

### Definitions

#### Ecology

The **scientific study** of the **interactions** among **organisms** and the **environment**

#### Biotic

living (producers, reducers)

#### Abiotic

nonliving (air, energy)

#### Environmentalism

The study of **ecological problems** in the **human context** (economics, morals)

#### Dynamic steady state

occurs when gains and losses are in balance (matter and energy)

### Species Interactions

**Predation** an organism kills and consumes another

**Parasitism** one organism lives in or on another

**Competition** when 2 organisms have negative effect on each other because they depend on the same resource

**Mutualism** when 2 species benefit from each other

**Commensalism** when 2 species live closely, one benefits but the other is unaffected

**Amensalism** when 2 species living close to each other, one is negatively affected, but the other is unaffected

### Solar Energy Terms

#### Electromagnetic Radiation

Energy from the Sun; packed in particles called photons

#### Photosynthetically active region

wavelengths of light that are suitable for photosynthesis **400 nm** (Violet) to **700 nm** (red)

### Solar Energy Terms (cont)

#### Chloroplasts

specialized cell organelles. Chlorophylls are pigments that absorb the light.

#### Light Reactions

convert energy from **photons** into **chemical energy**

#### Dark Reactions

aka Calvin cycle, use **chemical energy** and **CO<sub>2</sub>** to make \*\*sugar

#### Photorespiration

**RuBP** combines with a molecule of **O<sub>2</sub>**, resulting in **CO<sub>2</sub>** and **loss of energy**. reverses the gains made by photosynthesis

### C3 Photosynthesis

$CO_2 + RuBP \rightarrow 2 G3P$

-catalyzed by RuBP

-Disadvantages: they need a large amount of Rubisco, and need a lot of O<sub>2</sub>

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### Heat Gain and Loss Terms

#### Radiation

the emission of electromagnetic energy by a surface

#### Conduction

the transfer of the kinetic energy of heat between substances in contact

#### Convection

the transfer of heat by movement of liquids and gases

#### Evaporation

water goes from liquid to gas. removes heat from a surface

large organisms lose and gain heat

**less rapidly** than smaller organisms due to surface area

#### When temps vary

it is **easier** for a large animal to maintain a constant internal temperature

### Heat Gain and Loss Terms (cont)

#### Thermal Inertia

the resistance to a change in temp due to a large body volume

### Organization in Ecology

individual => population => community => ecosystem => landscape => biosphere

#### Individual approach

understands how **adaptations** enable it to survive

#### Population approach

examines **variation** in the number, density, and composition of individuals

#### Community approach

understands **diversity and interactions** of organisms living in the same place

#### Ecosystem approach

describes the **storage** and **transfer** on energy and matter

#### Biosphere approach

Examines **movements of energy** and chemicals over the earth's surface

### Habitat and Niche

#### Habitat

place or physical setting in which organism lives

#### Examples

freshwater, coastal, forests, deserts

#### Niche

range of conditions tolerated, resources required. No 2 species have the same niche

#### Examples

different insects prefer to feed on different plants that might be in the same field

### Thermal Optima

**Thermal Optima** the temperature in which an organism best performs



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Not published yet.  
Last updated 8th September, 2024.  
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### Thermal Optima (cont)

Its determined by the properties of an organism e.g. enzymes and lipids, body form, cells and tissues

Temps that exceed thermal optima can hurt e.g. Coral Bleaching

### Photorespiration

-Reverses the gains made by photosynthesis

-catalized by Rubisco

-becomes more problematic in hot and dry conditions

-Rubisco has a greater tendency to react with O<sub>2</sub> when **O<sub>2</sub> concentration is high, CO<sub>2</sub> concentration is low, or temperature is high**

-when its hot or dry, stomata will partially close and CO<sub>2</sub> concentrations in leaves will be low

### C4 Photosynthesis

-adds a more efficient enzyme

CO<sub>2</sub> + PEP → OAA

-adds a CO<sub>2</sub> concentrating mechanism

-disadvantages: less tissue is used for photosynthesis. energy needed for the CO<sub>2</sub> pump

-C4 plants are more active at hot times of the year

-C4 grasses occur primarily in warm climates

### CAM Photosynthesis

CAM photosynthesis a pathway in which the initial assimilation of carbon into OAA occurs at night

like C4 plants CAM plants are better adapted to warm

### Thermoregulation

Thermoregulation the ability of an organism to control their body temp

### Thermoregulation (cont)

Homeotherms organisms that maintain constant temp. allows biochemical reactions to work most efficiently (humans)

Poikilotherms organisms that do not have constant body temperature (reptiles)

Endotherms Organisms that can generate metabolic heat to raise body temp

mammals and birds, requires a lot of work and energy

Ectotherms Organisms with body temp determined by their external environments

Reptiles, amphibians, insects. tend to be smaller.

### Food Chain

Producers (autotrophs) convert light/chemical energy into resources

Consumers (heterotrophs) obtain their energy from other organisms

Mixotroph can switch between producers and consumers

Scavengers consume dead animals

Detritivores break down dead organic matter (detritus) into smaller particles

Decomposers break down detritus into simpler elements that can be recycled

### Salt Balance in Aquatic Animal

Solute a substance dissolved in water. Always different than the concentration in the surrounding water.

### Salt Balance in Aquatic Animal (cont)

Semipermeable Membranes membranes that allow only particular molecules to pass through. Reduces free movement of solutes

Osmosis net movement of water across a semipermeable membrane, towards a higher solute concentration

Osmotic Potential the force with which a solution attracts water by osmosis. expressed in pressure units (MPa)

Osmoregulation mechanisms organisms use to maintain a proper solute balance

Hyperosmotic tissue solute concentrations are **higher** than surrounding water

Freshwater Fish

Hyposmotic tissue solute concentrations are **lower** than surrounding water

Saltwater Fish

Salt Balance in mangroves mangrove roots are in salt water, so its hard to take up the water with a high salt load. they have developed special salt glands on leaves, their cells maintain high sugar, and roots exclude salt by active transport back into the water