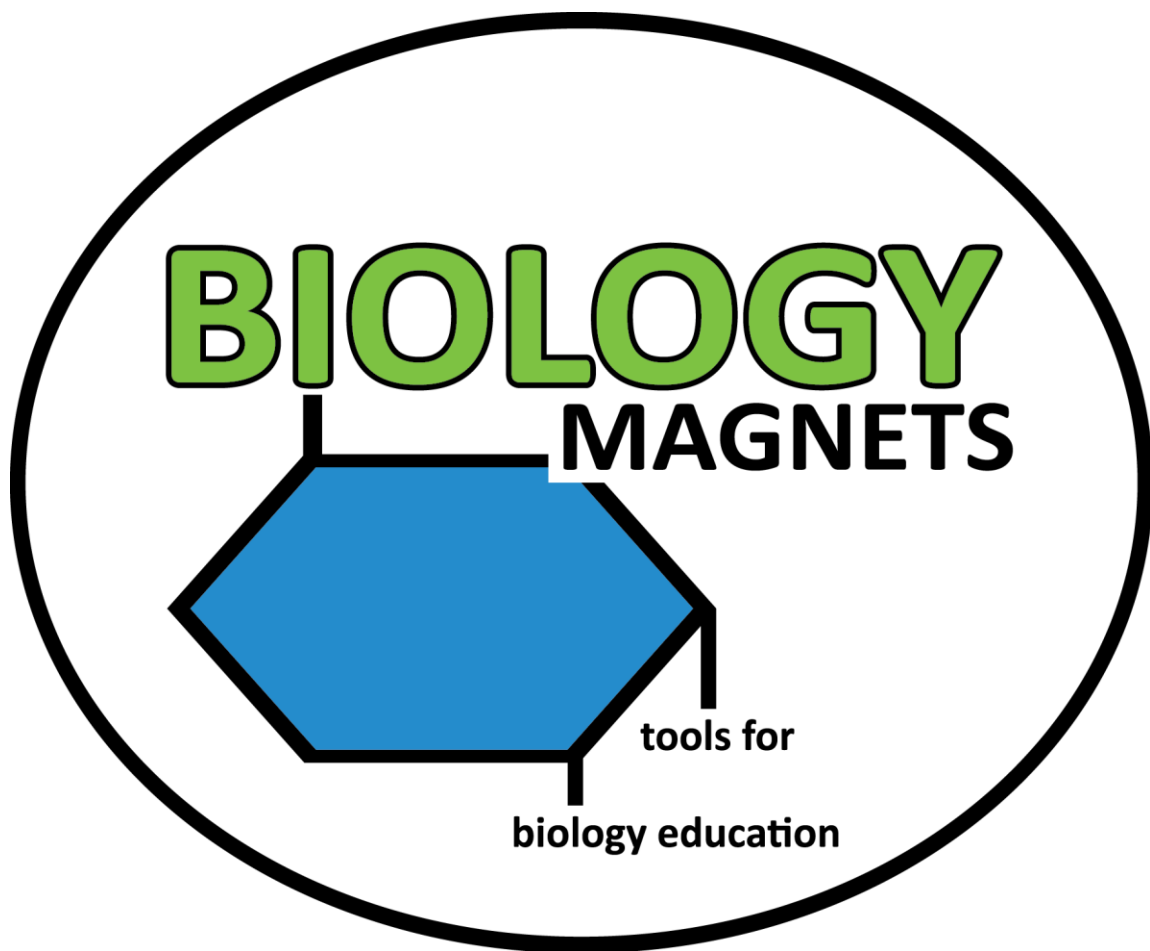


# Biology Magnets Module 2: Parts of a Cell - Teacher and Student Guides



## Teacher Information

This module uses magnets designed for teacher and student interaction to guide learning the various parts of a cell. Contained in this guide is an outline for a lesson that can last from 10 minutes to approximately 80 minutes depending upon teacher preference. The lesson has both teacher-centered and student-centered activities. The student-centered activities are most effective if students are in small groups. It may be necessary to have multiple magnet sets for large classes. A student handout is provided which can be printed out and given to each student group to help guide their progress as they work with the magnets. If budget or white board space is limited, groups can alternate between using a set of magnets and doing other activities. Teachers can refer to the videos posted at the BIOmagnet web site at [BiologyMagnets.com](http://BiologyMagnets.com) for further teaching instructions.



## Magnet Care and Maintenance

Biology magnets are made to last for years. Periodically magnets will fall off or are knocked off the plastic. A piece of magnetic tape is included with each module, which should be able to replace around 10-12 magnets if necessary. Simply cut a new magnet and peel off the back to replace. Magnetic tape can be purchased from a hobby store to replace magnets lost over time. Laminate may peel off, especially on small pieces. Transparent tape can be used as a replacement or to re-attach laminate that comes loose by curling the tape over the back of the magnet. The machines used to cut Biology Magnets are not always perfectly accurate. Sometimes a bit of white or black outline on the edges occurs or a cut might be slightly off center. Use scissors to remove extra outline that is unnecessary if desired. Store magnets in the clasp envelopes in which they arrived for easy organization.

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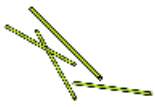
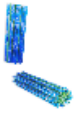






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**Pili** - This file is licensed under the This file is licensed under the Creative Commons Attribution-Share Alike 4.0 International license. By This vector image is completely made by Ali Zifan - Own work; used information from Biology 10e Textbook (chapter 4, Pg: 63) by: Peter Raven, Kenneth Mason, Jonathan Losos, Susan Singer · McGraw-Hill Education., CC BY-SA 4.0, <https://commons.wikimedia.org/w/index.php?curid=44194140>. Modified to remove pili from cell. The new work is released with the above license.

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## Biology Magnets Module 2 Materials List

| Magnet Name   | Quantity | Picture   | Function  | Type of Cell                     |
|---|----------|---|---|----------------------------------|
| Nucleus, Nucleolus,<br>Nuclear Membrane,<br>Nuclear Pores | 1        |    | Nucleus - Holds DNA,<br>chromosomes<br>Nucleolus – Makes ribosomes                                    | Eukaryotic -<br>Plant and Animal |
| Mitochondrion   | 2        |    | Puts together ATP for the cell  | Eukaryotic – Plant<br>and Animal |
| Chloroplast   | 2        |    | Performs photosynthesis   | Eukaryotic – Plant               |
| Rough and Smooth<br>Endoplasmic Reticulum                 | 2        |    | Rough ER – Makes and stores<br>proteins bound for membranes<br>Smooth ER – Makes and stores<br>lipids | Eukaryotic – Plant<br>and Animal |
| Golgi Apparatus   | 1        |  | Packages lipids and proteins for<br>distribution or use in the cell                                   | Eukaryotic – Plant<br>and Animal |
| Water Vacuole   | 1        |  | Stores water in the cell, creates<br>turgor pressure  | Eukaryotic – Plant               |
| Lysosome  | 2        |  | Breaks down/digests food and<br>foreign particles   | Eukaryotic –<br>Animal           |
| Peroxisome  | 2        |  | Breaks down hydrogen<br>peroxide, breaks down lipids  | Eukaryotic – Plant<br>and Animal |
| Vesicle   | 2        |  | Stores and transports materials<br>in cell  | Eukaryotic – Plant<br>and Animal |

|  |           |   |   |   |
|--|-----------|---|---|---|
| Free Ribosomes   | 4         |    | Makes proteins used in cytoplasm  | Prokaryotic and Eukaryotic – Plant and Animal |
| Flagellum  | 1         |    | Causes movement of cells  | Prokaryotic and Eukaryotic – Plant and Animal |
| Cytoskeleton   | 2         |    | Forms scaffolding in cell for support and movement  | Eukaryotic – Plant and Animal                 |
| Centrioles   | 1         |    | Involved in cell reproduction   | Eukaryotic – Animal                           |
| Cilia  | 1         |    | Causes movement of cells or of material around cells  | Eukaryotic – Plant and Animal                 |
| Nucleoid   | 1         |   | Chromosomal loop of DNA coiled within cell  | Prokaryotic                                   |
| Plasmid  | 2         |  | Small loops of DNA within cell  | Prokaryotic                                   |
| Plasma membrane (green), cell wall (red), capsule (blue) | 1         |  | Cell membrane – Controls what enters and exits the cell<br>Cell Wall – Peptidoglycan layer for protection and support<br>Capsule – gel layer for protection | Prokaryotic                                   |
| Pili   | 2         |  | Causes cell to attach to surfaces and other cells; some used to pass plasmids to other cells  | Prokaryotic                                   |
| 3" Magnetic Tape Strip                                   | 1         |  | Used to replace lost magnets  | Abiotic!                                      |
| <b>Total Pieces</b>                                      | <b>31</b> |   |   |   |

## Lesson 2A – Parts of a Cell (10-80 minutes)

**Teacher-Centered Activity (10-40 minutes):** This lesson reviews all of the parts of the cell using the Biology Magnets from Module 2 as shown in the table above. Start the lesson by going over all of the parts of a **prokaryotic cell (Figure 2.A.1)**. It would be helpful to have a diagram showing all of the cell parts as well, which students can refer to, either in their textbook or on the overhead projector. This way students can see different depictions of the same cell parts. Draw an oval on the board representing the cell membrane. One by one, starting with the nucleoid, move the parts of the prokaryotic cell into the oval (or attach them to the membrane) and discuss the function of each part. After adding the cell membrane, wall, and capsule magnet, draw the remainder of those structures around the entire cell with matching colored markers (if available). If time allows, repeat this, calling on students to recall the parts and functions as you move them into the cell. Next, draw a bigger oval and build the **eukaryotic cell**. Leave the prokaryotic cell on the board for comparison if there is room. Repeat the same process, discussing the function of each organelle as they are placed within the cell. Lastly, show the differences between the **animal cell (Figure 2.A.2)** and the **plant cell (Figure 2.A.3)**. The cell wall for the plant cell will have to be hand drawn outside the cell membrane as there is no cell wall magnet for the eukaryotic cell. If time is available, change the shape of the membrane to wavy, with extensions, and discuss surface area to volume ratio and how it changes with the shape of the membrane (example **Figure 2.A.4**).

Figure 2.A.1 – Sample Prokaryotic Cell

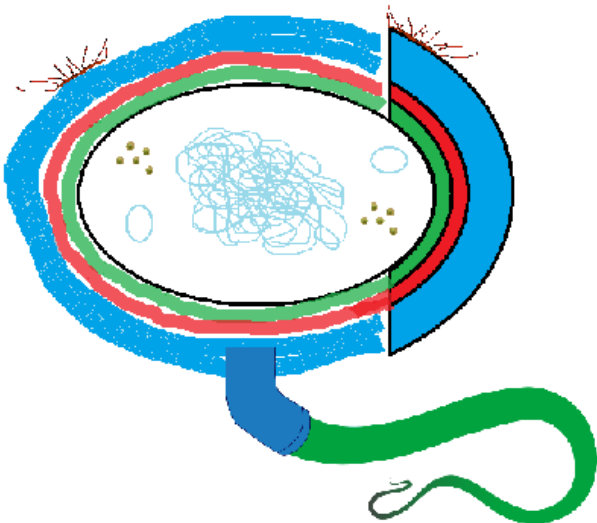


Figure 2.A.2 – Sample Animal Cell

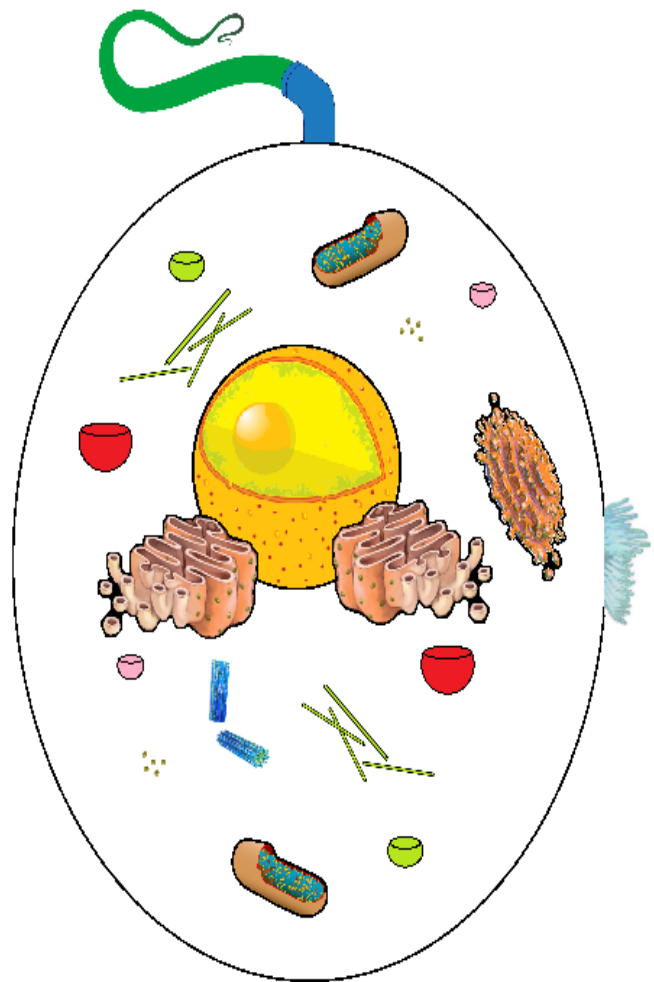


Figure 2.A.3 – Sample Plant Cell

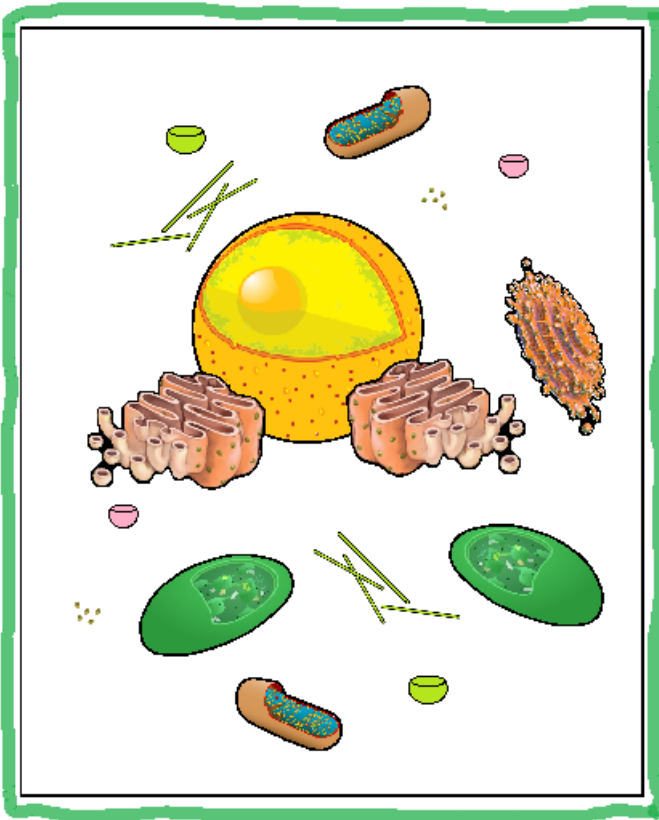
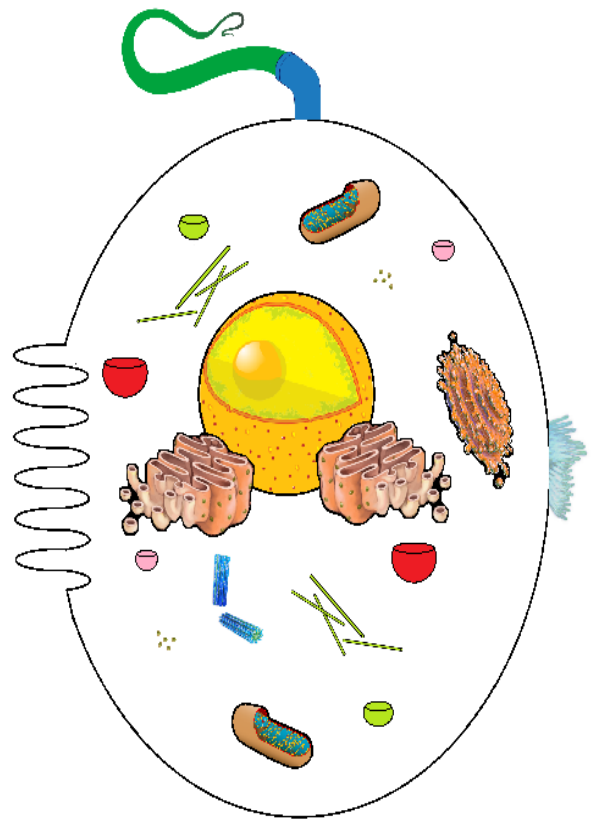


Figure 2.A.4 – Animal Cell With Increased Surface Area to Volume Ratio



**Student Centered Activity (10-40 minutes):** After teaching the parts of the cell, put students into small groups and have them take turns building the three types of cells (prokaryotic, animal, plant) and naming the parts and the function of those parts. Allow the students to help one another. It may be helpful if the students have the student handout to act as a guide the first time they do the activity and then graduate to doing it without help. After all groups have shown mastery, have the students re-draw the cell membrane so it has greater surface area to volume ratio.

**Extra exercises:**











**Research Organelles:** Have students go online and find other organelles not represented in the cells the students have built. Have them draw these organelles with markers in their cells. If extra magnetic tape is available, have the students draw the organelles they researched onto index cards and attach magnets to the back to create their own magnets for their cells. Have each student report the organelle they researched and made to the rest of the class.


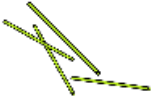






**Oral Quiz:** Give an oral quiz by calling out names of organelles and having students or groups move organelles into it as they are called. This can be done individually or in groups. Alternatively, have the students give oral quizzes to one another.



## Biology Magnets Module 2 – Parts of a Cell – Student Handout

**Student Centered Activity:** Draw a large oval on the board that will represent the plasma membrane of a cell. Use the chart below to help you learn the organelles. Move the magnets one at a time into your cell membrane and build your cell. First, build a prokaryotic cell. You will have to finish drawing the cell membrane, cell wall, and capsule layer with colored markers. Make sure you can say all of the parts and their function to your group members without looking at the chart. After everyone has mastered the prokaryotic cell, build an animal cell. Again, try to name the organelle and its function without looking at the chart. Then build the plant cell and repeat the process with it. You will have to draw a cell wall around the cell membrane with a marker. Can you name the differences between an animal cell and a plant cell? Once you have finished tell your teacher that you have mastered the organelles!

| Magnet Name   | Picture   | Function  | Type of Cell                                  |
|---|---|---|---|
| Nucleus, Nucleolus, Nuclear Membrane, Nuclear Pores |    | Nucleus - Holds DNA, chromosomes<br>Nucleolus – Makes ribosomes                                 | Eukaryotic - Plant and Animal                 |
| Mitochondrion                                       |    | Puts together ATP for the cell  | Eukaryotic – Plant and Animal                 |
| Chloroplast   |   | Performs photosynthesis   | Eukaryotic – Plant                            |
| Rough and Smooth Endoplasmic Reticulum              |  | Rough ER – Makes and stores proteins bound for membranes<br>Smooth ER – Makes and stores lipids | Eukaryotic – Plant and Animal                 |
| Golgi Apparatus                                     |  | Packages lipids and proteins for distribution or use in the cell                                | Eukaryotic – Plant and Animal                 |
| Water Vacuole                                       |  | Stores water in the cell, creates turgor pressure   | Eukaryotic – Plant                            |
| Lysosome  |  | Breaks down/digests food and foreign particles  | Eukaryotic – Animal                           |
| Peroxisome  |  | Breaks down hydrogen peroxide, breaks down lipids   | Eukaryotic – Plant and Animal                 |
| Vesicle   |  | Stores and transports materials in cell   | Eukaryotic – Plant and Animal                 |
| Free Ribosomes                                      |  | Makes proteins used in cytoplasm  | Prokaryotic and Eukaryotic – Plant and Animal |

|  |   |   |   |
|--|---|---|---|
| Flagellum  |    | Causes movement of cells  | Prokaryotic and Eukaryotic – Plant and Animal |
| Cytoskeleton   |    | Forms scaffolding in cell for support and movement  | Eukaryotic – Plant and Animal                 |
| Centrioles   |    | Involved in cell reproduction   | Eukaryotic – Animal                           |
| Cilia  |    | Causes movement of cells or of material around cells  | Eukaryotic – Plant and Animal                 |
| Nucleoid   |    | Chromosomal loop of DNA coiled within cell  | Prokaryotic                                   |
| Plasmid  |   | Small loops of DNA within cell  | Prokaryotic                                   |
| Plasma membrane (green), cell wall (red), capsule (blue) |  | Cell membrane – Controls what enters and exits the cell<br>Cell Wall – Peptidoglycan layer for protection and support<br>Capsule – gel layer for further protection | Prokaryotic                                   |
| Pili   |  | Causes cell to attach to surfaces and other cells; some used to pass plasmids to other cells  | Prokaryotic                                   |

### Extra exercises:

**Research Organelles:** Go online and find other organelles not represented by the Biology Magnets. Draw these organelles with dry erase markers in the cells. Alternatively, if magnetic tape is available, draw the organelles researched onto index cards and attach magnets to the back to create magnets for your cells. Each student can report the organelle researched and its function to the rest of the class.

**Oral Quiz:** Give an oral quiz to another student or another group by calling out names of organelles and having the student or group move the organelles into it as they are called. Try to see if your group can get all of the organelles correct.