

## TEKS Cluster: Cell Structure and Function

- B.4 Science concepts.** The student knows that cells are the basic structures of all living things with specialized parts that perform specific functions and that viruses are different from cells.

### Cellular Complexity

#### *Readiness Standards*

- B.4(B) investigate and explain cellular processes, including homeostasis, and transport of molecules

#### *Supporting Standards*

- B.4(A) compare and contrast prokaryotic and eukaryotic cells, including their complexity, and compare and contrast scientific explanations for cellular complexity

### Viruses

#### *Readiness Standards*

- B.4(C) compare the structures of viruses to cells, describe viral reproduction, and describe the role of viruses in causing diseases such as human immunodeficiency virus (HIV) and influenza

**TEKS Scaffold**

TEKS	Student Expectation
A.10(B)	evaluate the cause and effect of disease, trauma, and congenital defects on the structure and function of cells, tissues, organs, and systems

**B.4(B)** **B.4 Science concepts.** The student knows that cells are the basic structures of all living things with specialized parts that perform specific functions and that viruses are different from cells. The student is expected to:

**(B) investigate and explain cellular processes, including homeostasis, and transport of molecules**

B.4(A)	compare and contrast prokaryotic and eukaryotic cells, including their complexity, and compare and contrast scientific explanations for cellular complexity (S)
7.12(D)	differentiate between structure and function in plant and animal cell organelles, including cell membrane, cell wall, nucleus, cytoplasm, mitochondrion, chloroplast, and vacuole (R)
7.12(E)	compare the functions of cell organelles to the functions of an organ system (S)
7.12(F)	recognize the components of cell theory (S)
6.12(B)	recognize that the presence of a nucleus determines whether a cell is prokaryotic or eukaryotic (S)

**Stimulus**

Investigation*	Demonstration	Graph*	Chart/Table*
Diagram*	Visual/Image/Illustration	Web/Cycle/Chain	Model
Informational Text/List*	Map	Formula/Equation	

**Content Builder**

- Cellular processes
- Homeostasis
- Transport of molecules

Major concepts in this standard include:

- Osmotic balance/diffusion
- Concentration gradients
- Permeability
- Active transport
- Passive transport
- Endo/Exocytosis
- Structure and function of cell organelles: cell wall, cell membrane, ribosomes, genetic material, cytoplasm, flagella/cilia, nucleus/nucleolus/nuclear membrane, chloroplast, Golgi apparatus, lysosome, mitochondrion, rough/smooth endoplasmic reticulum, vacuole, vesicle

*Career and College Readiness Standards Connection*

VI. Biology – F. Systems and homeostasis

1. Know that organisms possess various structures and processes (feedback loops) that maintain steady internal conditions.
2. Describe, compare, and contrast structures and processes that allow gas exchange, nutrient uptake and processing, waste excretion, nervous and hormonal regulation, and reproduction in plants, animals, and fungi; give examples of each.

**Instructional Implications**

Understanding cellular processes develops the foundation for the cell cycle and DNA replication, transcription, and translation in subsequent units. Applying the structure and function of cell organelles to the transport of molecules will create a basic understanding of cellular systems. Students may struggle with this concept because it is abstract in nature and only the cause-effect relationship outputs can be observed.

When you teach this concept, remember to:

- Vary models to show cellular structure in function in both plant and animal cells.
- Provide opportunities for students to observe the transport of molecules.
- Provide opportunities for students to associate the cell organelle structure/function with the transport of molecules.
- Allow students to analyze varied scenarios for homeostasis and how to maintain homeostasis.

(continued)

### Learning from Mistakes

Students may make the following mistakes:

- Misidentifying the structure/function of organelles with their specific roll in cellular processes
- Misunderstanding that homeostasis is a regulation of an organism's internal environment to maintain conditions that suit survival and that this can occur at the cellular level
- Misunderstanding the purpose and role of active/passive transport in the transport of molecules

### Academic Vocabulary

active transport*	concentration gradient*	mRNA*	plastid*
aerobic cellular respiration*	cytoplasm	nucleic acid	ribosome*
anaerobic cellular respiration	endoplasmic reticulum*	nucleolus* nucleus	semi-permeable
animal cell	energy conversion*	organelle*	synthesis*
ATP (adenosine triphosphate)*	golgi apparatus*	osmosis	thymine*
cell membrane	homeostasis	photosynthesis	vacuole*
cell wall	lysosome*	plant cell	vesicle
chloroplast	mitochondria*	plasma membrane*	

### Interesting Items

- B.4(B) 2022 #26
- B.4(B) 2021 #33
- B.4(B) 2018 #2
- B.4(B) 2016 #28
- B.4(B) 2015 #37

**B.4 Science concepts.** The student knows that cells are the basic structures of all living things with specialized parts that perform specific functions and that viruses are different from cells.

B.4(A) The student is expected to:

**(A) compare and contrast prokaryotic and eukaryotic cells, including their complexity, and compare and contrast scientific explanations for cellular complexity**

## Role in Concept Development

Supports

- B.4(B) investigate and explain cellular processes, including homeostasis and transport of molecules
- B.4(C) compare the structures of viruses to cells, describe viral reproduction, and describe the role of viruses in causing diseases such as human immunodeficiency virus (HIV) and influenza

Connection/  
Relevance

This standard supports B.4(B) by providing cellular categories for organisms with or without a nucleus. It supports B.4(C) by providing overarching cellular categories for the comparison of viral organisms to cells.

### *Career and College Readiness Standards Connection*

VI. Biology – A. Structure and function of cells

2. Explain in your own words how cells can be categorized into two major types: prokaryotic and eukaryotic, and describe major features that distinguish one from the other.
3. Describe the structure and function of major sub-cellular organelles.

When to Teach With B.4(B) and B.4(C)

Instructional  
Implications

Understanding how to compare and contrast prokaryotic and eukaryotic cells develops the foundational knowledge for cellular processes, viruses, and cell organelles and functions. Students may struggle with this concept because the structures are microscopic.

When you teach this concept, remember to:

- Vary models used to show multiple representations of prokaryotic and eukaryotic cells.
- Explore multiple theories for cellular complexity, such as endosymbiotic theory and cell theory.
- Provide opportunities for students to associate the structure and function of organelles.

Learning from  
Mistakes

Students may make the following mistakes:

- Misidentifying that both prokaryotic and eukaryotic cells have membrane-bound organelles such as the nucleoid region and the nucleus
- Misidentifying that homeostasis does not occur in all cell types

## Stimulus

Investigation	Demonstration	Graph	Chart/Table*
Diagram	Visual/Image/ Illustration*	Web/Cycle/Chain	Model
Informational Text/List*	Map	Formula/Equation	

## Academic Vocabulary

eukaryote  
organelle  
prokaryote

## Interesting Items

B.4(A) 2018 #40  
B.4(A) 2017 #1  
B.4(A) 2015 #46

## TEKS Scaffold

TEKS	Student Expectation
MM.5(C)	categorize diseases caused by bacteria, fungi, viruses, protozoa, rickettsias, arthropods, and helminths

**B.4 Science concepts.** The student knows that cells are the basic structures of all living things with specialized parts that perform specific functions and that viruses are different from cells. The student is expected to:

B.4(C)

**(C) compare the structures of viruses to cells, describe viral reproduction, and describe the role of viruses in causing diseases such as human immunodeficiency virus (HIV) and influenza**

7.12(D)	differentiate between structure and function in plant and animal cell organelles, including cell membrane, cell wall, nucleus, cytoplasm, mitochondrion, chloroplast, and vacuole (R)
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## Stimulus

Investigation	Demonstration	Graph	Chart/Table*
Diagram*	Visual/Image/Illustration*	Web/Cycle/Chain	Model*
Informational Text/List*	Map	Formula/Equation	

## Academic Vocabulary

antibiotic	herpes*	infect*	reproductive cycle*
bacteriophage*	host*	influenza	retrovirus*
capsid*	human immunodeficiency virus (HIV)*	lysogenic cycle*	RNA virus
cell*		lytic cycle*	t-cell*
chicken pox*		mitosis*	vaccine
DNA virus*	immune cells*	organelle*	viral reproduction*
genetic material*	immune system*	pathogen prion*	virus*
genome*			

## Content Builder

- Viral structure vs. cellular structure
- Virus reproduction (lytic and lysogenic)
- Viruses that cause disease such as HIV/influenza

Major concepts in this standard include:

- Viral structure vs. cellular structure
- Viral structures: capsid, nucleic acid, envelope, surface membrane proteins (attachment)
- Viral reproduction stages: entry, replication, release, latency
- Viral reproduction cycles: lytic and lysogenic vs. mitosis in cells
- Viral diseases: HIV, influenza, common cold, chicken pox, herpes, warts, etc.
- Viral diversity: bacteriophage, HIV, rabies, influenza (H1N1)

### Career and College Readiness Standards Connection

VI. Biology – A. Structure and function of cells

1. Know that although all cells share basic features, cells differentiate to carry out specialized functions.
3. Describe the structure and function of major sub-cellular organelles.

## Instructional Implications

Understanding the structure of viruses compared to cells is interrelated to the overarching concepts of homeostasis, cellular process, and the role of viruses in organisms. Comparing cells to viruses structurally and associating these organisms as living/nonliving supports further understanding of the basic structure of living things. Students may struggle with this concept because it is abstract in nature and only the cause/effect relationship outputs can be observed.

When you teach this concept, remember to:

- Vary models, diagrams, and visual images to show the structure and reproduction of viruses and cells.
- Provide opportunities to observe the cause/effect relationship of virus and host.
- Differentiate how antibiotics affect bacteria vs. viruses.
- Provide opportunities to analyze characteristics of viruses vs. cells.

## Learning from Mistakes

Students may make the following mistakes:

- Misidentifying viruses as ineffective during the copying phase because no symptoms are visible
- Misidentifying lytic and lysogenic cycles
- Misidentifying the roll of antibiotics and vaccines in treating/preventing disease
- Not associating cellular or viral structure with varied representations (image/model, list)

## Interesting Items

- B.4(C) 2021 #30
- B.4(C) 2017 #46
- B.4(C) 2016 #36
- B.4(C) 2015 #14