DEFINING KEY SCIENCE TERMS

- an organized way of using evidence to learn about the natural world.

- Biology- ________________________________.

- Observation- the process of ________________________________.

- Data- the information gathered from observation.
  - expressed as numbers
  - descriptive, involves characteristics or qualities (no numbers)

- Inference- a logical ________________________________ based on prior knowledge or experiences.

- Hypothesis- a proposed scientific ________________________________ for a set of observations.
  - Hypotheses must be ________________________________!!
  - Must be ________________________________!
  - Typically written in an ________________________________ format.
    - If... independent variable, then....dependent variable

SCIENTIFIC PROCESS

- Asking a ________________________________
- Forming a ________________________________
- Setting Up a ________________________________
- Collecting ____________
- ________________ Results
- Drawing ________________________________
SCIENCE AS A WAY OF KNOWING

• Truths About Science
  o It is an ________________________________
  o Scientific understanding is always ________________.
  o Science explores the universe and way many systems and processes
    ______________________.

• Qualities of a Good Scientist
  o __________________________
  o __________________________
  o __________________________

EXPERIMENTAL DESIGN

• __________________________ - an experiment that is designed to compare and experimental group to a control group.
  o __________________________ Variable- what is changed.
    ▪ When graphing, the independent variable is placed on the _____ axis.
  o __________________________ Variable- what is measured.
    ▪ When graphing, the dependent variable is placed on the _____ axis.
  o __________________________ - factors that remain the same between experimental groups.

• Observations and experimental results must be __________________________ in order for an experiment to be considered valid.

THEORIES

• __________________________ - a well tested explanation that unifies a broad range of observations.
  o To be valid a theory must pass several tests:
    ▪ It must ________________ observations clearly and consistently.
    ▪ Experiments that illustrate the theory must be ________________.
    ▪ You must be able to ________________ results from the theory.
MODELS

- Models

- Types of Models
  - Drawings on paper, real objects used to help us picture things we cannot see, a mental picture, a set of rules or mathematical relationships that describe how something works

WHERE DO LIVING THINGS COME FROM?

- living things can arise spontaneously from non-living things.
  - While this was the common belief for many years, we now know that it is _________________ and scientists all over the world prescribe to the idea of biogenesis.
- all living things come from other living things.

REDI'S EXPERIMENT ON SPONTANEOUS GENERATION

REPEATING INVESTIGATIONS

- Claimed that spontaneous generation could occur under the right conditions.
  - *Heated* sealed flask of gravy and found microorganisms (thought heat would kill any living things in gravy)
  - Found gravy swarming with activity.
• Boiled 2 flasks of gravy, sealed 1 immediately and left the other open (thought boiling would kill microorganisms).
• Open jar was full of life. Sealed jar was uncontaminated.

• Pasteur showed that all living things come from other living things.

CHARACTERISTICS OF LIVING THINGS
• Living things are __________________________________________________________.
• A cell is the smallest unit of an organism that can be considered alive.
  - Contains nucleus (that houses DNA) and membrane-bound organelles; includes many forms of life (_______, ____________, and ____________).
• ________________ - does not have a nucleus (still has DNA-free floating in the cytoplasm); does not have organelles; smaller and less complex; includes ________________.

• Living things ________________.
  o ________________ Reproduction- 2 parents are united to form a genetically unique offspring.
  o ________________ Reproduction- a single parent produces offspring that are identical to itself.

• Living things are based on a ________________.
  o Chromosomes contain ________________ (which are passed from parent to offspring) that are made up of ________________.
  o This information is needed to live, grow, and reproduce.

• Living things ________________.
  o Cells undergo ________________ to perform different functions

• Living things ________________.
  o All organisms must take in materials and energy to grow, develop, and reproduce.
  o ________________ - the sum of all the chemical reactions in the body.
    ▪ ________________ - reactions that require energy.
    ▪ ________________ - reactions that release energy.
  o Producers (autotrophs)- make their own energy.
  o Consumers (heterotrophs)- feed on producers (and other consumers) for their energy.

• Living things ________________.
  o Organisms detect and respond to stimuli from their environment.

• Living things ________________.
  o Although conditions outside an organism may change dramatically, most organisms need to keep conditions inside their bodies constant.
  (_________________________)

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Feedback reduces the stimulus.
  • Brings the body back to normal and restores homeostasis.

Feedback amplifies the stimulus.
  • Not typically involved in homeostasis.

• Taken as a group, living things _________________.
  • Individuals do not change, but groups of organisms tend to evolve over time.

LEVELS OF ORGANIZATION
• _______________ - all living things
• ___________ - group of similar ecosystems
• _______________ - living things and their nonliving surroundings
• _______________ - populations that live together in a defined area
• _______________ - group of organisms of one type that live in the same area
• _______________ - individual living thing
• _______________ - tissues, organs, and organ systems
• _____________ - smallest functional unit of life
• _______________ - groups of atoms; smallest unit of most compounds

MICROSCOPES
• Microscopes- _________________.
  • Produce magnified images by focusing visible light rays.
  • Uses 2 lenses to form an image.
  • The only microscope that can be used to study _________________.
• _________________.
  • Use beams of ________________ to produce images.
  • Can produce images up to 1,000x _________________.
  • Cannot view living cells.
2 Types:

- __________________________________________________________ (TEMs)-
  Has the most magnification. Used to view the fine structures inside a cell. (____________________)
- __________________________________________________________ (SEMs)-
  used to view the detailed surface of a specimen.

EARLY MICROBIOLOGISTS

- __________________________________________________________
  o Viewed “animalcules” or ____________________________, in pond water, rain water, and dust.
  o Credited for advances in the ____________________________.
- __________________________________________________________
  o First to describe and coin the word “__________”

MAKING MEASUREMENTS

- ____________ - a measure of the straight-line distance between two points.
- ____________ - a measure of the amount of matter in an object.
  o ______________ - a measure of the gravitational force exerted on an object. (______________________________)
- ____________ - a measure of the size of the body or region in three-dimensional space.

UNITS OF MEASUREMENT

- SI SYSTEM- __________________________________________________________

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Unit</th>
<th>Abbreviation</th>
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</thead>
<tbody>
<tr>
<td>Length</td>
<td>meters</td>
<td>m</td>
</tr>
<tr>
<td>Mass</td>
<td>grams</td>
<td>g</td>
</tr>
<tr>
<td>Time</td>
<td>seconds</td>
<td>s</td>
</tr>
<tr>
<td>Temperature</td>
<td>Celsius or</td>
<td>C or K</td>
</tr>
<tr>
<td>Volume</td>
<td>Liters</td>
<td>L</td>
</tr>
</tbody>
</table>
SI PREFIXES

- SI prefixes are used for very ___________ and ___________ measurements.
  - SI prefixes are all based in multiples of ________.
  - Ex: 5,000 kilometers = 500,000,000 centimeters

<table>
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<th>Kentucky Has Dark</th>
<th>base unit</th>
<th>Deep Coal Mines</th>
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</thead>
<tbody>
<tr>
<td>K – kilo</td>
<td>De – deci</td>
<td></td>
</tr>
<tr>
<td>H – hecta</td>
<td>C – centi</td>
<td></td>
</tr>
<tr>
<td>Da – deca</td>
<td>M – milli</td>
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</tr>
</tbody>
</table>

CLASS PRACTICE

1. Convert 486 milliliters to centiliters.
2. Convert 312 kilometers to meters.
3. Convert 0.32 hectagrams to decigrams.

YOU TRY IT!

1. Convert 1.85 meters to centimeters.
2. Write 55 decimeters as meters.
3. Change 1.6 kilograms to grams.

SCIENTIFIC NOTATION

- **Scientific Notation** - a method of expressing a quantity as a number multiplied by
  10 to the appropriate power. (______)
  - When you ____________ in scientific notation, you
    ___________ the exponents.
  - When you ____________ in scientific notation, you
    ________________ the exponents.

<table>
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<td>10^2</td>
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<td>10^1</td>
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<td>0.01</td>
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<tr>
<td>10^{-3}</td>
<td>0.001</td>
</tr>
</tbody>
</table>

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CLASS PRACTICE
Write the following measurements in scientific notation.

1. 800,000,000 meters
2. 0.0015 kg
3. 67,453 L

YOU TRY IT!
Write the following measurements in scientific notation.

1. 0.00046 mL
2. 42,000,000,000 km
3. 89,265 g

CLASS PRACTICE
Write these measurements in long form.

1. 4.5 \times 10^3 \text{ g}
2. 1.99 \times 10^{-8} \text{ cm}
3. 0.422 \times 10^4 \text{ m}

YOU TRY IT!
Write these measurements in long form.

1. 9.53 \times 10^5 \text{ dm}
2. 0.1223 \times 10^3 \text{ cg}
3. 6.04 \times 10^{-4} \text{ mL}

CLASS PRACTICE
Perform the following calculations

1. \( (5.5 \times 10^4 \text{ cm}) \times (1.4 \times 10^4 \text{ cm}) \)
2. \( 5.2 \times 10^8 \text{ cm}^3 \)
   \( 9.5 \times 10^2 \text{ cm}^3 \)

YOU TRY IT!
Perform the following calculations

1. \( (3.8 \times 10^{-2} \text{ cm}) \times (4.4 \times 10^{-2} \text{ cm}) \times (7.5 \times 10^{-2} \text{ cm}) \)
2. \( 6.05 \times 10^7 \text{ g} \)
   \( 8.8 \times 10^6 \text{ cm}^3 \)
GRAPHING SCIENTIFIC DATA

- Line Graphs- 

- Bar Graphs- 

- Pie Graphs- 

![Volume Measured over Time](image1)

![Melting Points of Some Common Metals](image2)

![Composition of a Winter Jacket](image3)