

**SCIENCE**  
**Life Science**  
**Grade 8**  
**Cells**

**Overview:**

In this lesson, students will develop an understanding of cells and cell processes. They will make a substance similar to cytoplasm, create a model of a cell with all its parts, and simulate osmosis and diffusion of materials in the cell.

**Lesson Duration:**

This unit will take 1-3 class periods to complete, depending upon the length of class periods.

**Benchmarks:**

LS-M-A1 Describing the observable components and functions of different plant and animal cells

LS-M-A2 Comparing and contrasting the basic structures and functions of different plant and animal cells

SI-M-A5 Developing models and predictions using the relationship between data and explanations

**Teacher Preparation:**

- The teacher will need to gather the necessary materials to complete these activities.
- By eighth grade, students should have already been introduced to the concept of cells and their parts. Some prior knowledge will be necessary to complete the activities.
- Prepare materials for class cell model and organelles.

**Teacher Notes on Content:**

The teacher will need to be aware of the following terms and ideas. Additional information about the individual organelles can be found in the information sheets at the end of the lesson.

1. **Cell-** The basic unit of structure and function in living things.
2. **Organelles-** The structures within cells; organelles allow cells to perform life functions. *Examples include:*
  - Cell membrane-** forms the outer boundary of the cell
  - Cytoplasm-** the gel-like material inside the cell membrane

**Nucleus-** the structure, centrally located, that directs all the activities of the cell and contains the genetic material, DNA

**Endoplasmic reticulum-** a folded membrane that serves as a pathway for materials to move from the outer membrane to the nucleus in the cell

**Ribosomes-** the protein factories of the cell

**Golgi bodies-** package and move proteins to the outside of the cell

**Mitochondria-** organelles that break down food molecules and release energy

**Lysosomes-** bubble like structures containing enzymes that digest wastes and worn-out cell parts

**Vacuoles-** storage areas in the cell

**Cell wall-** in plant cells, the cellulose structure that supports and protects the cell

**Chloroplasts-** in plant cells, the organelles that convert light energy into food molecules called glucose

**3. Cell Theory-** The cell theory consists of three components listed below:

1.) all organisms are made up of one or more cells,

2.) cells are the basic units of structure and function in all organisms, and

3.) all cells come from cells that already exist.

**4.** Cells differ in size, shape, and function.

**5. Diffusion-** the movement of molecules from an area where there are many to an area where there are few

**6. Osmosis-** the movement of water through a cell membrane by diffusion

### **Materials/Equipment:**

#### *Activity One:*

100 mL of water per group, or just one if teacher is demonstrating

1 packet of unflavored gelatin

large, clear plastic cup or beaker

#### *Activity Two:*

Cell Parts Information Sheets (laminated if possible)

Poster paper, chart paper (group model),

Blank cell model sheet (individual model)

Colors, markers, or color pencils

Music (optional)

Construction paper (optional)

Glue (optional)

#### **Activity three-**

1 can of air freshener

**Set or Opener:**

*Activity one: (5 min)*

1. Have each group of students mix 1 packet of unflavored gelatin to 100 mL of water and stir. The teacher can also make this mixture ahead of time or as a demonstration. Allow students time to observe the mixture.
2. Have students record their observations in their journals or on a piece of paper.
3. OPTIONAL- depending upon the level of your students, you may want to have them define the key terms at the beginning of the period so they will have already seen them when activity two starts.

**Body of Lesson:**

*Activity two:*

*(25-30 min) the Musical Cells Game*

1. Explain to the students that we are beginning to study objects that have the consistency and appearance of the mixture they just observed. These objects are called **cells**, which are too small to be observed with the naked eye. There are also a number of even smaller structures floating around within these cells called **organelles**. Because cells are so small, and their organelles are even smaller, models are a good way for us to simulate what they look like.
2. Each student will need a blank cell model sheet, and colors, markers, or color pencils. Have students label the **cell membrane**, **nucleus**, and **cytoplasm** on the blank sheet. Explain the function of each of these cell parts to students.
3. Divide the class into six small groups or pairs. Depending on the number of students in each class, give each group or pair of students one of the Cell Parts Information sheets 1-6, containing information about the **endoplasmic reticulum**, **ribosomes**, **golgi bodies**, **mitochondria**, **lysosomes**, and **vacuoles**. Cell information sheets 7 and 8 will be used to differentiate between plant and animal cells in step 6.
4. Each group will have 3-5 minutes per sheet to read and discuss the cell part, its structure and function, and then add it to their model. Music can be playing during this time. When the music stops or time is called, the students pass the sheets to the next group.
5. When all groups are finished making their models, each group will have one cell part information sheet at their table. That is the cell part that the group is responsible for adding to the class model on the poster board or chart paper. Construction paper and glue can be used for this class model, and the parts can be cut out prior to class to save time. Each group has to come to the class model, add the cell part, and explain its function to the class. The teacher will need to provide any other necessary information that the students may leave out. Have students take notes on content during these

presentations, or have the Cell Parts Information Sheets available as handouts.

6. Refer to Cell Parts information sheets 7 and 8. Explain that in plant cells, there are a few different parts that are not found in animal cells. The two major differences are the presence of the **cell wall** and **chloroplasts**. Explain the structure and function of these two organelles, and have students label the differences on their model. You may want to have students draw an entirely new model so that they can understand the rigid nature of plant cells.

### *Activity Three*

*(5 minutes)*

7. Explain to students the idea that materials must move around within the cell and into and out of the cell. Cells move materials through a process called **diffusion**. Diffusion occurs when molecules move from an area of high concentration to an area of low concentration. Cells need to maintain a constant amount of water to perform their functions. A special type of diffusion is called **osmosis**. It is the movement of water across cell membranes.
8. Stand in the corner of the room with the can of air freshener. Ask students to raise their hand as soon as they are able to smell the air freshener. Students will be able to see that the molecules of the air freshener spread from the can (high concentration) throughout the room (low concentration).

### **Closure:**

*(5 minutes)*

- Explain to students that each cell in their bodies is like a factory in many ways.
- Have students brainstorm to make connections as to how the different parts of the cell are like the different parts of a factory. You can record their responses on the board, or have them write their reflections in their journal.

*Possible answers may include:*

The power supply- mitochondria

The conveyer belt or hallways - endoplasmic reticulum

The warehouse- vacuoles

The garbage disposal- lysosomes

Central office – nucleus

Supply room – ribosomes

**Activities, data sheets, lab sheets** are attached.

Attached

**Assessment:**

1. Materials are moved into and out of the cell through which organelle?
  - a. cell membrane
  - b. mitochondria
  - c. ribosomes
  - d. nucleus
  
2. What process allows water to move into and out of the cell?
  - a. Mitosis
  - b. Meiosis
  - c. Osmosis
  - d. Pinocytosis

*Constructed Response:*

Cells are the smallest units of living things. Name and explain the function of at least **two** organelles found in both animal and plant cells.

## Answer Key: Assessment, page 194

1. A
2. C
3. *Answers may include any two of the following:*
  - Cell membrane-** forms the outer boundary of the cell
  - Cytoplasm-** the gel-like material inside the cell membrane
  - Nucleus-** the structure that directs all the activities of the cell
  - Endoplasmic reticulum-** a folded membrane that moves materials around in the cell
  - Ribosomes-** the protein factories of the cell
  - Golgi bodies-** package and move proteins to the outside of the cell
  - Mitochondria-** organelles that break down food molecules and release energy
  - Lysosomes-** digest wastes and worn-out cell parts
  - Vacuoles-** storage areas in the cell

### Reference Links:

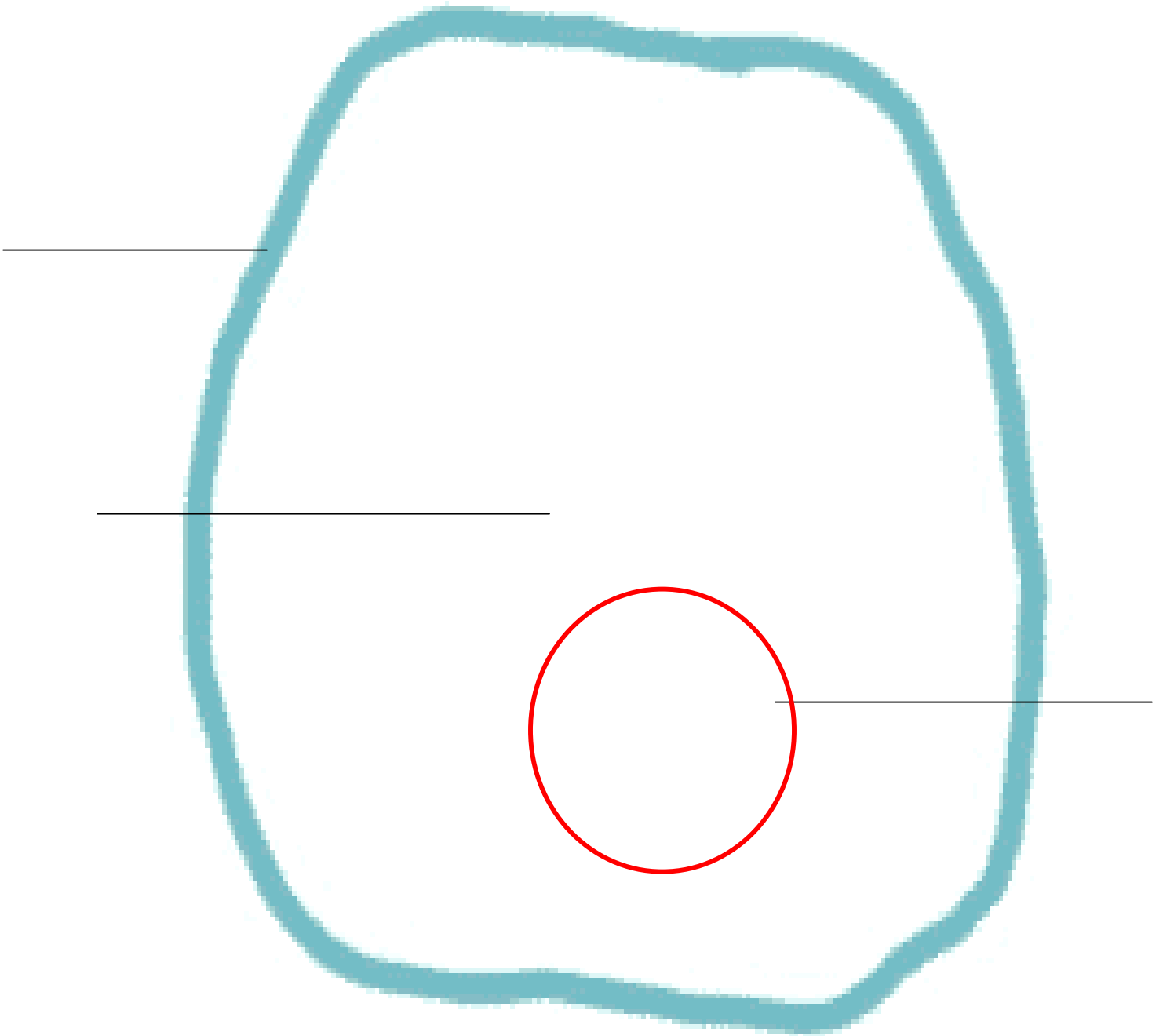
<http://manateemiddle.org/manateemiddle/newpage27.htm>

<http://www.richlandone.org/lrhs/website/internet%20lessons.htm>

<http://library.thinkquest.org/12413/structures.html>

# **Activity Sheets and Resources**

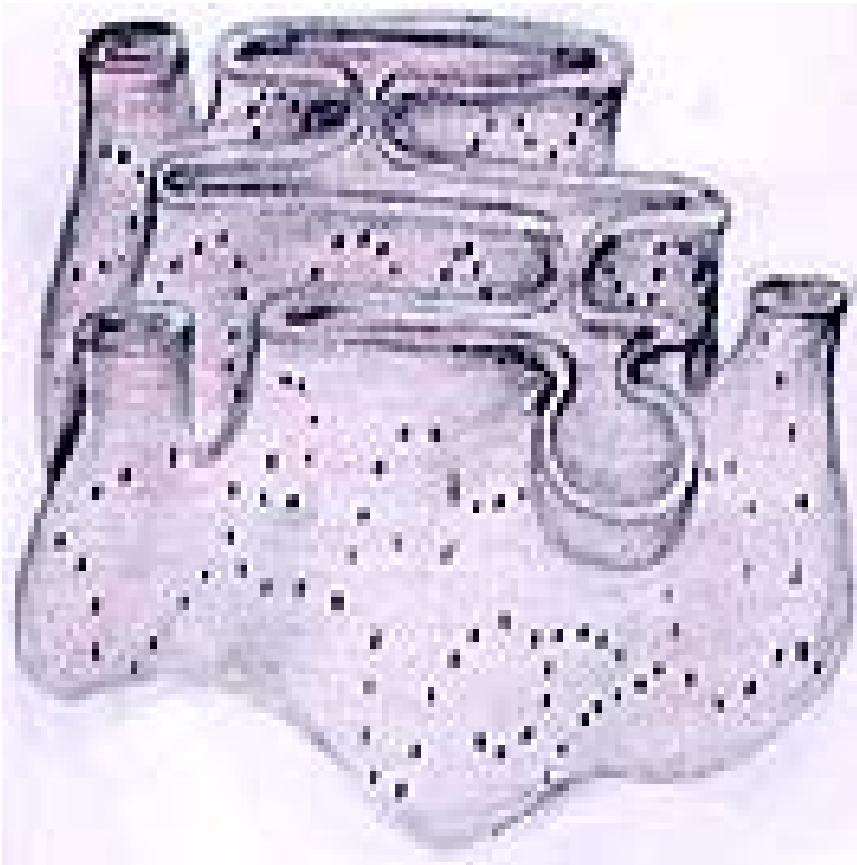
# Cell Model



## Cell Part Information Sheet #1

### Endoplasmic Reticulum

- Tubular network fused to nuclear membrane
- Goes through cytoplasm onto cell membrane
- Stores, separates, and serves as cell's transport system
- Smooth type: lacks ribosomes
- Rough type (pictured): ribosomes embedded in surface



## Cell Part Information Sheet #2

### Ribosomes

- Each cell contains thousands
  - Miniature 'protein factories'
  - Composes 25% of cell's mass
  - Stationary type: embedded in rough endoplasmic reticulum
  - Mobile type: injects proteins directly into cytoplasm



## Cell Part Information Sheet #3

### Golgi Bodies

- Protein 'packaging plant'
- A membrane structure found near nucleus
- Composed of numerous layers forming a sac



## Cell Part Information Sheet #4

### Mitochondria

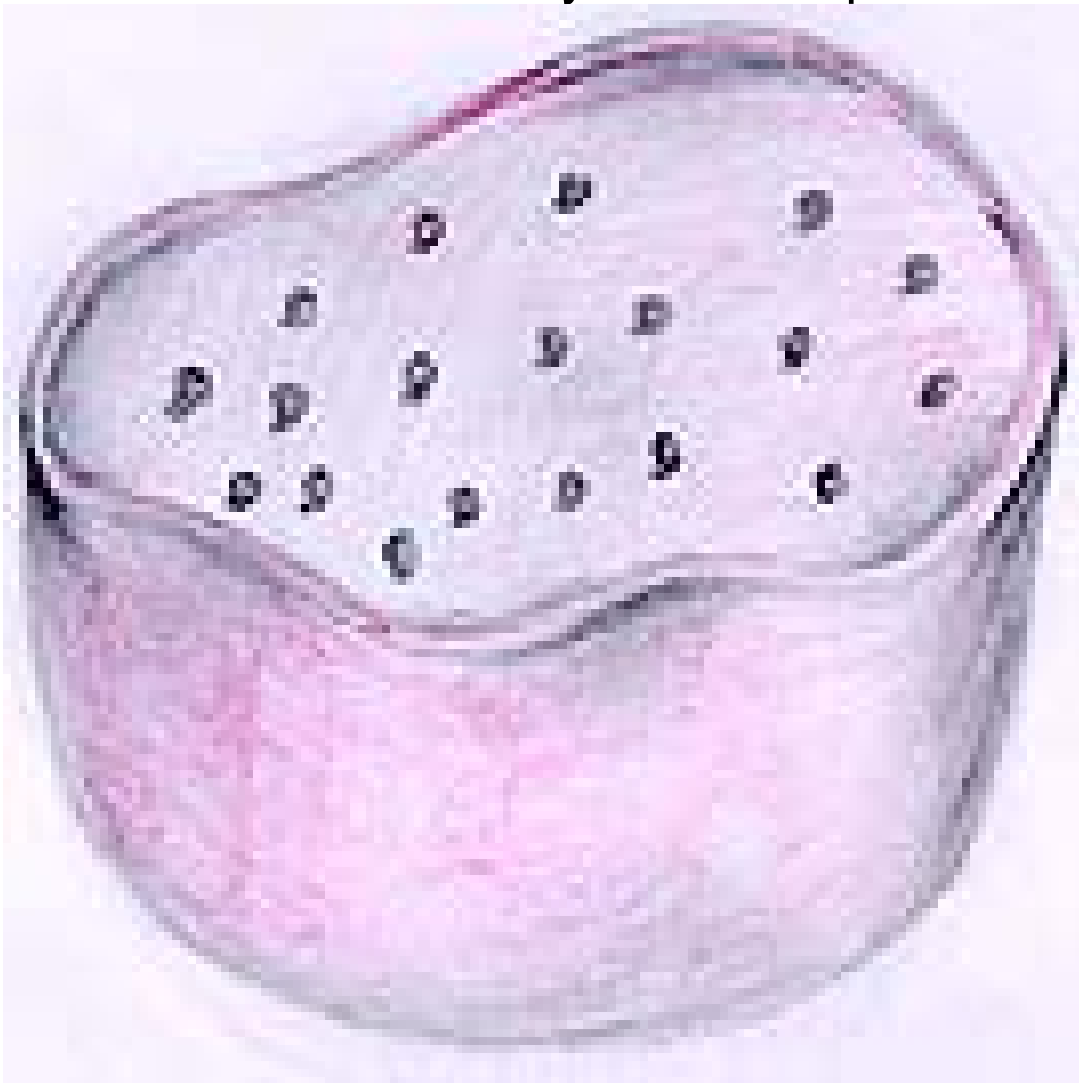
- Second largest organelle with unique genetic structure
- Double-layered outer membrane with inner folds called *cristae*
- Energy-producing chemical reactions take place on cristae
- Controls level of water and other materials in cell
- Recycles and decomposes proteins, fats, and carbohydrates, and forms urea



## Cell Part Information Sheet #5

### Lysosomes

- Digestive 'plant' for proteins, lipids, and carbohydrates
- Transports undigested material to cell membrane for removal
- Vary in shape depending on process being carried out
- Cell breaks down if lysosome explodes



## Cell Part Information Sheet #6

### Vacuoles

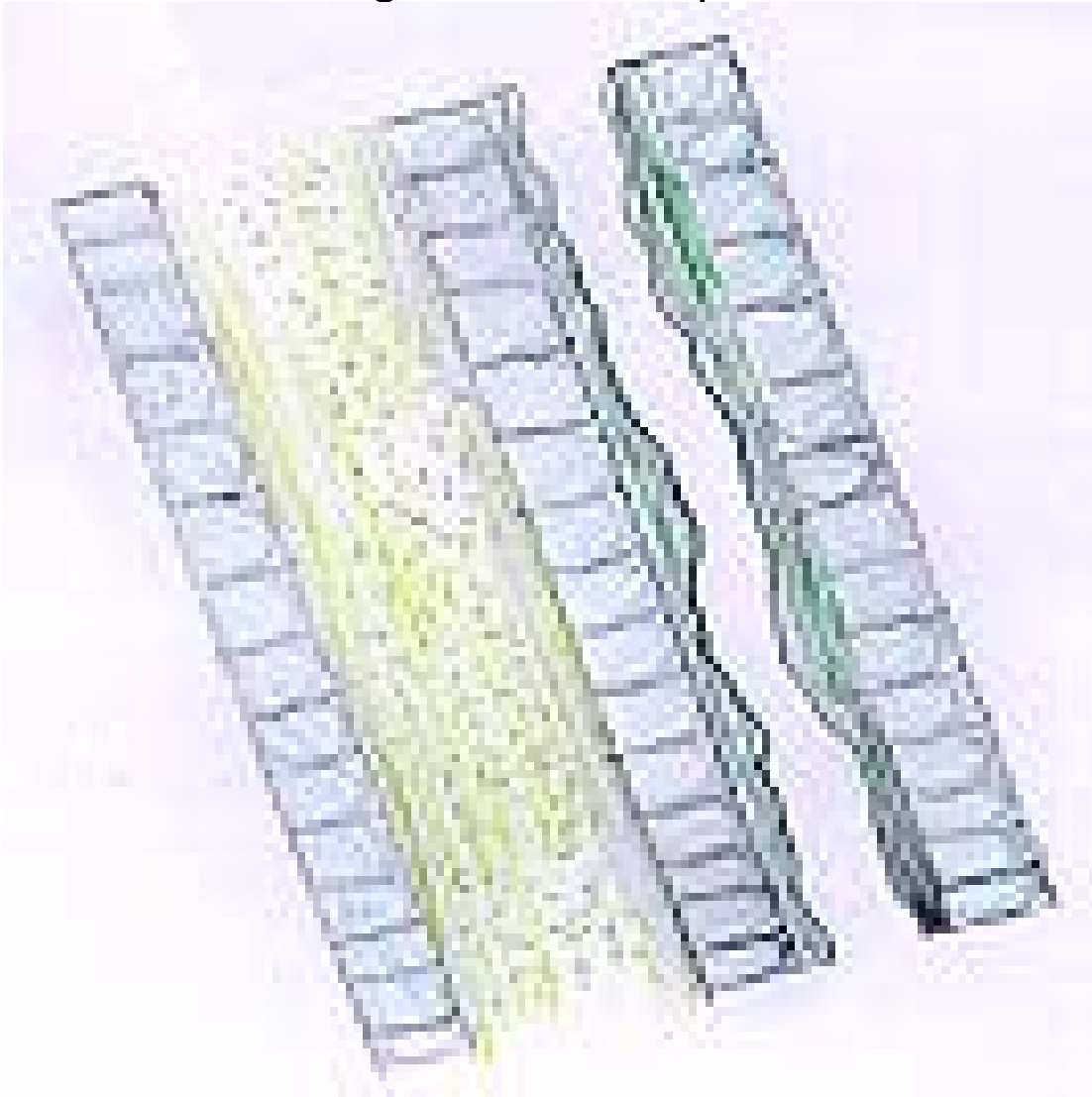
- Membrane-bound sacs for storage, digestion, and waste removal
  - Contains water solution
  - Contractile vacuoles for water removal (in unicellular organisms)



## Cell Part Information Sheet #7

### Cell Wall

- Most commonly found in plant cells
  - Controls turgity
  - Extracellular structure surrounding plasma membrane
  - Primary cell wall: extremely elastic
  - Secondary cell wall: forms around primary cell wall after growth is complete



## Cell Part Information Sheet #8

### Chloroplasts

- A plastid usually found in plant cells
  - Contain green chlorophyll where photosynthesis takes place

