**Cells and Their Organelles**

The cell is the basic unit of life. All cells are surrounded by a thin covering called a cell membrane. The cell membrane is semipermeable, allowing some substances to pass into the cell and blocking others. **Color and label the cell membrane orange.** Plant cells have an additional strong, stiff layer surrounding the cell membrane called the cell wall. The cell wall is made of material called cellulose. The cell wall protects and supports the cell allowing water, oxygen, carbon dioxide and other dissolved materials to pass in and out of the cell. **Color and label the cell wall brown**.

The large, oval structure in the center of a cell is the nucleus. The small round body inside the nucleus is called the nucleolus. It produces ribosomes which are involved in protein production. The nucleus controls many of the functions of the cell and acts as the “brain” by regulating or controlling all of the activities of the cell. It also contains thick, rod-like structures that are made of nucleic acids or DNA and RNA called chromosomes. The chromosomes direct all cell activities including growth and reproduction. The chromosomes pass on the traits of the cell to offspring. **Color and label the chromosomes light purple**. The nucleus is surrounded by the thin nuclear membrane. **Color and label the nucleolus dark blue, the nuclear membrane yellow, and the nucleus light blue**. Materials can move from the nucleus to the cytoplasm through pores in the nuclear membrane. Cytoplasmis the jellylike material outside the cell nucleus in which the organelles are located. It protects and supports the organelles and moves materials around inside the cell. It is constantly flowing within the cell. **Color and label the cytoplasm pink**. All cells, even prokaryotes contain small round, grain-like bodies called ribosomes. **Label and color the ribosomes dark purple.** They are mostly attached to the endoplasmic reticulum, but can be found floating freely in the cytoplasm as well. They are made primarily of RNA and are the protein-making sites of the cell.

Endoplasmic reticulum(ER) is a vast system of interconnected, tubular passageways that lead out of the nuclear membrane transporting proteins around and out of the cell. Rough ER is covered with ribosomes that give it a rough appearance. **Color and label the rough ER red**. Rough ER transports materials through the cell and produces proteins in sacks called cistern which are sent to the Golgi, or inserted into the cell membrane. The Golgi apparatus consists of folded membranes that look like a stack of pancakes. The Golgi modifies and packages proteins, transports lipids and creates lysosomes. **Color and label the Golgi apparatus light green.** Smooth ER does NOT have ribosomes on its surface. It makes proteins and lipids that will be exported by the cell. It also controls the calcium level in muscles and detoxifies the cell. Smooth ER is more tubular and forms a separate sealed network that is fairly distributed throughout the cytoplasm. **Color and label the smooth ER gray**.

Chloroplasts are elongated or disc-shaped organelles containing chlorophyll that trap sunlight for energy. Photosynthesis (in which energy from sunlight is converted into chemical energy - food) takes place in the chloroplasts. Only plant cells, not animal cells, can make their own food. **Color and label the chloroplasts dark green**. Cells also contain fluid-filled sacs called vacuoles. The vacuole fills with food being digested and waste material that is on its way out of the cell. Plant cells have one very large central vacuole that takes up most of the space in the cell. Animal cells have a few small, round vacuoles that store water, food, waste and other materials. **Color and label the vacuoles white**. Mitochondria are spherical to rod-shaped organelles with a double membrane. The inner membrane is infolded many times, forming a series of projections called cristae. The mitochondria supply energy for the cell by breaking down sugar into water and carbon dioxide earning it the name powerhouse. Some very active cells that require a lot of energy, like liver cells, may have more than 1000 mitochondria. **Color and label the mitochondria red and blue striped**.

Cells also contain small, round organelles called lysosomes that contain digestive enzymes. Nutrients are digested by the cell here, as well as, old cell organelles, dead cells and even whole cells that are going to be recycled. **Color and label the lysosomes tan**. They are common in animal cells but very rarely seen in plant cells.