Guided Notes - Characteristics of Life

- I can identify examples of the characteristics of life.
- I can generate examples for the characteristics of life.
- I can differentiate between living and non-living.

An Organism has or once had **ALL** the characteristics of life.

Characteristics of Life Table

Characteristics	Description	Example (at least two)
1) Made of Cells	Cells are the basic unit of life	Single cell - bacteria multicellular - humans
2) Displays Organization	How the cell/organism is built macromolecules → cells → tissues → organs → organsystems	arm - made from cells, tissues, muscles, bones lipids - provide energy
3) Grows and Develops	· increase in mass · Change in abilities	baby → Child walk → run
4) Reproduces	make more of the species. (Pass on DNA)	Cat having kittens Bacteria multiplying
5) Respond to Stimuli	Reaction to internal or external Factor	See a bear → run S R Touch hot stove → move hand
6) Obtains and Uses Energy (Metabolism)	Energy is needed for life processes (make or eat)	Plant using photosynthesis Moose eating cheese
7) Maintains Homeostasis	Keep all internal processes in check to survive	Body temperature constant Blood pressure 120/80
8) Adapts to Environment	Genetic traits allowing for better survival	Plants having roots to get water flowers to attract insects for pollination

Unicellular- one cell

Multicellular- more/many than 1 cell

Why are you living and a car isn't?

perform all characteristics of life → cannot perform all characteristics. may model some, gas for energy

What is Science?

The Goal of Science

1) deals only with the natural world
2) to collect and organize information
3) propose explanations that can be tested!

Science – using evidence to learn about the natural world; a body of knowledge

Science begins with observation – often taking data on what you see, hear or smell

data – the information gathered from observations
quantitative **data** = numbers
qualitative **data** = descriptive

Inference – a logical interpretation based on prior knowledge or experience (Ex. You see a window broken and a baseball on the floor next to the shattered glass. You can -infer- that a baseball broke your window)

Hypothesis – a proposed scientific explanation. This statement is testable and can be confirmed with experimentation or further observation. You predict the outcome of your experiment using an if-then statement that shows what you expect to see as a result of an experiment or observation

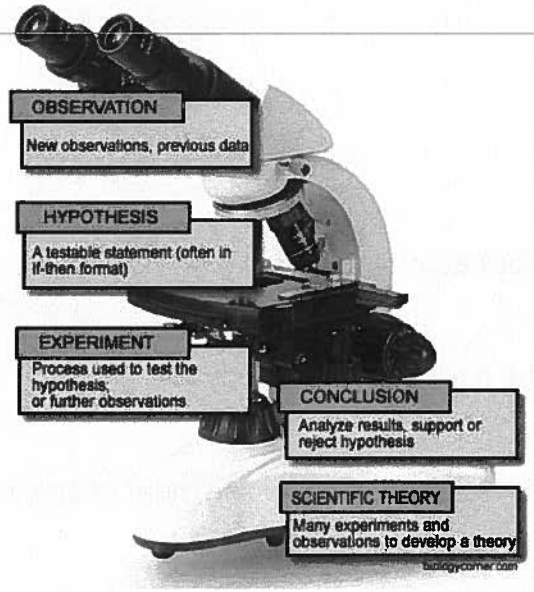
(Ex. **If** fertilizer makes a plant grow faster, **then** seedlings planted with fertilizer will be taller than the ones planted without fertilizer)

Common Steps of a Scientific Method

1) Observe
2) Define Problem/Question
3) Research/Gather information
4) Form a hypothesis
5) Design a controlled experiment to test hypothesis

independent **variable** – the variable that is deliberately changed (usually on x-axis)
dependent **variable** - the variable that is observed/measured (usually on y-axis)

6) Gather and analyze data
7) Draw a conclusion
8) Reflect & repeat



The Scientific Method in Action

Suppose you observed that a cricket outside your window seems to be chirping every night, but some nights it chirps faster than others. A friend of yours told you once that you can use the sound of a cricket chirp to tell the temperature. Curious, you decide to design an experiment. First you must create a ***hypothesis****; here are some examples of possible hypotheses:*

The frequency of cricket chirps will change as the temperature changes.
As the temperature decreases, a cricket will chirp fewer times.

Either hypothesis will work, the important thing is that you can -test- the hypothesis by doing an experiment which will confirm or deny the statement.

To set up the experiment, you go out to your yard and capture a few crickets. You bring them inside and place them in a container. But wait, if you have a bunch of crickets together, what if they chirp based on how many crickets there are nearby. The goal in designing an experiment is to eliminate all the variables except the one you are testing. This means all your cricket subject must be housed in the same environment (same lighting, same food, same water..etc). Okay, so you get that set up and take the temperature of your room. Now you must wait for the crickets to start chirping. You count how many times the cricket chirps for a 5 minute period.

Now you have to compare that number with the chirps that occur at different temperatures. You may use a heating pad, or ice or any other way to lower or raise their temperature. You would then take data for 5 minutes at the new temperature.

In your experiment, the ***INDEPENDENT VARIABLE*** *is the thing you changed – the temperature.*
The ***DEPENDENT VARIABLE*** *is what you are measuring that happens as a result of that change - the number of chirps.*

The ***CONTROL GROUP*** *isn't obvious in this case – but you can consider your original (room temperature) data as your control, and the other temperatures your experimental data.*

After you have taken data, you can then draw a ***conclusion*** *about whether your hypothesis is accepted (correct) or denied (incorrect).*

http://www.biologycorner.com/lesson-plans/scientific-method/scientific-method/

Guided Notes - Characteristics of Science

- I can distinguish between science and pseudoscience.
- I can critique the validity of scientific data.
- I can identify reliable sources for peer review and research.

Scientific claims can be tested and Repeated.

Pseudoscience are opinions that cannot be tested.

Description	Science	Pseudoscience
1. Studying genes and inheritance	X	
2. Forecasting personality by reading bumps on the head		X
3. Observing interactions of organisms in the environment	X	
4. Peers reviewing investigations and experiments	X	
5. Telling the future by reading lines on the palms		X
6. Forming untestable hypotheses based on nonscientific literature		X
7. Forming testable hypotheses based on observations and questions	X	
8. Communicating experimental findings and offering data for peer review	X	

Hypotheses can be tested using experimentation.

Experiments can be repeated.

Data and results may support or reject a hypothesis.

A hypothesis with much repeated support is called a theory.

Facts of nature are known as laws.

More questions can be generated from the results/data from an experiment. Often, peer review can provide validity.

Challenges to theories occur and more/new testing can result.

Guided Notes - Scientific Inquiry

- I can generate a question to be answered using scientific inquiry.
- I can develop a hypothesis to be tested.
- I can design and conduct a controlled experiment.
- I can identify the independent and dependent variables in an experiment.
- I can identify weaknesses in experimental design.

Scientific inquiry begins with observation. It involves asking questions and processing information.

Combining what you know to what you have learned in a logical way is called an inference.

Biologists and other scientist use processes to gather information and answer questions called scientific method(s).

Basics Steps Used in Scientific Methods

Experiments must be controlled and have only one variable.

Identify ***the parts of the experiment described in the table below.***

Experiment: A biologist gives a new kind of food to a group of dogs and compares the weight gain of these dogs over time to a group of similar dogs that do not receive the new food.
Experimental group: Dogs with NEW Food given
Control group: Dogs NOT receiving new food.
Independent variable: New Food
Dependent variable: weight gain

Data from experiments can be ___qualitative___ based on observation or data can be measured called ___quantitative___.

The SI-System International uses the ___metric___ system to record numerical data.

Guided Notes - Data, Tables & Graphs

- I can create data tables and graphs.
- I can analyze data.

TIPS for creating a quality graph.

Label axes (x, y), Descriptive title, units on axes, scales on axes of equal units

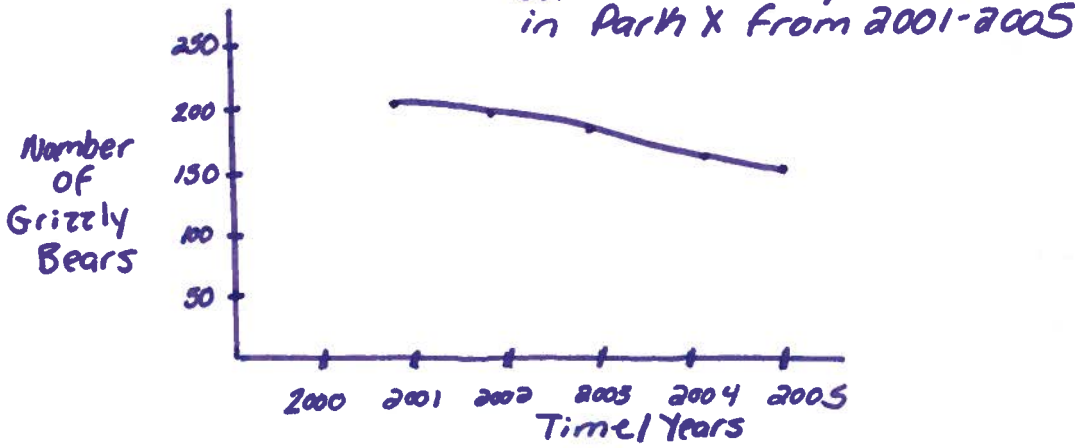
Bar Graph vs Line Graph

Used to show comparisons.

often used to show trends. Typically time is on the x-axis

Using the data table below, create a graph.

Grizzly Bears in Park X	
Year	Quantity
2001	195
2002	190
2003	184
2004	164
2005	158



Variables: independent Years **dependent** Number of Grizzly bears

Analyze the data below.

The heavy duty battery by Panasonic holds less voltage over time. The Panasonic took five hours for the flashlight to drain the voltage. The two alkaline batteries, Duracell & Energizer, held their voltage almost twice as long compared to the Panasonic. Flashlights with alkaline batteries can be used twice as long as a heavy duty battery.