Notes: Cell Structures/Organelles & Cellular Transport

Ch. 7.3 Animal and Plant Cell Structures/Organelles

Plant and animal cells are both examples of eukaryotic cells.

Label the Animal Cell Structures/Organelles
Label the Plant Cell Structures/Organelles

- Nucleus
- Nucleolus
- Cell wall (cellulose)
- Mitochondrion
- Chloroplast
- Cytoplasm
- Golgi apparatus
- Plasma (cell) membrane
- Rough endoplasmic reticulum (ER)
- Smooth endoplasmic reticulum (ER)
- Ribosomes
- Microtubules
- Vacuole
Plant Cell Structures/Organelles Answer Key

- Nuclear pore
- Nucleus
- Nucleolus
- Vacuole
- Microtubule
- Cell wall (cellulose)
- Mitochondrion
- Chloroplast
- Rough endoplasmic reticulum
- Smooth endoplasmic reticulum
- Ribosomes
- Plasma membrane
- Golgi apparatus
- Cytoplasm
Compare and contrast between prokaryotic and eukaryotic cells. Identify an example of each type of cell.

<table>
<thead>
<tr>
<th>Prokaryotic</th>
<th>Both</th>
<th>Eukaryotic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple structure</td>
<td>Genetic material (DNA and/or RNA)</td>
<td>Complex structure</td>
</tr>
<tr>
<td>Smaller cell size</td>
<td>Plasma membrane</td>
<td>Larger cell size</td>
</tr>
<tr>
<td>Unicellular</td>
<td>Ribosomes</td>
<td>Unicellular or multicellular</td>
</tr>
<tr>
<td>No nucleus</td>
<td>Require energy</td>
<td>Nucleus</td>
</tr>
<tr>
<td>No membrane-bound organelles</td>
<td>Maintain homeostasis</td>
<td>Membrane-bound organelles</td>
</tr>
</tbody>
</table>

Example: Bacteria

Example: Animal, Plant, Protist, Fungi

Compare and contrast plant and animal cells.

<table>
<thead>
<tr>
<th>Plant</th>
<th>Both</th>
<th>Animal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rectangular cell shape</td>
<td>Genetic material (DNA and/or RNA)</td>
<td>Round cell shape</td>
</tr>
<tr>
<td>Cell wall (cellulose)</td>
<td>Nucleus</td>
<td>No cell wall</td>
</tr>
<tr>
<td>Chloroplasts</td>
<td>Plasma membrane</td>
<td>No chloroplasts</td>
</tr>
<tr>
<td>No lysosomes</td>
<td>Mitochondria</td>
<td>Lysosomes</td>
</tr>
<tr>
<td>No centrioles</td>
<td>Ribosomes</td>
<td>Centrioles</td>
</tr>
<tr>
<td>No cilia</td>
<td>Eukaryotic</td>
<td>Cilia</td>
</tr>
<tr>
<td>Large vacuole</td>
<td>Golgi apparatus</td>
<td>Smaller vacuoles (if present)</td>
</tr>
</tbody>
</table>
Ch. 7.4 Cellular Transport

Cellular transport –

Movement of substances across plasma (cell) membrane.

Two Types of Cellular Transport:

1. **Passive Transport** - movement of particles across plasma (cell) membrane without using energy. *NO ENERGY*

Examples of Passive Transport (no energy required):

a. Diffusion - net movement of particles from an area of higher concentration to an area of lower concentration that does not require energy.

Factors that affect the rate of diffusion:

- Temperature
- Pressure
- Concentration

If ↑ Temperature, Pressure, and/or Concentration, then ↑ rate of diffusion.

When diffusion of substances into the cell = diffusion of substances out of the cell (no net movement of particles), the system is at **dynamic equilibrium**.
b. facilitated diffusion - uses transport proteins (facilitators) to move ions and other small molecules across the plasma membrane without using energy.

Facilitators (helpers)
- Channel proteins
- Carrier proteins

\[ \text{Osmosis} \] - diffusion of water across a plasma (cell) membrane.

2. **Active Transport** - movement of particles across plasma (cell) membrane using Energy. *ENERGY*

Examples of Active Transport (requires energy):

a. Sodium (Na⁺)/Potassium (K⁺) ATPase Pump

Found in the Plasma (cell) membrane of animal cells.

Exchanges 2 **K⁺** into the cell for 3 **Na⁺** out of cell.
b. **Endocytosis** - Process by which a cell surrounds a substance in the outside environment, causing its enclosure in part of the plasma membrane.

Ex. White blood cells engulfing bacteria

c. **Exocytosis** - Process by which a substance is secreted from the inside of the cell to the outside environment.

Ex. Secretion of hormones from endocrine glands

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**Table:**

<table>
<thead>
<tr>
<th>Passive Transport</th>
<th>Both</th>
<th>Active Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>• No energy</td>
<td>• Transport substances across plasma membrane</td>
<td>• Requires energy</td>
</tr>
<tr>
<td>• Moves particles from high → low concentration (with concentration gradient)</td>
<td>• Use proteins</td>
<td>• Moves particles from low → high concentration (against concentration gradient)</td>
</tr>
<tr>
<td>Example 1 Diffusion 2 Facilitated Diffusion 3 Osmosis (diffusion of H₂O)</td>
<td>• Maintain homeostasis</td>
<td>Example 1 Na⁺/K⁺ Pump 2 Endocytosis 3 Exocytosis</td>
</tr>
</tbody>
</table>

Compare and contrast passive and active transport? Provide an example of each type of transport in your response.
How do cells react in 3 types of solutions?

<table>
<thead>
<tr>
<th>Solute Content</th>
<th>Purpose</th>
<th>Used by</th>
<th>Examples (% of Carbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less Solute</td>
<td>Quickly replace the fluids lost by sweating but low in carbohydrates</td>
<td>Those who need hydration without such a hit of carbs, e.g., jockeys, gymnasts</td>
<td>2</td>
</tr>
<tr>
<td>More Water</td>
<td>Quickly replace the fluids lost by sweating and provide a boost of carbohydrates</td>
<td>The most commonly drunk by athletes, footballers and other sports people</td>
<td>6.3</td>
</tr>
<tr>
<td>Equal Solute</td>
<td>To supplement carbohydrate intake</td>
<td>Those who need very high levels of energy. Best drunk after exercise to top up on muscle glycogen stores</td>
<td>6</td>
</tr>
<tr>
<td>Equal Water</td>
<td></td>
<td></td>
<td>6.4</td>
</tr>
<tr>
<td>More Water</td>
<td></td>
<td></td>
<td>9.1</td>
</tr>
<tr>
<td>Hypotonic</td>
<td></td>
<td></td>
<td>10.7</td>
</tr>
<tr>
<td>Isotonic</td>
<td></td>
<td></td>
<td>15.9</td>
</tr>
<tr>
<td>Hypertonic</td>
<td></td>
<td></td>
<td>17.2</td>
</tr>
</tbody>
</table>

1. **Isotonic Solution**  
   *Iso-* means equal or same  
   - Solution in which water and other substances diffuse into and out of the cell at an equal rate (equilibrium, no net movement of water).

RESULT: The cell size **remains the same (no change)**
2. Hypotonic Solution  

* Hypo- means **less than or under**
* Less [solute] & More [H₂O] in solution than the cell
- Solution where there is more water outside the cell than solute, water moves **into** the cell causing the cell to swell or burst.

RESULT: The cell size **increases/expands/may burst**.
* Animal cells may burst in hypotonic solutions because no cell wall

3. Hypertonic Solution  

* Hyper- means **more than or above**
* More [solute] & Less [H₂O] in solution than the cell
- Solution where there is less water outside the cell than solute, water moves **out** of the cell causing it to shrink.

RESULT: The cell size **decreases/shrinks/shrivels**.