TEAS prep: Bio

May 10, 2023

Part 1: Biological Organization, taxonomy, cell types, cell theory, ecological principles

https://courses.lumenlearning.com/wm-nmbiology1/

Let’s start our review of biology for the TEAS with the cell theory

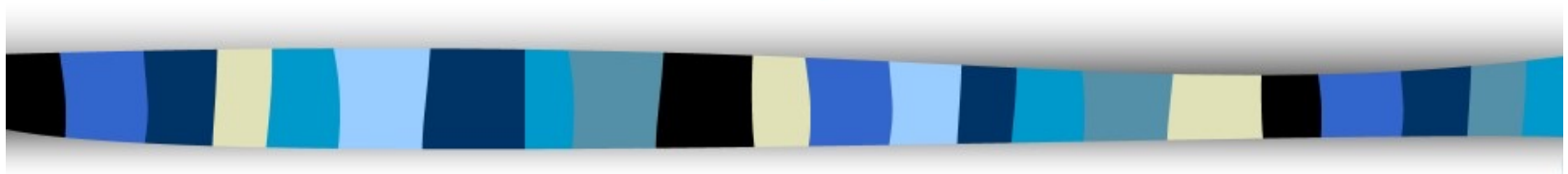
- All living things are made of cells
- All cells come from pre-existing cells
- Cells are the basic unit of structure and function in living things

Living organisms can be classified into **two groups based on the cell types they are made up of**

- According to the cell theory the cell is the basic unit of life
- All organisms are composed of one or more cells
- **Based on the organization of cellular structures, all living things can be divided into two groups; prokaryotic and eukaryotic** https://courses.lumenlearning.com/wm-nmbiology1/chapter/comparing-prokaryotic-and-eukaryotic-cells/
- Animals, plants,fungi and protozoans are eukaryotic
- Only bacteria are prokaryotic

Okay let's look at how biologists organize organisms for study
Using taxonomy.

Taxonomy



The science of naming organisms.

Scientific Names You Need to Know

- *Homo sapiens*
- *Canis lupus*
- *Felis domesticus*
- *Pan pan*

Why binomial nomenclature?

- Much easier than a 10+ word name under old “polynomial system”
- Same name no matter where you go
- Less confusion
- Binomial = SCIENTIFIC NAME

All organisms classified in a hierarchy

- Kingdom (broadest)
- Phylum
- Class
- Order
- Family
- Genus
- Species (most specific)

The 6 kingdoms

- Prokaryotes (Used to be 1 kingdom, Monera)
  - Archaebacteria
  - Eubacteria
- Eukaryotes
  - Fungi
  - Protista
  - Animal
  - Plantae

Overview of the 6 kingdoms

- Archaebacteria
  - Unicellular
  - Live in extreme environments
  - Prokaryotic
- Eubacteria
  - Unicellular
  - Prokaryotic
  - “Common bacteria”

Overview of the 6 kingdoms

- Protista
  - Eukaryotic
  - Unicellular or colonial
  - Lots of different life styles
- Fungi
  - Cell walls made of chitin
  - Eukaryotic
  - Multicellular
  - External heterotrophs

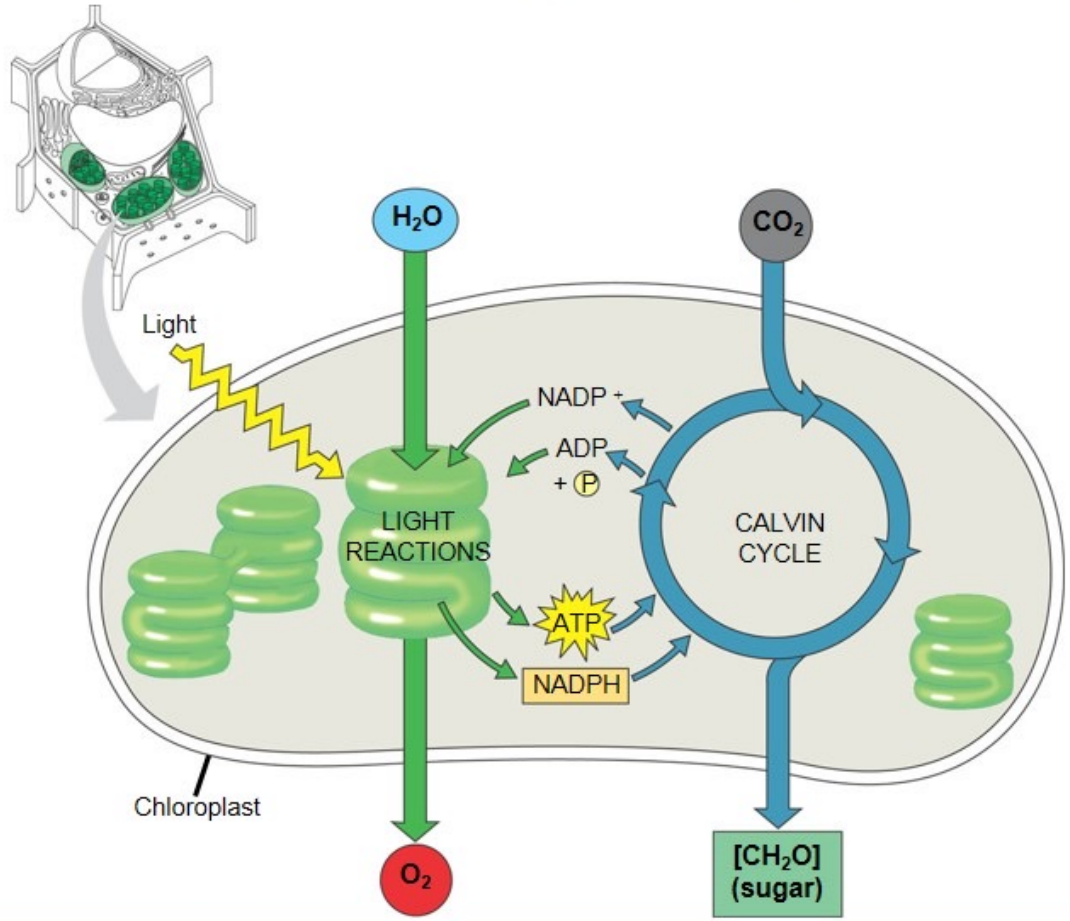
Overview of the 6 kingdoms

- Plantae
  - Eukaryotic & Multicellular
  - Cell walls made of cellulose
  - Autotrophic
- Animalia
  - Eukaryotic & Multicellular
  - No cell walls
  - Internal heterotrophs

Plant Characteristics

- Multicellular
- Autotrophic (photosynthesis)
- Chlorophylls *a* and *b* in thylakoid membranes
- Surrounded by cell walls containing cellulose (polysaccharide)
- Store reserve food as amylose (starch)

An overview of photosynthesis



2 Stages of Photosynthesis

1. Light reactions: sunlight converted to chemical energy
   - Occur in the grana
   - Split water, release oxygen, produce ATP, and form NADPH
2. Calvin cycle: sugar is made using energy gathered during light reactions
   - Occurs in the stroma
   - Forms sugar from carbon dioxide, using ATP for energy and NADPH for reducing power

- Our simplified photosynthesis equation:

$$CO_2 + H_2O + \text{Light energy} \rightarrow (CH_2O) + O_2$$

- The accepted hypothesis was that carbon dioxide was first split:

$$CO_2 \rightarrow C + O_2$$

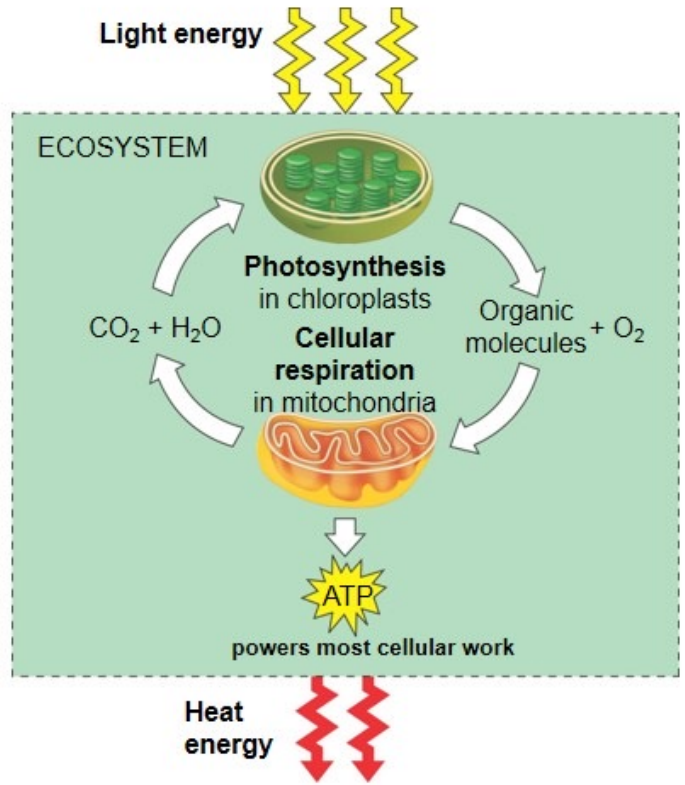
- Then added to water:

$$C + H_2O + \rightarrow (CH_2O)$$

- If correct, this means that the oxygen that is released (shown in the equation at the top) comes from carbon dioxide.

Photosynthesis requires energy

- **Energy**
  - Flows into an ecosystem as sunlight and leaves as heat



Speaking of ecosystems…….

Let’s consider living organisms and their relationship to the environment
on which they depend for survival…..

Ecology

WHAT IS ECOLOGY?

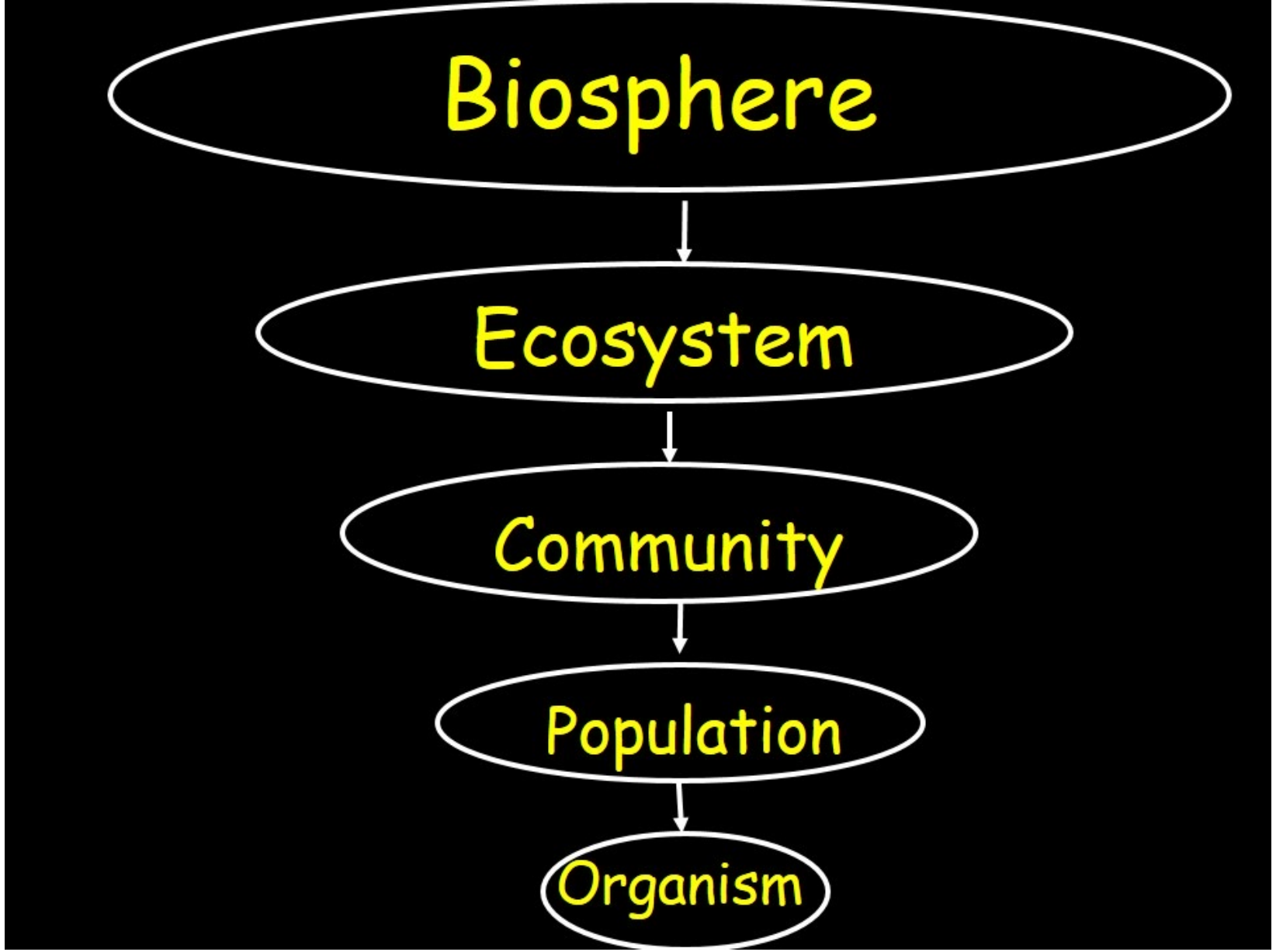
Ecology- the scientific study of interactions between **organisms and their environments,** focusing on energy transfer

Ecology is a science of **relationships**

WHAT DO YOU MEAN BY ENVIRONMENT?

The environment is made up of two factors:

- **Biotic factors**- all living organisms inhabiting the Earth
- **Abiotic factors**- nonliving parts of the environment (i.e. temperature, soil, light, moisture, air currents)


Biosphere
Ecosystem
Community
Population
Organism

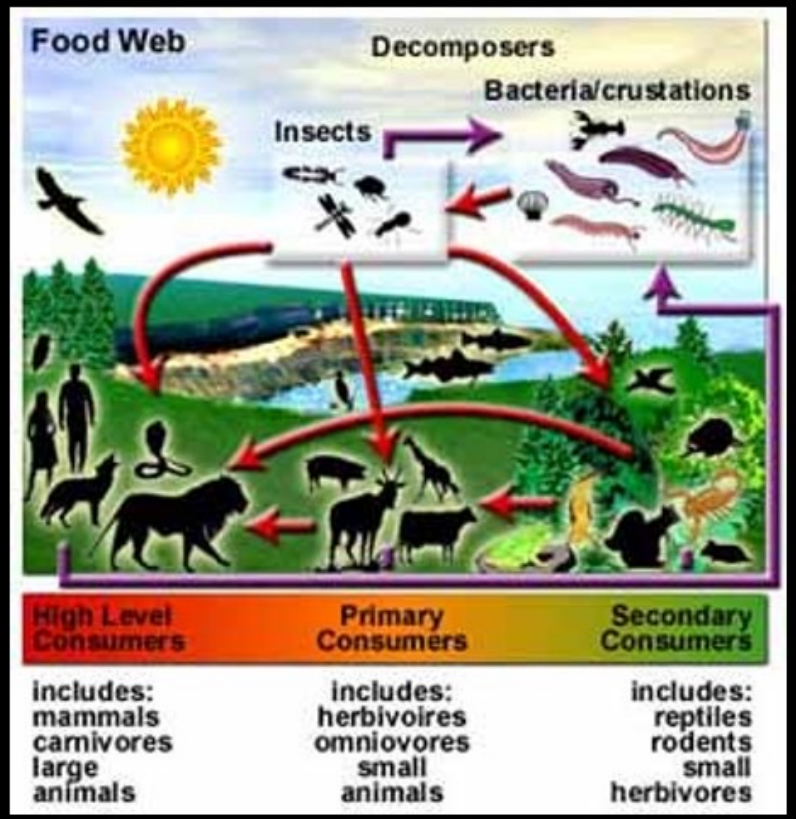
Organism - any unicellular or multicellular form exhibiting all of the characteristics of life, an individual.

- The lowest level of organization

POPULATION

- ✓ a group of organisms of **one species** living in the same place at the same time that **interbreed**
- ✓Produce **fertile** offspring
- ✓**Compete** with each other **for resources** (food, mates, shelter, etc.)

Community - several interacting populations that inhabit a common environment and are interdependent.



Ecosystem - populations in a community and the abiotic factors with which they interact (ex. marine, terrestrial)

Habitat vs. Niche

Niche - the role a species plays in a community; its total way of life

Habitat- the place in which an organism lives out its life

Habitat vs. Niche

A niche is determined by the tolerance limitations of an organism, or a limiting factor.

Limiting factor- any biotic or abiotic factor that restricts the existence of organisms in a specific environment.

Feeding Relationships

- There are 3 main types of feeding relationships

1. Producer - Consumer
2. Predator - Prey
3. Parasite - Host

Feeding Relationships

Producer- all autotrophs (plants), they trap energy from the sun

- Bottom of the food chain

Feeding Relationships

Consumer- all heterotrophs: they ingest food containing the sun's energy

- Herbivores
- Carnivores
- Omnivores
- Decomposers

Feeding Relationships

CONSUMERS

1. Primary consumers
   - Eat plants
   - Herbivores
- Secondary, tertiary … consumers
   - Prey animals
   - Carnivores

Feeding Relationships

Consumer-Carnivores-eat meat

- Predators
  - Hunt prey animals for food.

Feeding Relationships

Consumer- Carnivores- eat meat

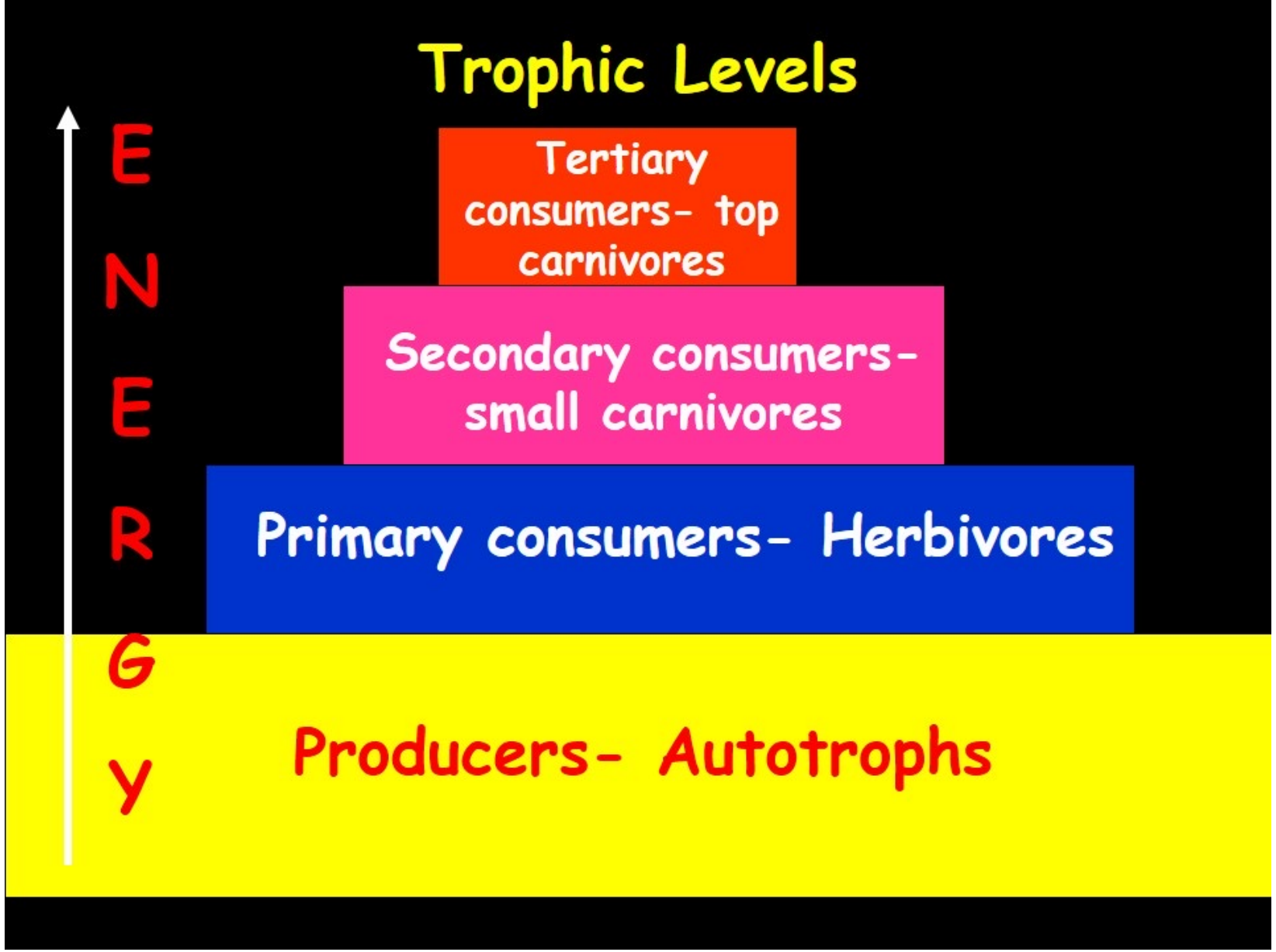
- Scavengers
  - Feed on carrion, dead animals

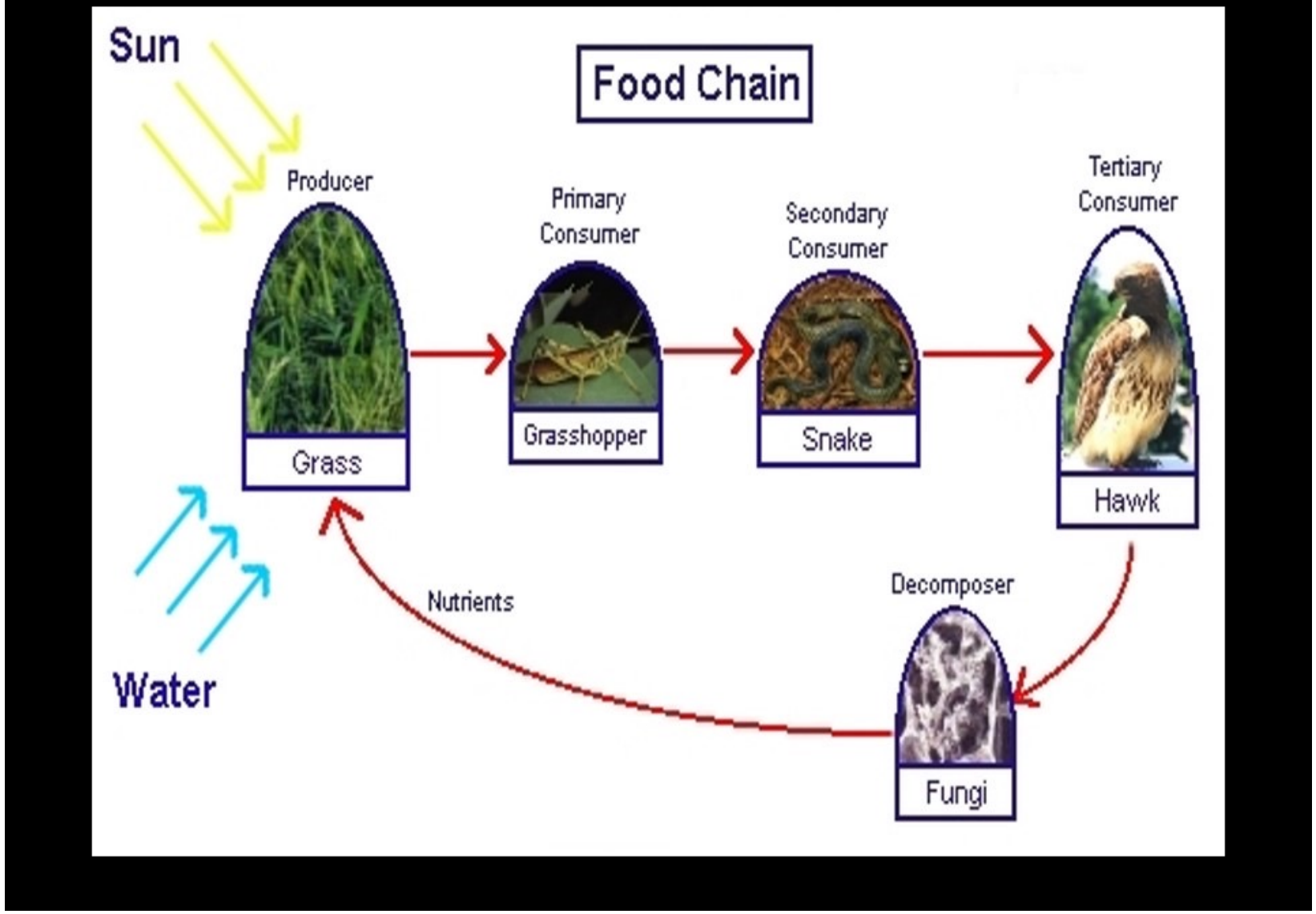
Feeding Relationships

Consumer-

Decomposers

- Breakdown the complex compounds of dead and decaying plants and animals into simpler molecules that can be absorbed


Trophic Levels
ENERGY
Tertiary consumers- top carnivores
Secondary consumers- small carnivores
Primary consumers- Herbivores
Producers- Autotrophs


Sun
Food Chain
Producer
Primary Consumer
Secondary Consumer
Tertiary Consumer
Grass
Grasshopper
Snake
Hawk
Nutrients
Decomposer
Fungi
Water