Biology: "The Study of Life"

"The **chemicals** of life"
- water – Inorganic
- carbohydrates
- lipids
- proteins
- nucleic acids
- minerals – Inorganic
- vitamins

Organic – contains Carbon

→ make up **organelles**
- DNA – All
- cell membrane – All
- cytoplasm – All
- ribosomes – All (proteins)
- mitochondria – ATP
- cell wall – plants – prokaryotes
- chloroplast – plants – photosynthesis
- flagella
- cilia
- pseudopodia – False foot – Amoeba

→ make up **cells (types of cells)**
- prokaryotic – nonnucleus
- eukaryotic – nucleus
  - -animal cells
  - -plant cells

Cells carry out life **processes**

- **osmosis**
- **cellular respiration**
- **photosynthesis**

"The Chemicals of Life"

- **water**
  - **inorganic** – No Carbon
  - **polar** (has a positive and negative charge- makes water "sticky")
  - **"universal solvent"** (can dissolve many things- water is the main component of blood)
  - **high heat capacity** (takes a long time to heat up and cool down- helps maintain our body heat)
  - has **surface tension** (insects "walk" on the surface of water)

H_2O

- **carbohydrates**
  - building blocks are **monosaccharides**
  - provides **quick energy** for organisms (glucose- a **monosaccharide**)
  - **cellulose** (makes up plant **cell walls**- provides support; source of **dietary fiber**)

C_1H_2O

- **lipids**
  - long-term **energy storage** ("fats" used in **hibernation**)
  - provide **insulation and protection** (for organs)
  - major component of the **cell membrane** – phospholipids bilayer
- **proteins**
  - building blocks are **amino acids**
  - provide **structure** for organisms
  - **enzymes** (special protein that **speeds up chemical reactions**)
    - affect metabolic activity
    - work at a specific temperature and pH (scale from 0-14; acids = <7; bases >7)
- **nucleic acids**
  - made up of **nucleotides (sugar, phosphate, nitrogen base)**
  - stores and transports **genetic information**
  - **DNA** (double-stranded); **RNA** (single-stranded)
- **minerals**
  - **inorganic**- aid in **cell processes**
- **vitamins**
  - vitamin C (CARE-wound healing), vitamin K (KILL-blood clotting), vitamin D (DOG-bone growth)

Organelles

FOUND IN **ALL TYPES OF CELLS**

- **DNA**
  - stores genetic information
  - found in the nucleus of eukaryotic cells and the cytoplasm of prokaryotic cells
- **cell membrane**
  - controls what enters and leaves the cell
  - maintains water homeostasis
  - made of lipids
- **cytoplasm**
  - the jelly-like fluid that holds the other organelles
- **ribosomes**
  - make proteins (assemble amino acids)

FOUND ONLY IN **EUKARYOTIC CELLS**

- **mitochondria**
  - release energy for the cell
  - site of cellular respiration

FOUND ONLY IN PLANT CELLS

- **cell wall**
  - provide support for plant cells
  - made up of cellulose
- **chloroplast**
  - make glucose (food) for plant cells
  - site of photosynthesis

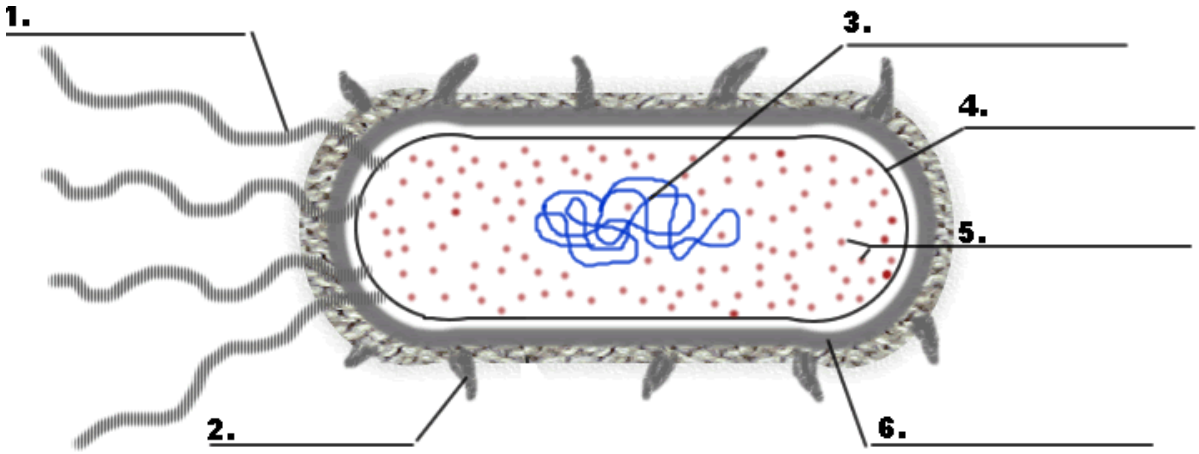
MOVEMENT ORGANELLES

- **flagella** (whip-like structure)
- **cilia** (short hair-like structures)
- **pseudopodia** (cytoplasmic extensions; "false feet")

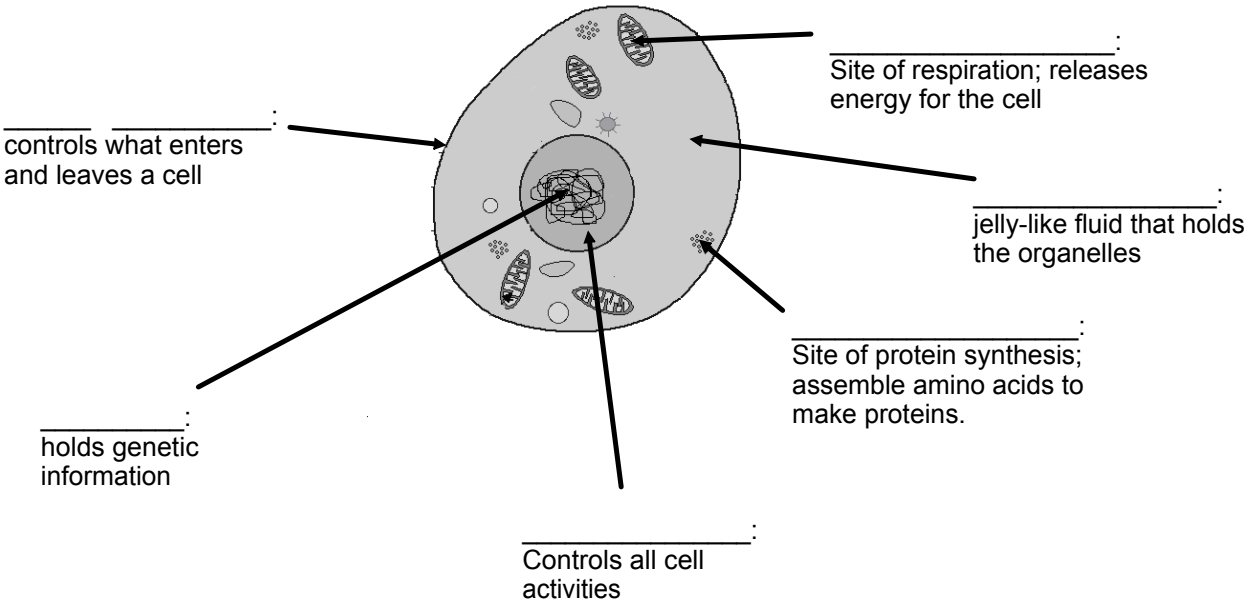
Types of Cells

Prokaryotic

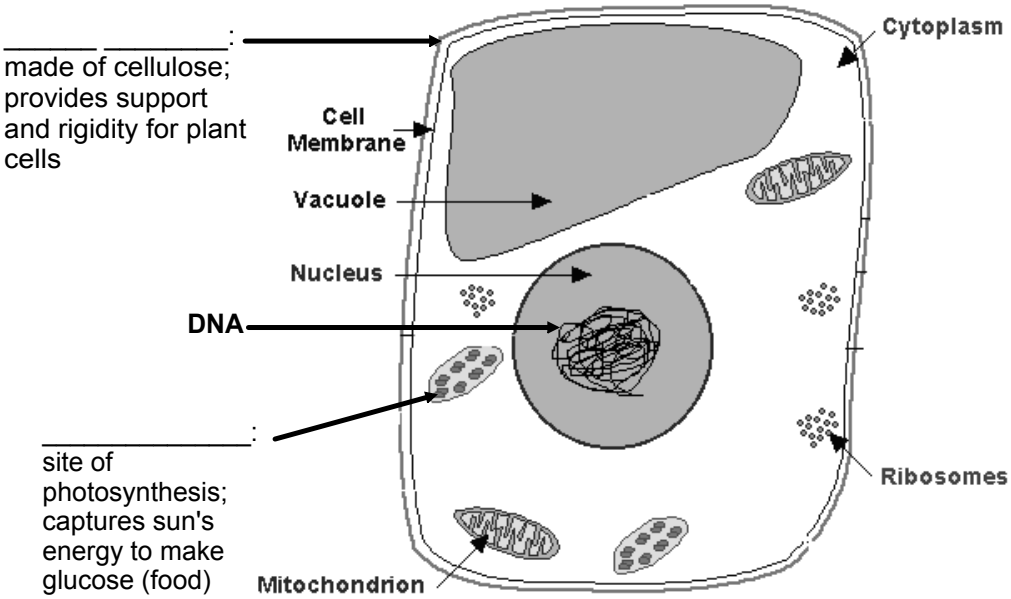
- simple cells without a nucleus
- contain DNA, cytoplasm, ribosomes, and cell membrane (some have cell wall and movement structures)
- example: bacteria



Types of Cells
Animal Cell: A Eukaryotic Cell



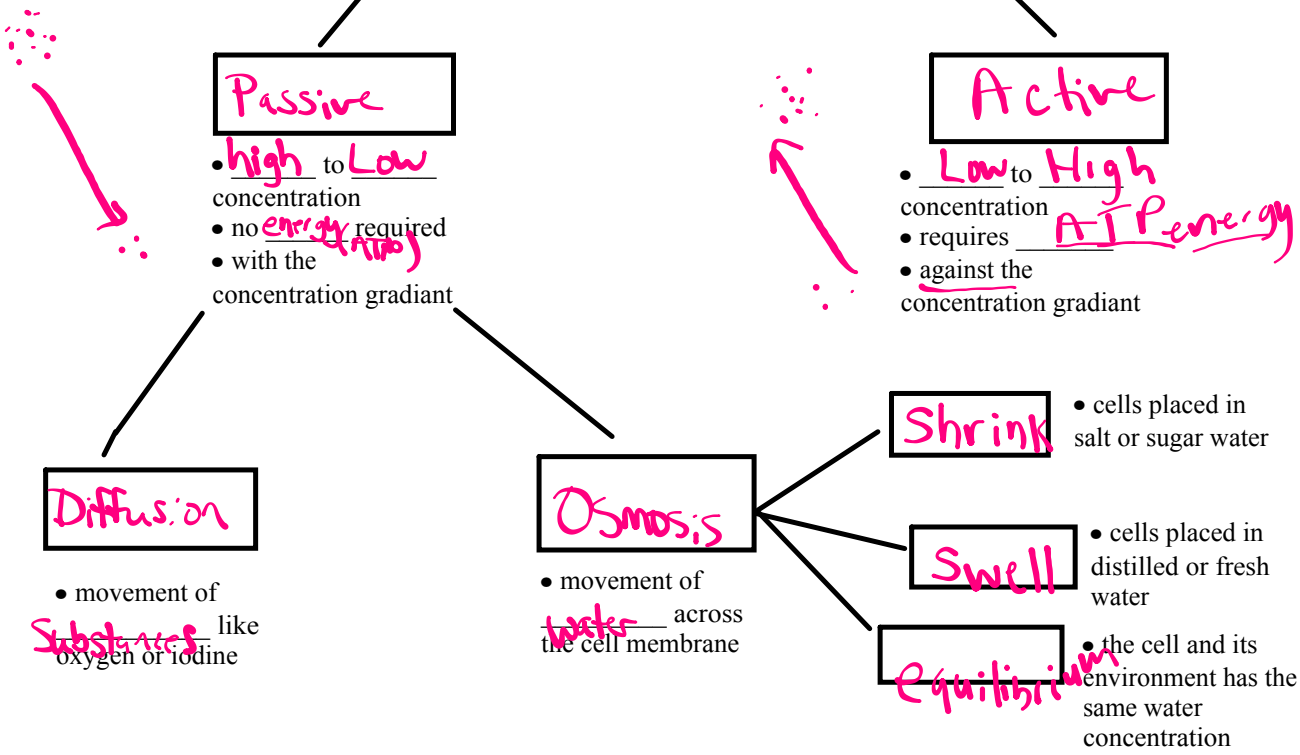
Types of Cells
Plant Cell: A Eukaryotic Cell



Cell Processes: Transport- Osmosis and Diffusion

(maintains homeostasis for the cell)

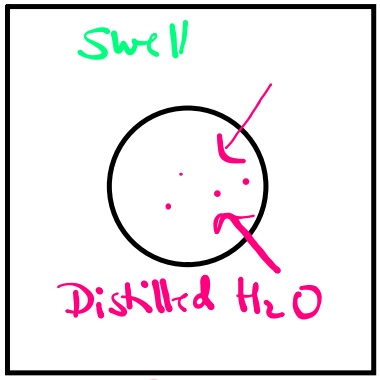
Transport Across the Cell Membrane



Cell in salt or sugar water

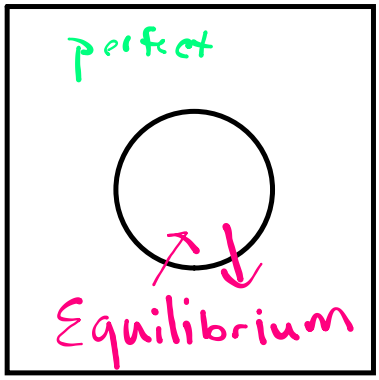
1

Cell in fresh or distilled water



2

Cell and its environment have the same water concentration

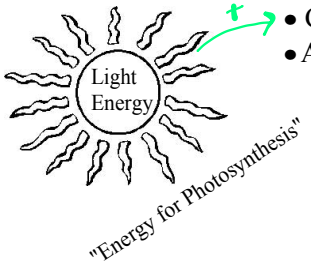


3

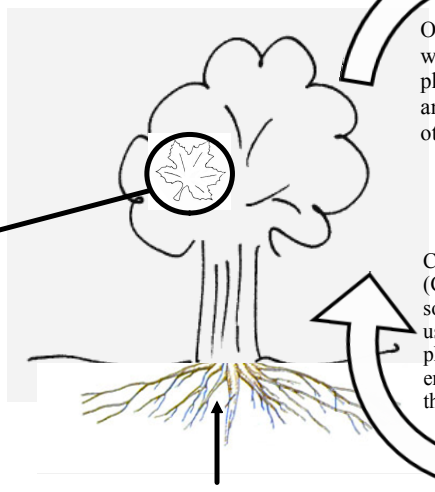
Which cell is at homeostasis? Cell 3

Cell Processes: PHOTOSYNTHESIS

- Carried out by plants, algae, and some bacteria
- CO_2 and H_2O are converted into sugar
- Affected by changes in CO_2 and light intensity



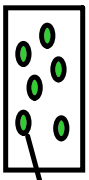
Organisms that don't have light energy use inorganic compounds to make glucose in the process of chemosynthesis.



Oxygen (O_2) is a waste product of photosynthesis and is used by other organisms.

Carbon dioxide (CO_2) is exhaled by some organisms and used in photosynthesisCO_2 enters a plant through its leaves.

Leaves are made of cells



- Chloroplasts are the organelles that carry out photosynthesis.
- Chlorophyll is the green pigment inside the chloroplasts that captures the sun's energy

Water (H_2O) enters the plant through the roots.

$$CO_2 + H_2O + \text{Light Energy} \rightarrow C_6H_{12}O_6 + O_2$$

carbon dioxide + water + light energy → glucose + oxygen

Cell Processes:
CELLULAR RESPIRATION

mitochondria

- **All living things carry out respiration**
- Creates ATP (energy) for cells to use for all of their life functions
- Aerobic respiration requires oxygen and produces a lot of ATP
- Anaerobic respiration does not require oxygen and does not produce a lot of ATP

Cytoplasm bacteria

Fermentation is a type of anaerobic respiration

Products of photosynthesis

Stores energy in chemical bonds!!!

$C_6H_{12}O_6 + O_2 \rightarrow CO_2 + H_2O +$ **ATP (energy)**

Reactants

Products

This is the reverse of photosynthesis!

Reactants of photosynthesis

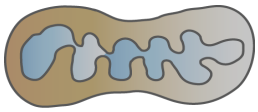
Comes from the food that we eat and digest!

Supplied to our cells through the respiratory and circulatory systems!

Taken out of the cells, into the bloodstream, and to the lungs where it is exhaled.

Found in plant and animal cells!!!

Mitochondria are the organelles that perform aerobic respiration



Certain muscle cells have a lot of mitochondria because they require a lot of energy!!!

As metabolism increases, respiration rate increases!!!