**PowerPoint Notes – Standard 2, Objective 3**

**Cell theory** was developed over time through advances in technology and by building on previous knowledge.

1665. Cell first observed. Robert Hooke, an English scientist, discovered a honeycomb-like structure in a cork slice using a primitive compound microscope. He only saw cell walls, as this was dead tissue. He coined the term "cell" for these individual compartments he saw.

1683. Miniature animals. Anton van Leeuwenhoek made several more discoveries on a microscopic level, eventually publishing a letter to the Royal Society in which he included detailed drawings of what he saw. Among these was the first blood cells, protozoa and bacteria cells.

1833. The center of the cell seen. Robert Brown, an English botanist, discovered the nucleus in plant cells.

1838. Basic building blocks. Matthias Jakob Schleiden, a German botanist, proposes that all plant tissues are composed of cells, and that cells are the basic building blocks of all plants. This statement was the first generalized statement about cells.

1839. Cell theory. Theodor Schwann, a German botanist reached the conclusion that not only plants, but animal tissue as well is composed of cells. This ended debates that plants and animals were fundamentally different in structure. He also pulled together and organized previous statement on cells into one theory, which states: 1 - Cells are organisms and all organisms consist of one or more cells 2 - The cell is the basic unit of structure for all organisms.

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**Observation:** In many parts of Europe, medieval farmers stored grain in barns with thatched roofs. As a roof aged, it was not uncommon for it to start leaking. This could lead to spoiled or moldy grain, and of course there were lots of mice around.

**Conclusion:** It was obvious to them that the mice came from the moldy grain.

**Organelles** Both are eukaryotic cells. Additional structures in plant cells: chloroplasts, cell wall, vacuoles.

**Cell Transport**

Hypotonic: Less solute in solution.

Isotonic: Equal solute in solution.

Hypertonic: More solute in solution.

Both are passive transport. –

**Diffusion**: No energy needed. High concentration to low concentration. With (down) the gradient. Very small molecules like gases (charged molecules), H2O.

**Facilitated Diffusion**: No energy needed. With (down) the gradient. High concentration to low concentration. Carrier or channel proteins. Larger, polar molecules (glucose).

**Active transport:** movement of molecules across a cell membrane; lower concentration to higher concentration; against (up) the concentration gradient; requires energy (ATP); needs carrier or channel proteins (protein gates). Charged molecules (Na+, K+, CA++, Cl-).

**Mitosis** Draw the process and identify the steps. Label the phases and describe the cellular events.

**Interphase**: Preparing for replication – cell grows, normal cell function. Preparing for cell division – DNA replication (synthesis). Preparing for division of nucleus (mitosis). Longest phase of a cell.

**Prophase**: Nuclear envelope disappears. Chromatin condenses. Centrioles form spindles. Chromosomes appear.

**Metaphase**: Chromosomes line up in center of nucleus. Spindle fibers attach to chromosomes.

**Anaphase**: Chromosomes separate (sister chromatids identical to each other) and move toward poles.

**Telophase**: Chromosomes now at poles. Chromosomes become more diffuse (chromatin). Nuclear envelope reforms. Cytoplasm may be simultaneously dividing.

**Cytokinesis**: Division of the cell at the end of mitosis (or meiosis). Cytoplasm divides. Separation into two daughter cells.

Root tip slide. See all the cells? What are your observations about this slide?

Cells in a root tip at various stages of mitosis.

Which four parts are involved in Mitosis? (Prophase, Metaphase, Anaphase, Telophase)

Which two parts are in between Mitosis? (Interphase, Cytokinesis)

Why? (Mitosis is the division of the nucleus)