

I. **Biology** – science of life

A. What is life?

1. Characteristics of all living things

a. Made of **cells** – basic unit of organisms

- i. May be unicellular – ex, bacteria
- ii. May be multicellular – ex, us, trees, ants

b. Living things **grow** – size and/or number of cells increase

- i. May grow continuously – ex, trees
- ii. May only grow during a short period – ex, animals

c. Have **metabolisms** – sum of all the chemical reactions in the organism

- i. Energy is essential for life
 - needed to maintain function, grow, repair, etc.
- ii. Metabolism is carefully controlled
- iii. Must maintain **homeostasis** – balanced internal environment

d. Respond to **stimuli** – changes in internal or external environment

- i. Stimuli include light, sound, temperature, chemicals, etc.
- ii. Response always involves some sort of movement
 - Not always visible or large scale

e. Organisms **reproduce** – make more of themselves

- i. May be **asexual** – one parent gives rise to identical offspring
 - Ex, bacteria, some plants
- ii. May be **sexual** – two parents give rise to non-identical offspring

- Ex, almost all animals, most plants

f. Organisms **evolve** – populations change over time to become better adapted to their environment

i. Ex, thick layers of blubber on animals that live arctic regions

ii. Adaptations come in different forms

- Structural – ex, spines on cactii

- Physiological/biochemical – lizards secrete nitrogenous waste as a dry paste

- Behavioral – most desert animals are inactive during peak daylight

B. Life requires constant energy input

1. Most originates from the sun

a. Some bacteria and archaea are exceptions

2. **Autotrophs** produce food from simple ingredients

a. Also called **producers**

i. Plants, algae, some bacteria

b. Most use **photosynthesis**

i. Capture light energy to make chemical bonds

ii. $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{sugar} + \text{O}_2$

3. **Heterotrophs** breakdown food made by autotrophs

a. Also called **consumers**

i. Animals, fungi, most bacteria

b. Usually use **cellular respiration**

i. Chemical bonds are broken to release energy

ii. $\text{Sugar} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$

c. Producers also use cellular respiration

4. Uses for energy

a. Make building blocks

b. Maintain homeostasis

c. Growth

d. Repair

e. Movement

f. etc.

C. Life requires a lot of information

1. Organisms have to do a lot of complex things just right

a. Requires accurate and timely information

2. Information must be transmitted internally

a. Very important in multicellular organisms

i. Endocrine system uses hormones

ii. Nervous system uses electrical impulses and chemicals

b. Have to coordinate activities

3. Information is transmitted between individuals

a. May be same or different species

b. May be chemicals, sounds, visual displays, etc.

i. Animals marking territory with scents