LESSON 5
PLANT AND ANIMAL CELLS

California Science Standard 5th Grade – Life Sciences

2.a. Students know many multicellular organisms have specialized structures to support the transport of materials.

2.e. Students will know how sugar, water and minerals are transported in a vascular plant.

2.f. Students know plants use carbon dioxide (CO_2) and energy from sunlight to build molecules of sugar and release oxygen.

2.g. Students know plant and animal cells break down sugar to obtain energy, a process resulting in carbon dioxide (CO) and water (respiration).

California Science Standard 5th Grade – Investigation and Experimentation

6.e. Identify a single independent variable in a scientific investigation and explain how this variable can be used to collect information to answer a question about the results of the experiment.

6.g. Record data by using appropriate graphic representations (including charts, graphs, and labeled diagrams) and make inferences based on those data.

6.i. Write a report of an investigation that includes conducting tests, collecting data or examining evidence, and drawing conclusions.

National Science Standards Life Science Content Standard C grades 5-8

Living systems at all levels of organization demonstrate the complementary nature of structure and function. Important levels of organization for structure and function include cells, organs, tissues, organ systems, whole organisms, and ecosystems.

All organisms are composed of cells—the fundamental unit of life. Most organisms are single cells; other organisms, including humans, are multicellular.

Cells carry on the many functions needed to sustain life. They grow and divide, thereby producing more cells. This requires that they take in nutrients, which they use to provide energy for the work that cells do and to make the materials that a cell or an organism needs.

Specialized cells perform specialized functions in multicellular organisms. Groups of specialized cells cooperate to form a tissue, such as a muscle. Different tissues are in turn grouped together to form larger functional units, called organs. Each type of cell, tissue, and organ has a distinct structure and set of functions that serve the organism as a whole.

Lesson Plan: Plant and Animal Cells

Objective

Students will learn about the main components of both animal and plant cells.
The main differences between a plant cell and an animal cell is that plant cells have a cell wall, a large vacuole and chloroplasts.

Why the three differences matter:

- Having a cell wall is what gives plants their "rigidity."
- The large vacuole must stay hydrated or the plant will wilt.
- Chloroplasts are what allow plants to photosynthesize (and gives them their green color).

Materials

Ziploc plastic bags
Inside a Cell Worksheet
Glossary which describes each organelle and its function
Venn Diagram
plastic bag
warm water
large bowl
square food storage container about 4"x4"x4"(for the plant cell only)
cranberries or raisins (Golgi body)
grapes (vacuoles)
1 plum (nucleus)
2-4 tangerine pieces (mitochondria)
2-4 peas (lyosome for animal cells)
peas (chloroplasts)
softened spaghetti noodles (endoplasmic reticulum)
pepper (ribosomes)
lemon Jell-O mix

Key Vocabulary: see glossary

Lesson

Plant and animal cells have a great deal of similarities between them. The smaller components inside the cells, called organelles, perform the same functions in each kind of cell. Have students look at the side by side diagrams of plant and animal cells. Using the venn diagram, have students note similarities and differences between the two. Have the students read over the definitions of each organelle in the glossary and write a one sentence summary in their own words.

Activity

3D Plant Cell Project + 3D Animal Cell Variation

Adapted from a lesson from the website; http://www.science-ideas.com/3d-plant-cell-model

All you need for your own 3D plant cell model are a few ordinary household objects. Additionally a few food item ded to illustrate the parts of the cell. Any of these foods can be substituted by a different food item, depending on what's available to you. The only thing one might strongly adhere to is to have the chloroplast be green. Other cell models use non-food items, but having students eventually eat the cells might make it more memorable. One could have a "tea party" in which students dine on their cells and comment on the textures and tastes of the chloroplasts and vacuoles.

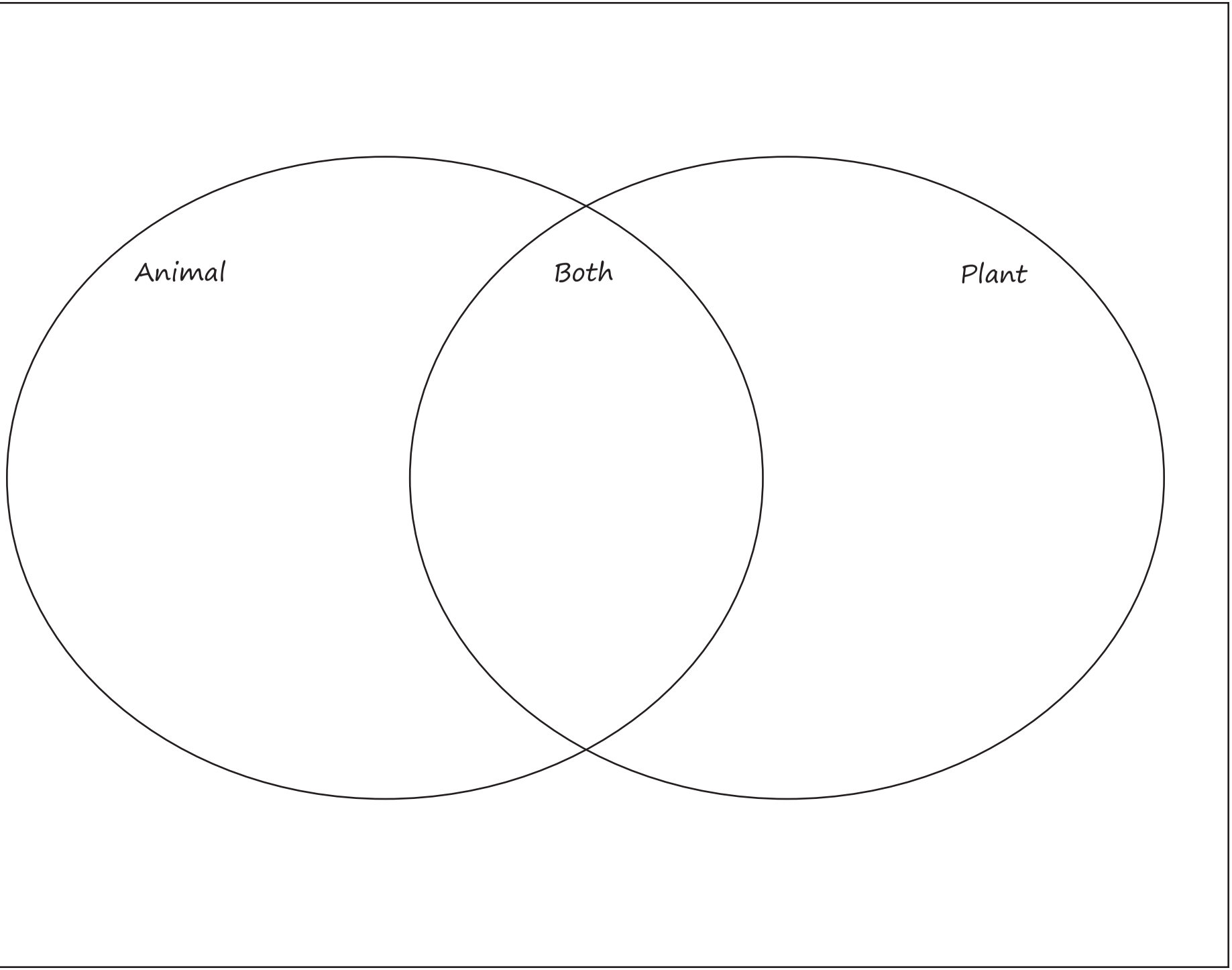
Steps to creating a 3D cell model:

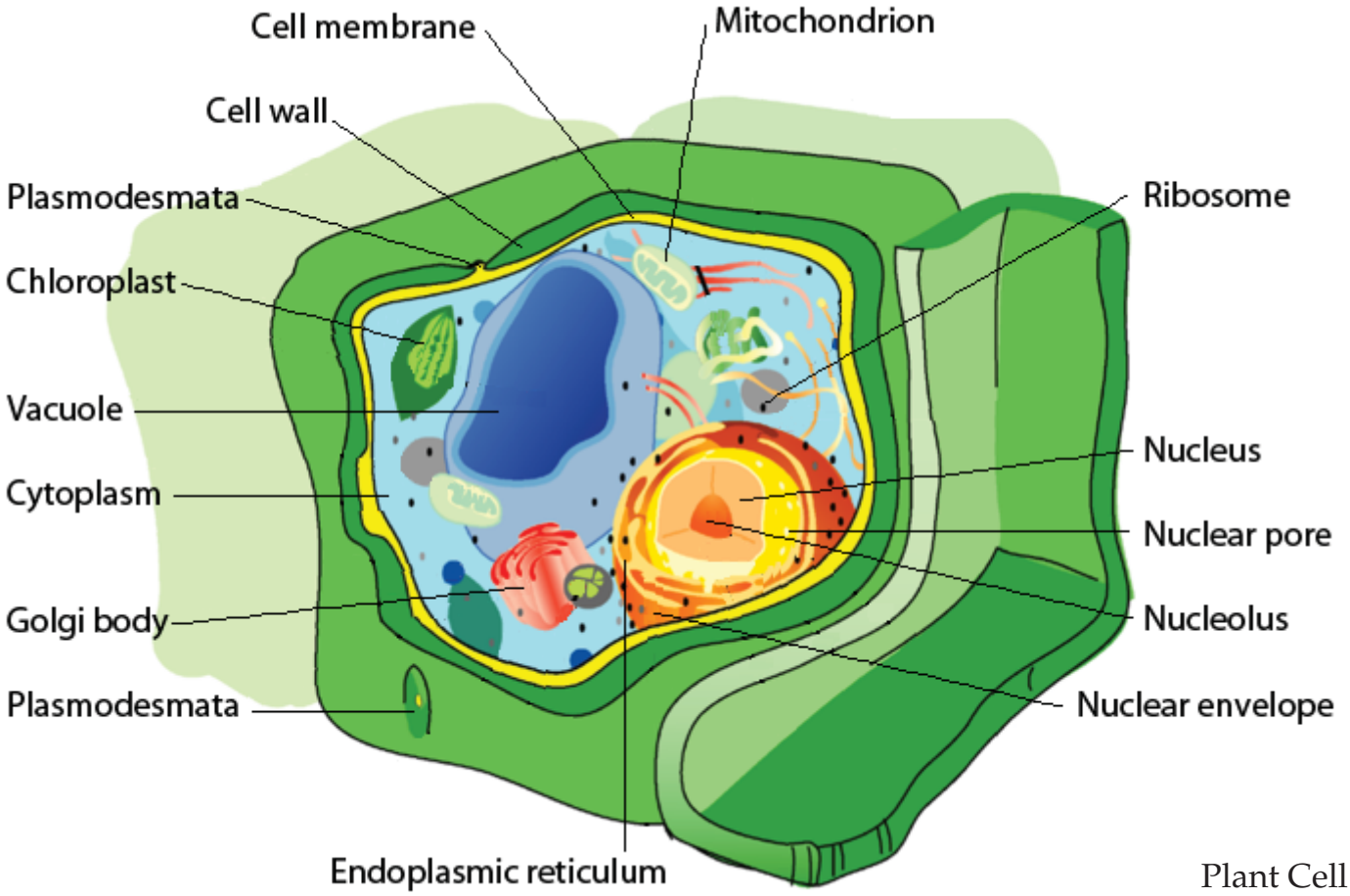
- Place your plastic bag in the square plastic container. The plastic bag needs to line the entire container as a **cell membrane**. This will create a block-like plant cell shape when completed, and the plastic container will represent a **cell wall**. (Variation: For an animal cell, simply open a plastic bag and lay it on a table. No container is needed for shaping.)
- The Jell-O needs to be mixed with warm water in a large bowl. Follow the instructions on the box to see how much water to use for the Jell-O package. Lemon is probably the best flavor to use because it is the most transparent.
- Fill up the plastic bag(s) with the warm Jell-O liquid. It should be near the top of the container.
- While the Jell-O has not hardened or firmed up, add the smaller parts of the cell to each bag. These are also called the **organelles**.
- What does each piece of fruit represent? The plums represent the nucleus, the tangerines represent **mitochondria**, peas represent **chloroplasts** (only for plant cell in square container), spaghetti represents **endoplasmic reticulum**, raisins or cranberries represent the **Golgi body**, grapes represent the **vacuoles**, pepper particles represent **ribosomes**.
- Close each plastic bag with a twist tie and place in a refrigerator until the Jell-O sets up. This will not take place for several hours or longer.

Have students draw their cells and label each organelle.

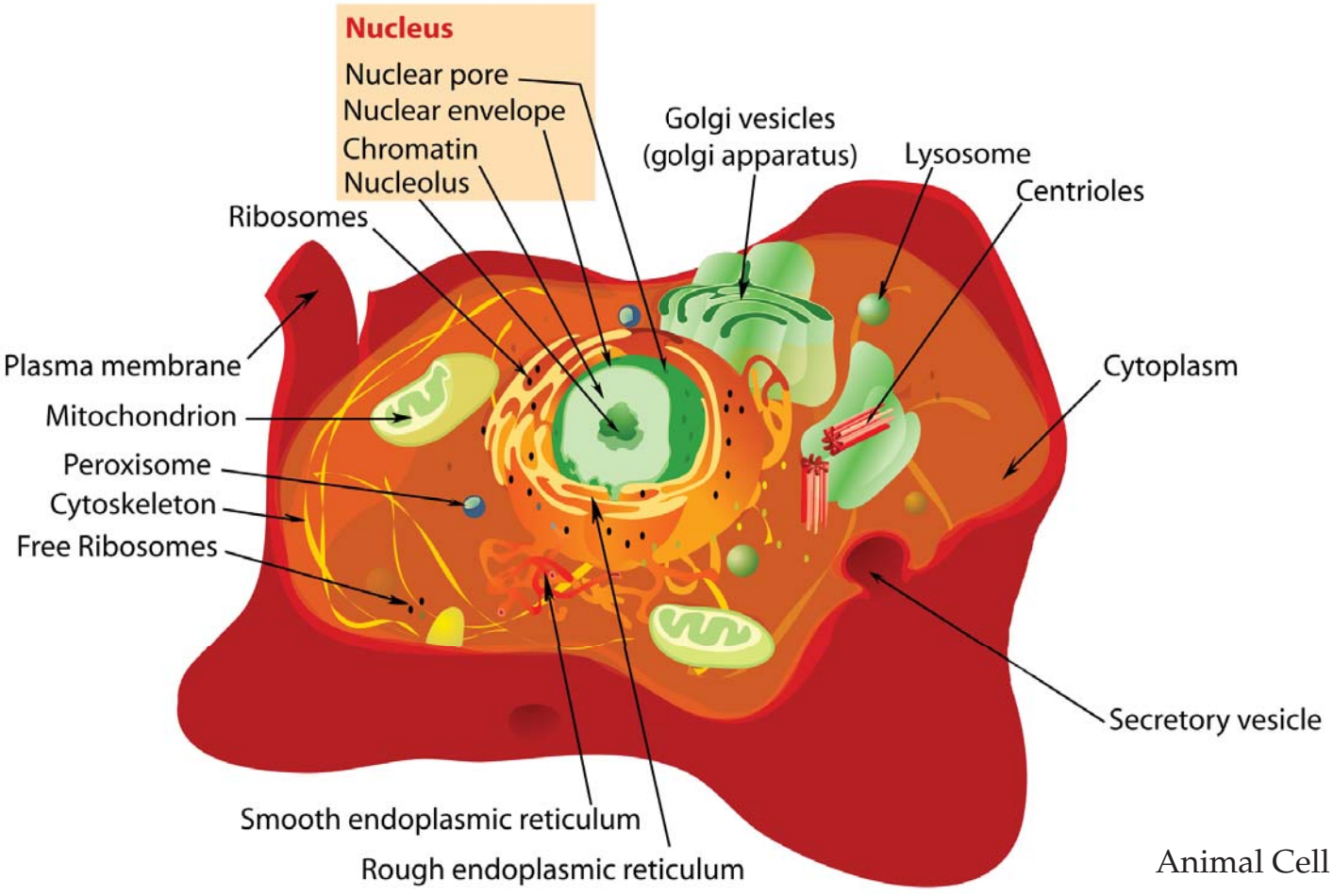
Assessment

Give students a diagram (minus labels) of either a plant or animal cell, or both, and have them fill in the names of the various organelles. They could also do a matching activity where they must connect an organelle with a definition of its function.

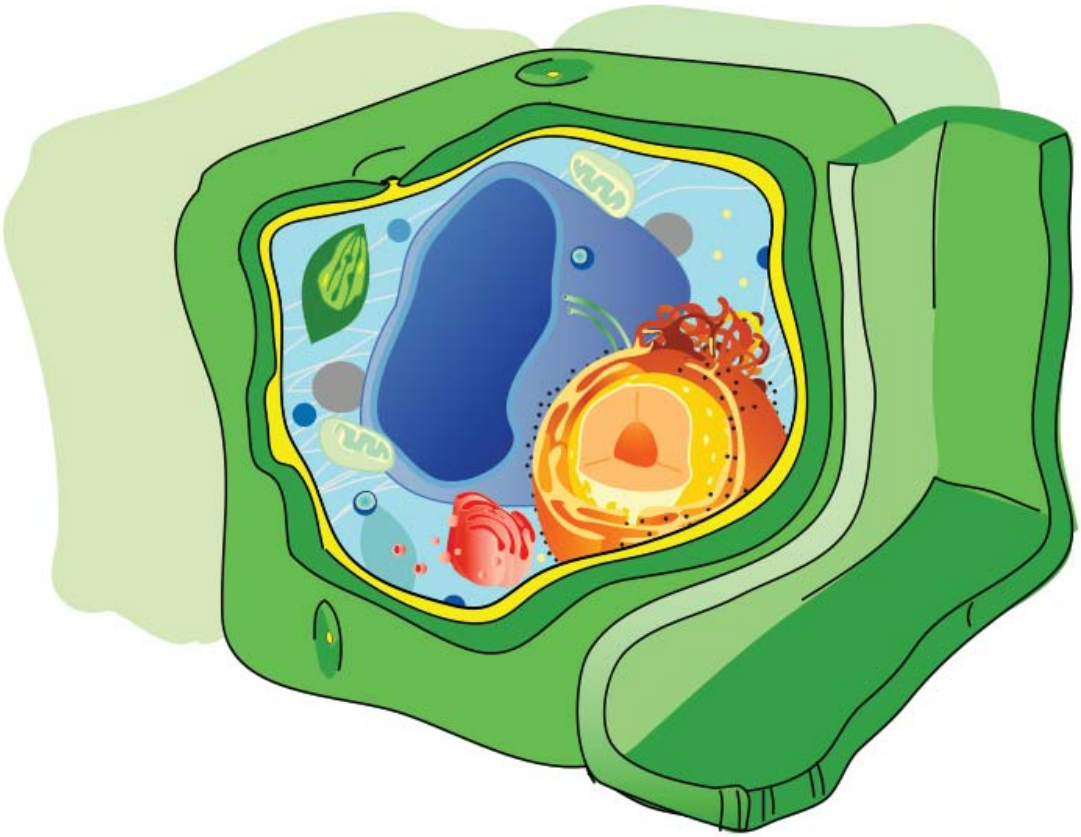

Animal
Both
Plant



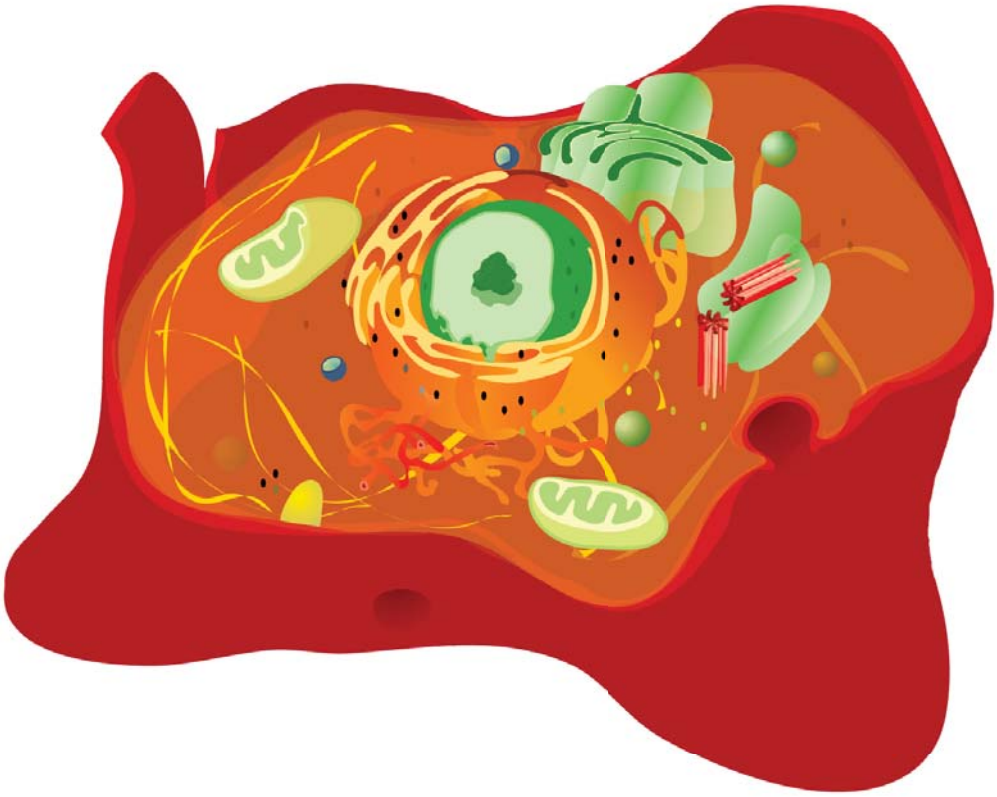
Plant Cell



Animal Cell



Plant Cell



Animal Cell

Inside a Cell Worksheet

Lesson Plan Glossary

- **Cell membrane** - A thin layer that surrounds a cell. It is located just inside the cell wall and acts like a guard, allowing some substances to pass through it while keeping others out.
- **Cell wall** - A tough, rigid layer that surrounds a plant cell. Cell walls can also attach to other cell walls to help form the structure of a plant.
- **Chloroplast** –Disc-shaped organelle containing chlorophyll and the location where photosynthesis occurs.
- **Cytoplasm** - A gooey substance like jello that contains all the cell's organelles outside of the nucleus.
- **Endoplasmic reticulum (ER)** - A system of membranes forming tubular compartments within the cytoplasm. ER can be smooth or rough, and coated with ribosomes.
- **Golgi bodies** - Organelles found near the nucleus in most eukaryotic cells that help to process and package proteins and carbohydrates into vesicles that are processed out of the cell.
- **Lysosomes** - The cell's garbage disposal system. Found only in animal cells, they are round organelles and contain enzymes that digest extra or worn-out organelles, food particles, and viruses or bacteria.
- **Mitochondria** - Capsule-shaped organelles that have a double membrane. The mitochondria's function is to provide energy for the cell.
- **Nucleus** - The brain of the cell. It controls many of the cell's functions and contains the DNA (in the form of chromosomes).
- **Organelle** - Membrane-bound body in the cytoplasm of a cell.
- **Peroxisome** - Single-membraned organelle present in almost all eukaryotic cells. Peroxisomes contain enzymes that digest harmful or poisonous substances.
- **Ribosomes** - Tiny round organelles that are the protein-making factories of the cell. Sometimes they float free in the cytoplasm and sometimes they are attached to endoplasmic reticulum.
- **Secretory vesicle** - Small pouch or sack, enclosed in a membrane, that can store substances ready for excretion from the cell.
- **Vacuole** - Membrane-lined area within a plant cell that is filled with water. This organelle takes up much of the space inside a cell and helps maintains its shape and size.