



# The Cell As A Factory

**Topic**  
Cell structures

**Key Question**

What structures can be found within plant and animal cells and what is the function of each of these structures?

**Focus**

Students will build a model of a cell to learn its structures and their function.

**Guiding Documents**

*NCTM Standards*

- Use mathematics in other curriculum areas
- Model situations using oral, written, concrete, pictorial, graphical, and algebraic methods

*Project 2061 Benchmarks*

- Within the cell are specialized parts for the transport of materials, energy capture and release, protein building, waste disposal, information feedback, and even movement.
- Different models can be used to represent the same thing. What kind of a model to use and how complex it should be depends upon its purpose.

**Science**

Life science  
biology  
cells

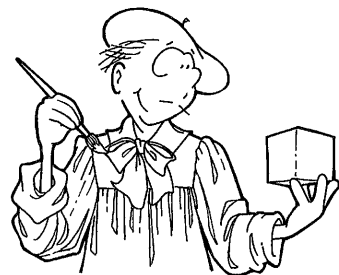
**Integrated Processes**

Observing  
Collecting and recording data  
Comparing and contrasting  
Classifying

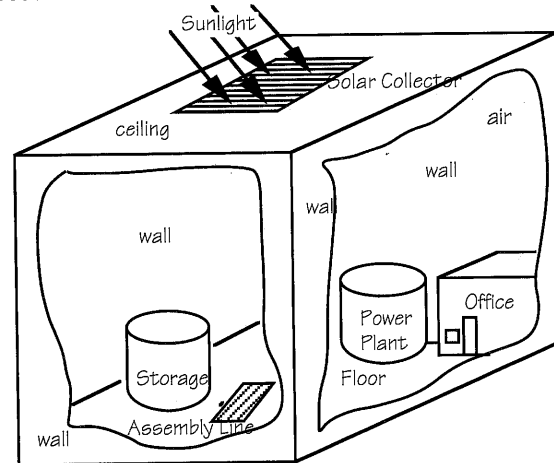
**Materials**

For each group of four students:

- one large cardboard box
- empty milk cartons
- empty tin cans
- string
- plastic wrap
- and any other assorted bits and pieces that can be used to build a *factory* model of a cell



The cell produces energy that is required for it to stay alive, perform certain functions, and reproduce. A cell can be likened to a factory in its structure and internal processes.



The major parts of a cell and their analogous factory counterparts are:

- **Cell Membrane:** The walls, floor, and ceiling of the factory.
- **Cytoplasm:** The "air" in the factory. All of the factory activities happen within this "fluid."
- **Mitochondria:** The power station that provides the energy to meet the operation and production needs of the factory.
- **Vacuoles:** Tanks that store water and other dissolved materials.
- **Endoplasmic Reticulum:** The assembly line along which materials move from point to point within the factory.
- **Ribosomes:** Workers stationed along the assembly line. Their job is to produce protein.
- **Chloroplasts:** Solar collectors on the roofs of plant factories that capture radiant energy for photosynthesis. Photosynthesis is the process by which the factory produces its own food.
- **Nucleus:** The main office that directs all the activities that occur in the factory.

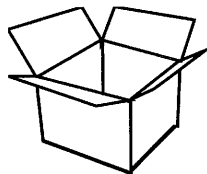
Each one of us is made up of at least one trillion cells (one million-million or 1,000,000,000,000). In our bodies each cell is alive except for fingernails, hair, and

dead skin cells. Cells are constantly dying and being replaced by new cells.

Detailed information on cells can be found in *Cells: The Basis of Life*.

### Management

1. Organize students into groups of four. Ask each group to bring a large cardboard box.



2. Explain and discuss the *factory* model of a cell with the students. Have students brainstorm the objects and materials they can bring to class to build their cell factory.
3. Instruct students to start bringing cell-building materials to class a couple of weeks before doing this activity. Store the materials inside each cardboard box.

### Procedure

1. Distribute student *The Cell as a Factory* page.
2. Using the materials in their cardboard box, have students construct a *factory* model of a plant or animal cell. Have students write whether they are modeling a plant or an animal cell.
3. Instruct the students to draw and label the structures of their factory cell.

### Discussion

Have each group give a short report about their cell factory. Emphasize the varied and clever ways students modeled the parts of an animal or plant cell.

### Extension

As extra credit, have students bring cookies, gelatin desserts, cakes, or pies that are in the form of a cell. Make sure they include a key telling what each cell structure is. Cell structures could be nuts, candies, or fruit.

# The Cell As A Factory

My drawing of a \_\_\_\_\_  
cell I made from a cardboard box.

The cell membrane (and cell  
wall) are the \_\_\_\_\_,  
\_\_\_\_\_, and \_\_\_\_\_  
of the factory.

In a plant cell, chloroplasts  
act like \_\_\_\_\_  
collectors.

Vacuoles are storage tanks  
that store \_\_\_\_\_.

The endoplasmic reticulum is  
the \_\_\_\_\_  
line of the factory.

Ribosomes are stationed  
along the \_\_\_\_\_.  
Their job is to make  
\_\_\_\_\_.

The cytoplasm is the  
\_\_\_\_\_  
in the factory.

The nucleus is the Main  
\_\_\_\_\_  
of the factory.

The mitochondria is the  
\_\_\_\_\_  
station of the factory.

