**Unit 4 – The Cell & Microscopes**

**MCAS Standards:** This unit addresses the following MA State Frameworks in Biology:

**2.1** Relate cell parts/organelles (plasma membrane, nuclear envelope, nucleus, nucleolus, cytoplasm, mitochondrion, endoplasmic reticulum, Golgi apparatus, lysosome, ribosome, vacuole, cell wall, chloroplast, cytoskeleton, centriole, cilium, flagellum, pseudopod) to their functions. Explain the role of cell membranes as a highly selective barrier (diffusion, osmosis, facilitated diffusion, active transport).

**2.2** Compare and contrast, at the cellular level, the general structures and degrees of complexity of prokaryotes and eukaryotes.

**2.3** Use cellular evidence (e.g., cell structure, cell number, cell reproduction) and modes of nutrition to describe the six kingdoms (Archaebacteria, Eubacteria, Protista, Fungi, Plantae, Animalia).

**SIS 1.** Make observations, raise questions, and formulate hypotheses.

**SIS 2**. Design and conduct scientific investigations.

**SIS 3**. Analyze and interpret results of scientific investigations.

**SIS 4.** Communicate and apply the results of scientific investigations.

**Big Ideas:**

1. Cell theory provides a framework for understanding the nature of life.
2. The structure of molecules and cells facilitates their functions.
3. Multicellularity enabled cell specialization which allowed an increase in biodiversity.

**Essential Questions:**

1. How does examining the relationship between structure and function help us understand the way cells function?

**Reading:** Text chapters 1-4, 7, 18-1, 18-3

**Objectives:** By the end of this unit, students will be able to:

## Cell Theory (Chapter 7-1)

## State the three ideas that make up the cell theory.

## Describe the contributions of each of the following scientists to cell theory: Hooke van Leeuwenhoek, Schleiden, Schwann and Virchow.

## Explain why cells must be small by analyzing the relationship between surface area and volume in cells.

## Explain the major differences between prokaryotic and eukaryotic cells.

# Cell structure and organelles (Chapter 7-2)

1. Describe the structure of the cell nucleus and its role in cell activities.
2. Identify all cell organelles on a picture of a cell.
3. Describe the structure and function of each cell organelle.
4. Identify cells as plant or animal, using pictures or living specimens.
5. Explain the three major differences between plant and animal cells.
6. Identify the Domains/Kingdoms of life made up of prokaryotic cells and those made up of eukaryotic cells, and describe the important characteristics of each.

**Cell Specialization (Chapter 7-4)**

1. Describe cell specialization that exists in unicellular and multicellular organisms.

# Microscope (Chapter 1-4, 7-1)

# Explain how light microscopes are used to study cells.

1. Describe the history of the development of the microscope.
2. Relate magnification and resolution, and determine the field of view at a given magnification.
3. Explain (and demonstrate) how scientists measure the length of objects using a microscope.
4. Demonstrate the use of a microscope to study cells.
5. Compare electron (transmission, scanning) and scanning tunneling microscopes with the compound light microscopes.

**Key Terms:**

Microscope

Light Microscope

Scanning electron Microscope

Scanning tunneling Microscope

Magnification

Resolution

Field of view

Anton Van Leeuwenhoek

Robert Hook

Theodor Schwann

Mathias Schleiden

Thomas Virchow

Cell theory

Surface to volume ratio

Cytoplasm

Ribosome

Eukaryote

Nucleus

Nucleolus

Nuclear envelope

Nuclear pore

Chromatin

Chromosome

Organelle

Vacuole

Vesicle

Golgi apparatus

Lysosome

Mitochondrion

Endoplasmic reticulum (rough, smooth)

Cell wall

Chloroplast

Central vacuole

Contractile Vacuole

Cytoskeleton

Microtubule

Microfilament

Cilia

Flagellum

Centriole

Eukaryote

Prokaryote

Animal Cell

Plant Cell

Cell

Tissue

Organ

Organ system

Unicellular

Multicellular

Colony

Cell specialization

Endosymbiosis theory

**Assessment Evidence**

Technology Project/Product: Webquest Cell Structure

Assessment: Microscope Lab

Assessment: Unit quiz

Assessment: Unit test

Observation: Teacher observation and feedback

**Learning Plan Period 5**

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| **DAY** | **IN CLASS TOPIC** | **HOMEWORK** |
| Tues 12/13  F day | Test – Chemistry of Life | Obj. 1-4 |
| Wed 12/14  A day | Cell Theory  Surface area to volume ratio | Obj . 5-7 |
| Thur 12/15  B day | No Class |  |
| Fri 12/16  C day | Prokaryotic/eukaryotic cells  Plant/animal cells  Eukaryotic cell structures | Obj. 8-10 |
| Mon 12/19  D day | Cell webquest | Obj. 11-14 |
| Tues 12/20  E day | Organism organization  Review for test | Obj 15-17 |
| Wed 12/21  F day | Microscope Lab | Study for test |
| Thur 12/22  A day | **Unit Test** |  |
| Fri 12/23  B day | No Class |  |

**Learning Plan Period 6**

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| **DAY** | **IN CLASS TOPIC** | **HOMEWORK** |
| Tues 12/13  F day | Test – Chemistry of Life | Obj. 1-4 |
| Wed 12/14  A day |  |  |
| Thur 12/15  B day | Cell Theory  Surface area to volume ratio | Obj . 5-7 |
| Fri 12/16  C day | Prokaryotic/eukaryotic cells  Plant/animal cells  Eukaryotic cell structures | Obj. 8-10 |
| Mon 12/19  D day | Cell webquest | Obj. 11-14 |
| Tues 12/20  E day | Microscope Lab | Obj 15-17 |
| Wed 12/21  F day | Organism organization  Review for test | Study for test |
| Thur 12/22  A day | No Class |  |
| Fri 12/23  B day | **Unit Test** |  |