

**Simulation Title:**

*Cell Commander*

**Learning Goal:**

Visually identify the typical structures (*organelles*) of a plant vs. animal cell.

Describe the function of each organelle.

**Mission Task:**

Control the organelles of a plant or animal cell in order to stay alive through maintaining the proper biological balance despite constantly changing conditions both inside and outside of the cell.

**Cover Story:**

You are the control center (*Nucleus*) of a cell (select plant or animal in advance). Both the external and internal conditions of your environment are constantly changing. Too much or too little of a nutrient can be harmful. A Biological balance must be maintained. This equilibrium is called *Homeostasis*, and it ensures your survival.

Additionally, you will need to keep out dangerous invaders while at the same time, sending off the proteins you make to the rest of the body/stalk.

Sound easy? Guess again. Good Luck!

**Role:**

As the *Nucleus*, you have control over all the other organelles in the cell. When an event occurs either inside or outside the cell, select the proper organelle to handle the job:

Animal Cell:

Plant Cell:

Nucleus-Control Center

Nucleus-Control Center

Cell Membrane-External Protection

Cell Membrane-External Protection

Mitochondria-Power Plant

Mitochondria-Power Plant

Endoplasmic Reticulum-Internal Transport E.R.-Internal Transport

Golgi Body-Waste Packaging

Golgi Body-Waste Packaging

Ribosomes-Construction/Repair

Ribosomes-Construction/Repair

Vacuoloe-Storage

Central Vacuole-Storage

Lysosomes-Internal Protection

Cell Wall-External Support

Centrioles-Reproduction

Chloroplast-Energy Converter

Since you are aware of what is happening everywhere in the cell, you may use key commands to view any part of the cell that you wish. You may zoom in for close ups on organelles, or pull back to view the entire cell from the outside.

**Scenario:**

1) Because the body has been healthy (animal)/the weather has been temperate (plant), the cell's organelles have been working ahead of schedule. Since there are extra proteins and sugars in the cell, they should be saved for later. Which organelle would you instruct to collect and hold onto the extra molecules?

2) Too many salts are surrounding the cell in the blood (animal)/in the soil (plant), and the cell is shriveling. Which organelle would you instruct to be more active in keeping the cell's water from leaving?

3) The body has caught a cold (animal)/The plant has caught a disease (plant), and invading bacteria/fungus are attacking the cell. Which organelle would you instruct to destroy the bacteria's/fungi's invasive proteins that have entered the cell?

4) The body is running up and down the court during a basketball game (animal)/The plant has gone weeks without seeing the sun (plant). The organism is getting very tired by the fourth quarter (animal)/end of winter (plant). Which organelle would you instruct to increase energy production?

Bonus 5) The body (animal)/stem (plant) has just been in a car accident (animal)/whacked with a power mower (plant) and needs to heal. Which organelle should be activated first, second, third, fourth, and fifth in order to move the much needed proteins out of the cell and to the rest of the organism?

Students who elect to play in “advanced” mode will need to choose organelles carefully, as they will have to remedy the outcome that results from an incorrectly selected organelle.

**Resources:**

A help menu will be available, in which a student may search either the name of an organelle for its function, or vice versa.

A .pdf document may also be printed for hard copy reference with a table that identifies each organelle by name, image, and function.

After the third mistakenly selected organelle, a student may ask the nucleus of a neighboring cell which organelle they would employ to do the job.

**Feedback:**

Visual:

Correctly selecting an organelle will cause it to flash green while it performs its task.

Incorrectly selecting an organelle will cause it to flash red while it performs its job, further throwing off the balance of the cell.

Written:

Students may also choose to have a text window open that describes the action performed by the organelle they have selected.

Verbal:

If the simulation is performed virtually, the player may listen to real-time help from a partner, the observing class, a field “expert” viewing simultaneously from another part of the globe, or the instructor.

**Developmental Needs:**

Within each “scenario”, create outcomes for incorrectly selected organelles.

Examples:

In scenario 1: if a student selects a lysosome instead of a vacuole, the proteins will be destroyed and lost to the cell.

In scenario 2: if a student selects a golgi body instead of the cell membrane, the cell will package water to be expelled, causing an INCREASE in water loss.

In scenario 3: If a student select the endoplasmic reticulum instead of the lysosome, the cell will spread the proteins around the cell, making it more difficult to contain.

**Expansion:**

Have students select various types of human cells to have them work with different organelle concentrations:

Nerve Cell: no Centrioles, additional Mitochondrion

Muscle Cell: additional Mitochondrion

Red Blood Cell: no organelles