to gather, analyze, interpret, and display data.
- Use the SI system of measurement to convert between _____ and metric, and metric and metric, and to recognize approximate representations of measurement.

Science Practice: Use technology to display data in tables and graphs, and use the graphical representations to interpret the data.

Words to Know

Fill in this table as you work through the lesson. You may also use the glossary to help you.

balance	a tool used to measure _____
beaker	a wide-mouthed tool used to hold liquids and measure _____ of a liquid
buret	a tall _____ tool used to deliver a specific volume of liquid
degree Celsius	a _____ scientific unit of temperature used with SI
graduated cylinder	a tall cylindrical tool used to measure _____ of a liquid

© Edgenuity, Inc.

Warm-Up | Tools, Technology, and Measurement

Words to Know

kelvin	the [ ] unit for temperature
kilogram	the SI [ ] for mass
liter	a common [ ] unit of volume used with SI
meter	the SI unit for [ ]
pipette	a thin cylindrical tool used to measure small and/or very precise volumes of a [ ]
probeware	a [ ] or electronic device used to collect data
ruler	a tool used to [ ] distance
SI	International [ ] of Units; standard set of units used by all scientists
thermometer	a tool used to measure [ ]
volumetric flask	a tool used to measure a [ ] volume of liquid

© Edgenuity, Inc.

Instruction | Tools, Technology, and Measurement

Slide 1

Lesson Question

Slide 2

Measuring Length

Length/distance

- Common tool:
  - [ ]
- Other tools:
  - Caliper (measures smaller lengths)
  - [ ] (measures smaller lengths)
  - Meter stick (measures long distances)

Measuring Mass

Mass

- Common tool:
  - [ ]
- Other tools:
  - Triple-beam balance
  - [ ] balance

© Edgenuity, Inc.

Instruction | Tools, Technology, and Measurement

Slide 2

Measuring the Volume of Solids

Volume of solids

- Ruler for [ ] solids
- Water [ ] for irregular solids

Measuring the Volume of Liquids

Volume of liquids

- Common tools:
  - [ ]
  - **Pipette** (measures smaller and/or precise volumes)
- Other tools:
  - **Beaker** (holds liquid and measures volume)
  - **Volumetric flask** (measures specific volume of liquid)
  - [ ] (delivers specific volume of liquid)

© Edgenuity, Inc.

Instruction | Tools, Technology, and Measurement

Slide 2

Measuring Gases

Gases

- Volume, [ ], and temperature change easily
- Common tools:
  - Gas collecting bottle (holds gas)
  - Manometer (measures pressure and volume)
  - [ ] (measures volume)

Measuring Temperature and Time

Temperature

- [ ] (liquid or digital)

Time

- Common tool:
  - Digital stopwatch
- Other tools:
  - [ ]
  - Analog [ ]

© Edgenuity, Inc.

Instruction | Tools, Technology, and Measurement

Slide 5

Tools for Data Analysis

Electronic tools such as graphing calculators and computers are useful in _____ data.

- Collect data quickly and _____
- Collect large amounts of data
- Display data
- Analyze data
- Store data

Analyzing Data Using Technology

Graphing calculator:

- Small, portable
- Low _____ consumption
- Easy/intuitive for many users
- Useful for quick calculations

Computer:

- Powerful
- More _____ /analysis options
- Large _____ capacity
- More flexible

© Edgenuity, Inc.

Instruction | Tools, Technology, and Measurement

Slide 5

Probeware

Probeware – _____ or other electronic devices used to collect data

- Typically small and portable

Collects various types of data:

- Temperature
- Time
- _____
- _____
- Motion
- Light intensity

Slide 7

Displaying and Interpreting Data: Tables

Data tables:

- show actual data _____.
- provide precise data.
- are used for _____ analysis.
- are not typically used for recognizing trends and _____.

Amount of Product (g)		
Timing (s)	**Trial 1**	**Trial 2**
0	0	0
1	1	6
2	2	12
3	4	18
4	8	24
5	16	30
6	32	36
7	64	42
8	128	48
9	256	54

© Edgenuity, Inc.

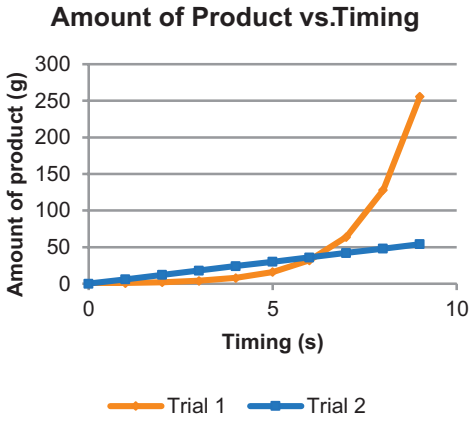
Instruction | Tools, Technology, and Measurement

Slide 7

Displaying and Interpreting Data: Graphs

Graphs:

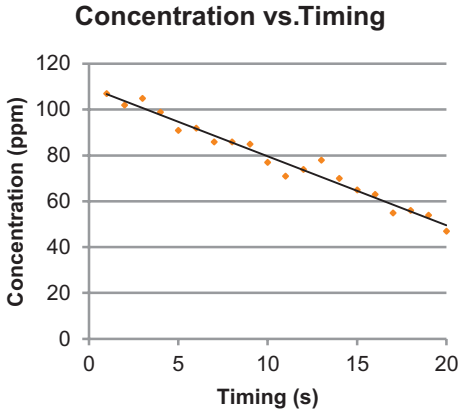
- show _____ clearly.
- allow for easy data set _____.
- provide less precise data points.
- are not typically used for numeric _____.



Best-Fit Lines

In graphs, sometimes data do not fall along the same line.

- Allow for estimates of mathematical relationships in "_____" data
- Can be lines, curves, or other _____ operations
- Created typically with technological tools



© Edgenuity, Inc.

Instruction | Tools, Technology, and Measurement

Slide 10

The Metric System: SI Units

The metric system in science:

- _____ uses the metric system for measurements.
- The metric system uses **SI** units.
  - International System of Units (abbreviated SI from French: *Système International d'Unités*)
  - SI units enhanced _____ communication

Advantages of the Metric System

- Simplicity
  - Metric system: one unit for most quantities
  - _____ system: many units for the same quantity
- Consistency
  - Metric system: increase or decrease units by multiples of _____
  - English system: unit conversions may be any _____

© Edgenuity, Inc.

Instruction | Tools, Technology, and Measurement

Slide 10

Common SI Units and Units Used with SI

Prefix	Distance	Volume	Mass	Time
kilo-	kilometer (km)	*kiloliter (kL)*	_____ (kg)	*kilosecond (ks)*
(none)	_____ (m)	_____ (L)	gram (g)	second (s)
centi-	centimeter (cm)	*centiliter (cL)*	*centigram (cg)*	*centisecond (cs)*
milli-	millimeter (mm)	milliliter (mL)	milligram (mg)	millisecond (ms)
micro-	micrometer (μm)	microliter (μL)	microgram (μg)	microsecond (μs)
nano-	nanometer (nm)	*nanoliter (nL)*	nanogram (ng)	nanosecond (ns)

Temperature: **degree Celsius** (°C), **kelvin** (K)
Time: minute (min)

Comparison of Units across Systems

	SI Unit	English Unit
Length	Kilometer	Mile
	Meter	Yard or foot
	Centimeter	
Volume	Liter	Quart
	Milliliter	Fluid ounce
Mass or weight	Kilogram	
	Gram	Ounce
Temperature		Degree Fahrenheit

© Edgenuity, Inc.

Slide 13

The Metric System is Base 10

Prefix	Symbol	Multiplier		Prefix	Symbol	Multiplier
tera-	T	1,000,000,000,000		centi-	c	0.01
giga-	G	1,000,000,000		milli-	m	0.001
mega-	M	1,000,000		micro-	μ	0.000001
kilo-	k	1,000		nano-	n	0.000000001

- The _____ units are grams (g), meters (m), liters (L), and seconds (s).
- _____ can be added to any unit.
- Multiples of 10 make _____ easier.

Metric Conversions

- Convert 5.97 cm to millimeters.
  - $1 \text{ cm} = 10$ _____
  - $5.97 \text{ cm} = (\text{_____})(10) = 59.7 \text{ mm}$
- Convert 25.0 mL to liters.
  - 1 _____ $= 0.001 \text{ L}$
  - $25.0 \text{ mL} = (25.0)(\text{_____}) = 0.025 \text{ L}$
- Convert 0.0453 kg to grams.
  - $1 \text{ kg} =$ _____ g
  - $0.0453 \text{ kg} = (0.0453)(1{,}000) = 45.3 \text{ g}$

© Edgenuity, Inc.

Slide 15

Conversion between Systems: English and SI

Use of the English and SI units:

- English units common in everyday [ ]
- SI units [ ] in scientific contexts

Quantity	Conversions
Length	1 m = 3.28 ft 1 ft = 0.305 [ ] 1 km = 0.625 mi 1 mi = 1.6 km 1 cm = 0.394 [ ] 1 in = 2.54 cm
Mass ([ ])	1 kg = 2.2 lb 1 lb = 0.455 kg 1 g = 0.0352 oz 1 oz = 28.4 g
Volume	1 L = 1.06 qt 1 qt = 0.943 L 1 mL = 0.0338 fl oz 1 fl oz = 29.6 mL

© Edgenuity, Inc.

Summary | Tools, Technology, and Measurement

Lesson Question

What is the role of tools, technology, and measurement in the development of scientific knowledge?

Answer

Slide 2

Scientific Tools

Scientists use a variety of tools to perform tasks and collect data.

- Length is measured with a _____, caliper, micrometer, or meter stick.
- Mass is measured with a balance.
- Volume of liquids is measured with graduated _____, pipettes, burets, beakers, and flasks.
- Temperature is measured with a _____.
- Time is measured with clocks and digital and analog stopwatches.

© Edgenuity, Inc.

Summary | Tools, Technology, and Measurement

Slide 2

Technology for Data Collection

Electronic devices can be used to collect data more quickly, more precisely, and in larger quantities.

- Graphing calculators are _____ and can be used for several types of data analysis.
- Computers are more powerful and flexible, and can store more data than graphing calculators.
- _____ may be used to collect data _____ and precisely, and can be combined with computer software for analysis and display.

Measurements in Science

English units are common in everyday life, but SI units are used in science.

- SI units include the kilogram (mass), meter (length), _____ (temperature), and second (time).
- Common units used with SI include _____ (volume) and degree Celsius (temperature).
- The _____ system units are based on multiples of 10, so they are easier to work with.
- Metric prefixes are used to indicate smaller or larger units. Each prefix represents a specific power of 10.

© Edgenuity, Inc.

Summary | Tools, Technology, and Measurement

Use this space to write any questions or thoughts about this lesson.

© Edgenuity, Inc.