Biology
Unit 1
THE SCIENCE OF LIFE

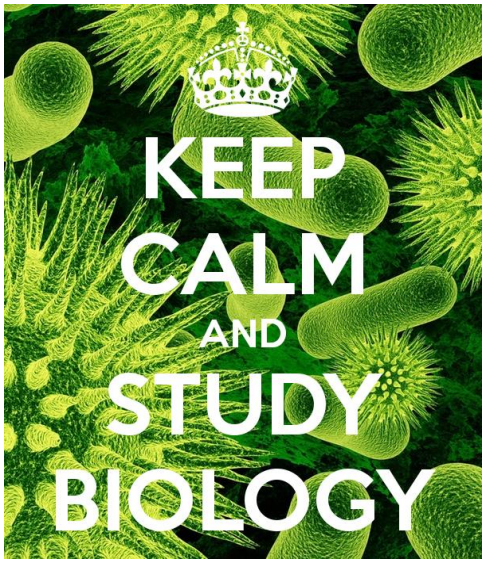
1:1 What is Biology?

BIOLOGY: the scientific study of living organisms

ORGANISM: a complete and entire living thing

WHY STUDY BIOLOGY?

- _____
- _____
- _____

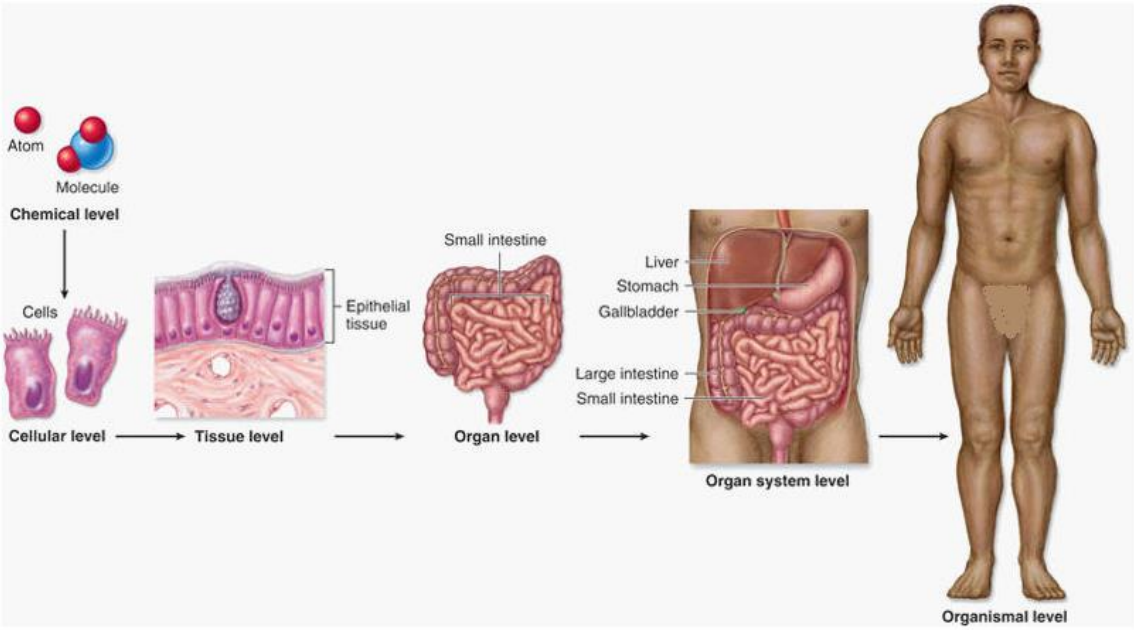


1:2 What is Life?

Organisms (living things) must possess ALL these CHARACTERISTICS OF LIFE.

CHARACTERISTICS OF LIFE

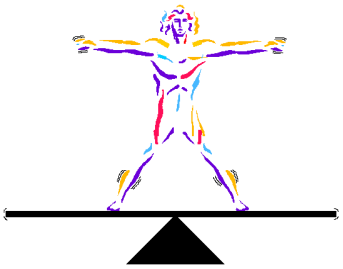
1. Living things are ORGANIZED and are made of at least ONE CELL.
   ORGANIZATION: orderly structure
   CELLS: smallest unit that can perform all of life's processes



2. Living things MAKE MORE living things, transmit hereditary information
   REPRODUCTION: the production of offspring
   Is reproduction essential to the survival of an individual? Species?

3. Homeostasis

HOMEOSTASIS: the ability of organisms to maintain conditions suitable for life



- Keeping internal conditions the same, even when external conditions change
- Regulation of temperature, water content, uptake of nutrients

What do you think the body consistently maintains?

_____

4. Metabolism/Energy

METABOLISM: sum of all chemical reactions that take in and transform energy and materials from the environment

ENERGY: the ability to do work or cause changes

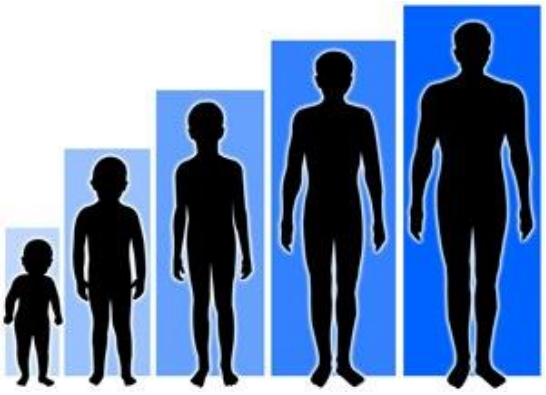
- Energy powers live processes
- Organisms obtain energy from food.

Why have you eaten in the last 12 hours?

5. Growth and Development.

GROWTH: an increase in the amount of living material and the formation of new structures

DEVELOPMENT: the physical changes that take place during the life of an organism

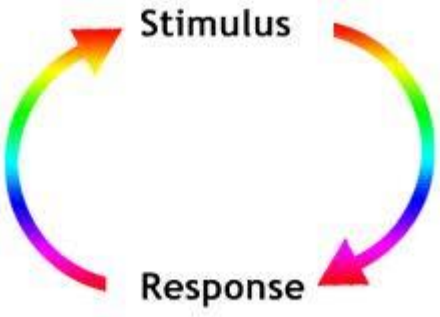


6. Evolution

EVOLUTION: the gradual change in characteristics of species overtime

7. Response to Stimuli

ENVIRONMENT: surroundings or external conditions



STIMULUS: any condition in the environment that requires an organism to adjust

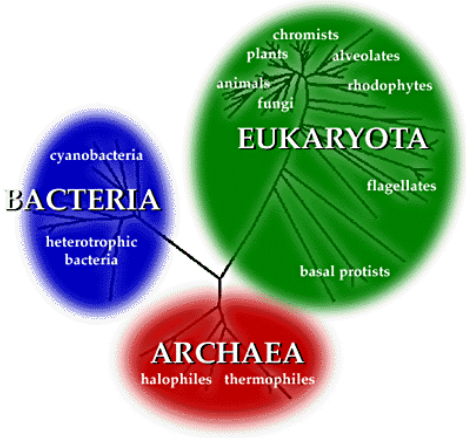
RESPONSE: reaction to a stimulus

1:3 Themes in Biology

These themes in Biology link isolated facts and ideas in the science.

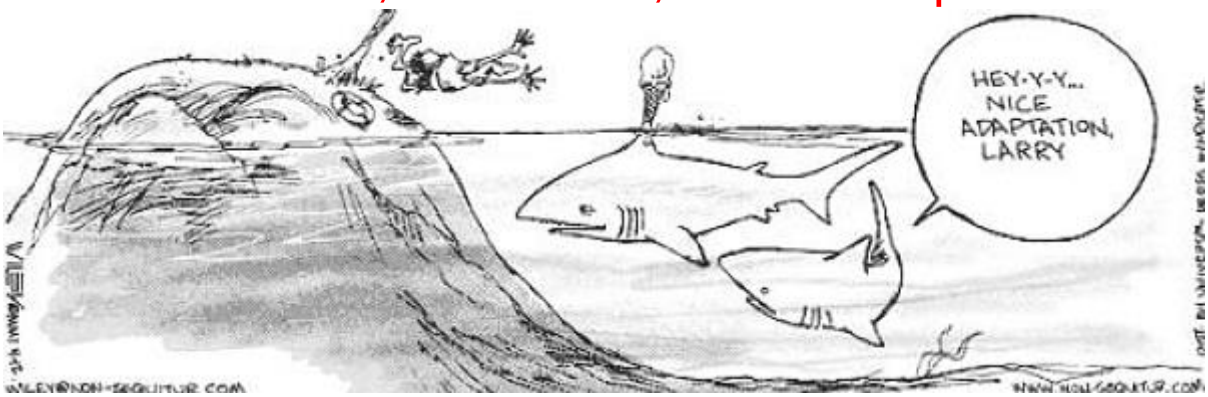
THEMES IN BIOLOGY

1. Diversity and Unity of Life
   - Life is extremely diverse, yet living things all have similar characteristics
   - Three domains of life



2. Interdependence of Organisms
   - Organisms interact with each other and need each other to survive
   - SYSTEM: separate parts interacting to function as a whole
   - INTERACTION: the action or influence of people, groups, or things on one another

3. Homeostasis
   - Maintain conditions suitable for life
   - Homeo (Homo): similar, sameness
   - Static (stasis): unchanging condition
4. Evolution of Life
   - EVOLUTION: the gradual change in characteristics of species over time
   - ADAPTATION: any characteristic that allows an organisms to better survive in an environment
     - Better ability to adjust
     - Structural, behavioral, or internal process



1:4 Problem Solving Methods in Biology

Scientists discover problems by observing the world around them. Scientists solve problems using the steps of the scientific method.

SCIENTIFIC METHOD: a logical, orderly way to solve a problem or answer a question

Steps of the Scientific Method

1. State the problem.
    - Example: Why doesn't the car start?
2. Form a hypothesis.
    - Example: Maybe the battery is dead.
3. Perform an experiment to test the hypothesis.
    - Example: Turn the lights on to test the battery.
4. Observe, measure, and record data from the experiment.
    - Example: The lights go on.
5. Form a conclusion based on observations from the experiment. Refine question and problem if necessary.
    - Therefore the battery is not dead. Are the ignition wires loose or wet?

HYPOTHESIS: a possible explanation of events based on observations

EXPERIMENT: a scientific test that will yield observations proving or disproving the predicted hypothesis

OBSERVATION: something seen or sensed, noted, and/or measured

DATA: information or measurements obtained from observations

CONCLUSION: explanation or answer to a problem based on data gathered in an experiment

1:5 Experimenting in Biology

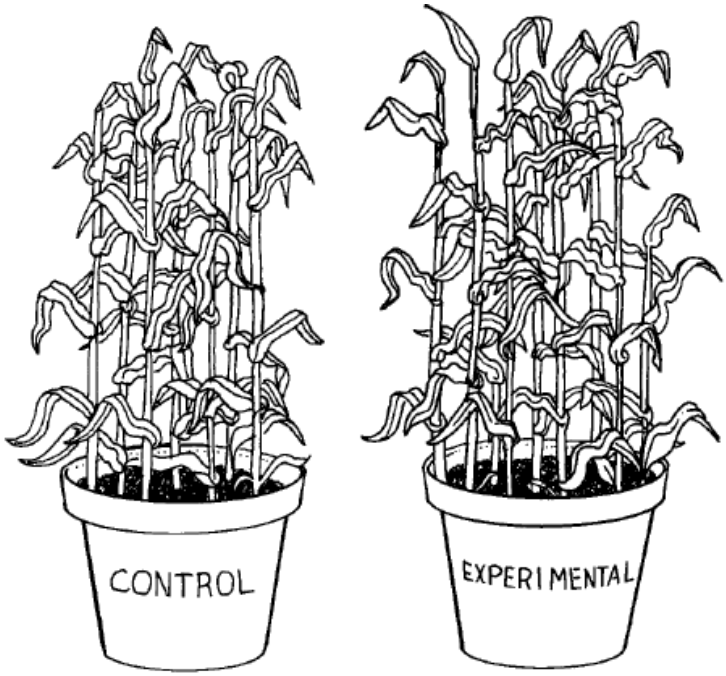
THEORY: an explanation that is based on a large body of scientific evidence obtained from many different observations and experiments

LAW: fact in nature

CONTROLLED EXPERIMENT: test done in duplicate, so that all variables are the same except the one being tested

Parts of a Controlled Experiment

1. INDEPENDENT VARIABLE: the factor being tested in a controlled experiment, the factor presumed to be the cause of the effect according to the hypothesis
2. EXPERIMENTAL GROUP: group used to test the hypothesis, group in which the independent variable is manipulated
3. CONTROL GROUP: comparison group in a controlled experiment, all variables remain constant, used to compare results from the experimental group



4. DEPENDENT VARIABLE: difference in results between experimental group and control group, change that results from the manipulation of the independent variable

- The DEPENDENT VARIABLE is caused by the INDEPENDENT VARIABLE.

- The difference in results between the CONTROL GROUP and the EXPERIMENTAL GROUP depends on the single factor that is different in the CONTROLLED EXPERIMENT.

All data gathered from controlled experiments MUST be recorded accurately. Experiments must be repeated and the results MUST be the same to form conclusions.

1:6 Measurement in Biology

INTERNATIONAL SYSTEM OF MEASUREMENT (SI):
universal system of measurement and symbols used by scientists worldwide

SI (metric system) is based on the number 10 and multiples of 10 and has very few basic units.

SI UNIT	abbreviation	MEASURES
Meter	m	length
Gram	g	mass
Liter	L	liquid volume
Cubic centimeter	cm^3	solid volume
Second	Sec	time
Celsius degree	°C	temperature

SI PREFIX	abbreviation	MULTIPLIES
Milli-	m	.001
Centi-	c	.01
Kilo-	k	1000

EXAMPLES→

- One milliliter (mL) equals 1/1000 of a liter.
- One centimeter (cm) equals 1/100 of a meter.
- One kilogram (kg) equals 1000 grams.