

SECTION 2 CELLS: DIVERSITY & FUNCTIONS

Diversity (differences) helps cells to survive and reproduce (make more of itself)

All Cells do something different

Cell diversity

Animal Cells are just for animals and not plants, vice versa

(a) Cells that connect body parts, form linings, or transport gases

(b) Cells that move organs and body parts

(c) Cell that stores nutrients

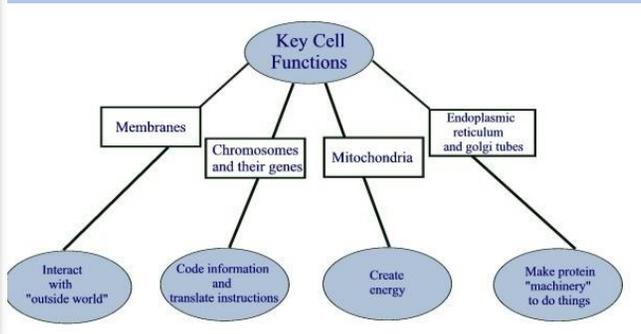
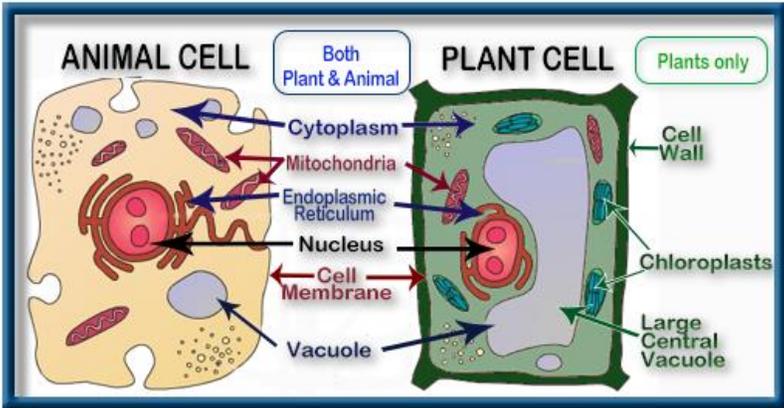
(d) Cell that fights disease

(e) Cell that gathers information and controls body functions

(f) Cell of reproduction

- Cell diversity
- Over 200 different types of human cells
- Types differ in size, shape, and subcellular components; these differences lead to differences in functions

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KEY CONCEPTS ABOUT CELLS: DIVERSITY & FUNCTIONS

MS-C

Bio. 1C. Students will relate the diversity of organelles to a variety of specialized cellular functions.

BIO. 1C. 1. Develop and use models to explore how specialized structures within cells (e.g., nucleus, cytoskeleton, endoplasmic reticulum, ribosomes, Golgi apparatus, lysosomes, mitochondria, chloroplast, centrosomes, and vacuoles) interact to carry out the functions necessary for organism's survival.

BIO. 1C. 2. Investigate to compare and contrast prokaryotic cells and eukaryotic cells, and plant, animal, and fungal cells.

BIO. 1C. 3. Contrast the structure of viruses with that of cells and explain why viruses must use living cells to reproduce.

Bio. 1D. Students will describe the structure of the cell membrane and analyze how the structure is related to its primary function of regulating transport in and out of cells to maintain homeostasis

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BIO. 1C. 2

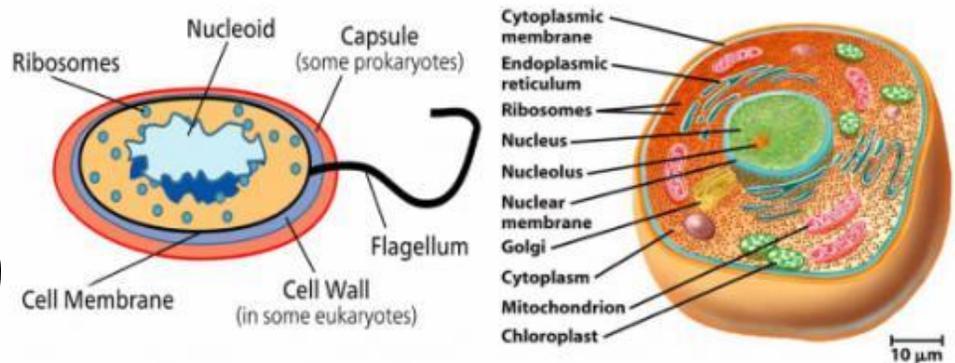
**Compare/Contrast
Prokaryotic Cells &
Eukaryotic Cells=plant,
animal, and fungal cells.**

**ALL CELLS ARE EITHER
PROKARYOTIC OR
EUKARYOTIC**

Uni-cellular (bacteria)

Multi-cellular (animal/plants)

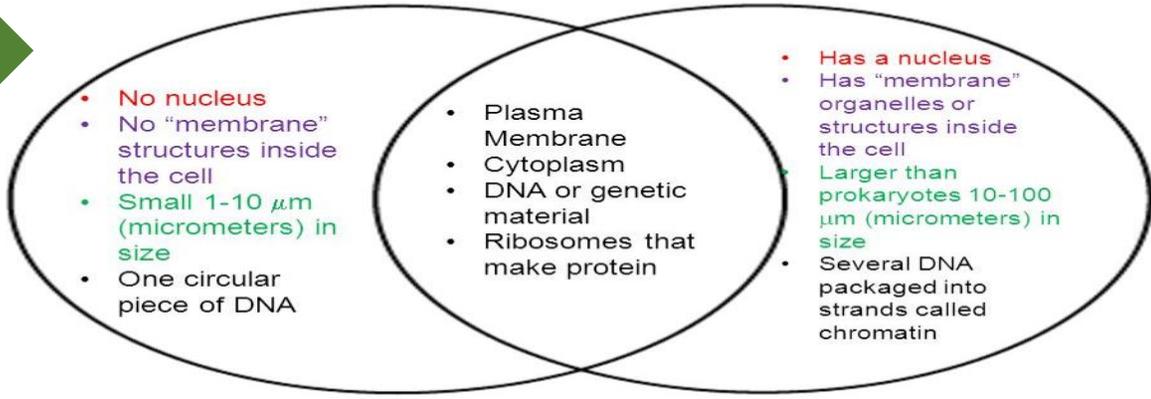
Prokaryotes vs Eukaryotes



Differences and similarities between Prokaryotes and Eukaryotes

Prokaryotes

Eukaryotes



Review by drawing out this Venn diagram

Video: (Short video on the differences between prokaryotic (bacteria) & eukaryotic (plants, animals, & fungi, etc.)



Watch this video a couple of times to see the organelles inside moving to see how they are important to help the overall cell function.

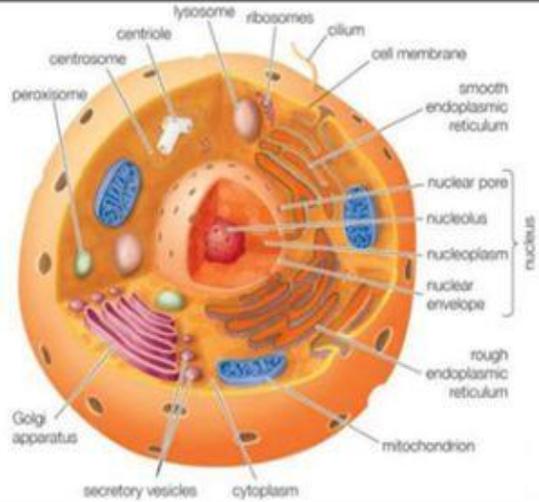
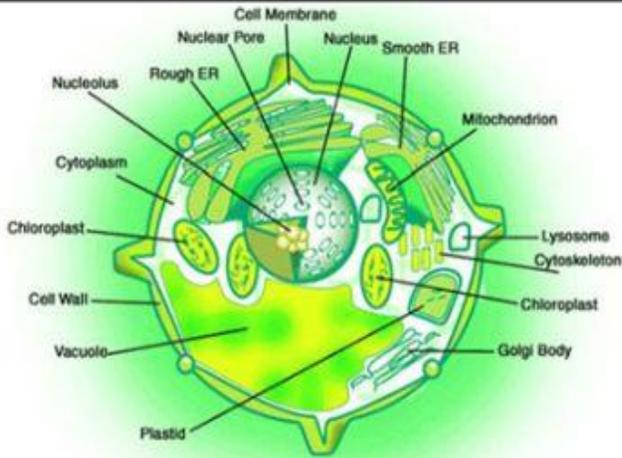
**What does it mean to be multicellular and unicellular?
Watch this 2 min. video below.**



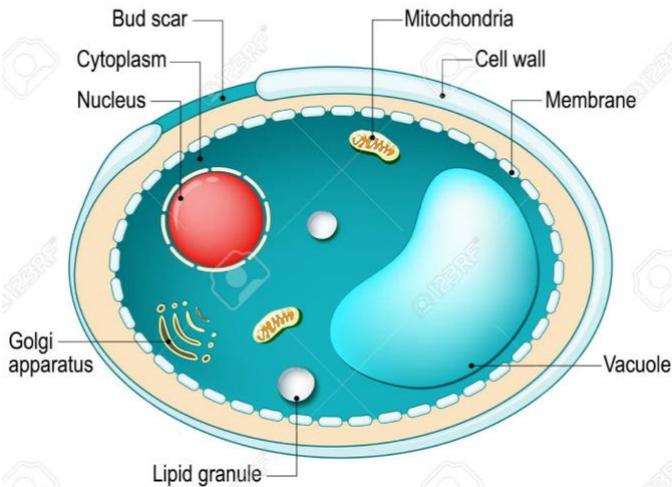
PLANT CELL

VS

ANIMAL CELL



YEAST CELL (Fungal Cell)



On the MAAP, the main Eukaryotic Cells are Plants, Animals, and Fungi Cells

Really know the key organelles (labeled parts). Organelles are like our organs in our body. Our organs help our body to function. Organelles (little organs) help the different cells (body) function

Key Organelles (little organs): Memorize the Highlighted/Underlined functions

- Nucleus contains genetic information in the form of **DNA**
- Nucleolus is inside the nucleus and creates ribosomes
- Ribosomes travel through endoplasmic reticulum and makes (synthesize) proteins
- Endoplasmic reticulum helps makes lipids (fats) and transporting nutrients in the interior (inside) of the cell
- Golgi Apparatus (Golgi Bodies) prepares/packages protein to be imported (taken in) and exported (taken out) of the cell to be used
- Mitochondria makes energy for the cell to do all of its functions
- In the plant, the chloroplast creates a nutrient source (food) for the plant cell
- Cytoskeleton is network of protein fibers to help give the cell shape (like our bones)
- Vacuoles serves as storage for cells (like water & nutrients)
- Prokaryotic cells are simple in their structure w/o a membrane bound nucleus
- Eukaryotic cells are more complex with a membrane bound nucleus
- Viruses contains either RNA or DNA
- Viruses must have a host cell to reproduce.

Name	What does it do?	Picture
Nucleus	Directs all the activities of the cell	
Cell Membrane	Protects the cell and allows nutrients to come into the cell.	
Cytoplasm	The gel-like fluid that holds the organelles.	
Ribosomes	Produces proteins that helps the cell grow.	
Endoplasmic Reticulum	Passages that transports materials.	

30L

Mitochondria	Produce energy	
Golgi bodies	Packages materials to be sent or received.	
Lysosomes	Breaks down food and waste materials.	
Vacuoles	Stores food, water, and nutrients.	
Cell Wall	Provides shape for plant cells.	
Chloroplasts	Uses sunlight energy to make food (glucose).	

Cell Functions

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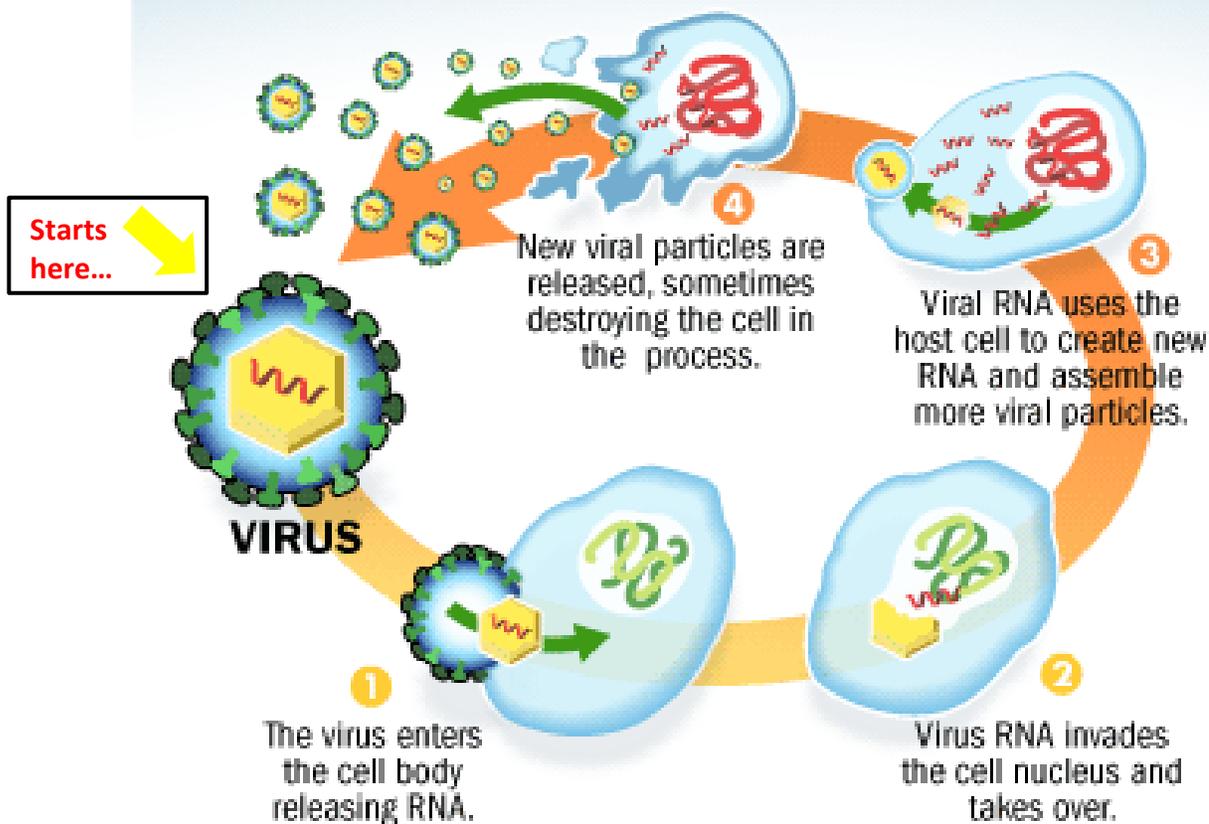
VERY IMPORTANT TO REMEMBER!!!!

Viruses are **not cells, nor** are they **alive**, **BUT** they possess a lot of the characteristics of what is alive (from week one).

Viruses must use living cells by taking over it (cell) to reproduce more itself (more viruses) = **Very BAD Relationship** (one sided, benefits one side) the

How a Virus Works

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KEY VOCABULARY: DIVERSITY & FUNCTIONS

MS-CCR Standard(s):

Bio. 1C. Students will relate the diversity of organelles to a variety of specialized cellular functions.

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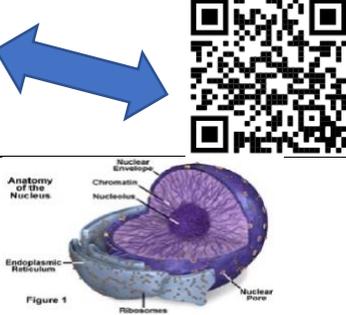
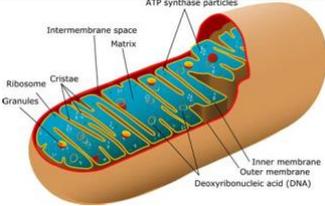
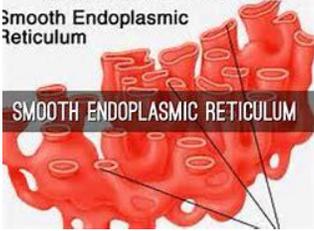
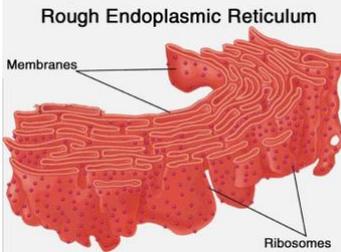
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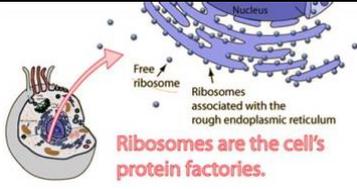
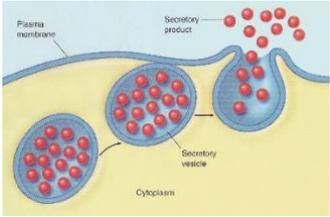
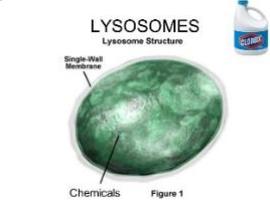
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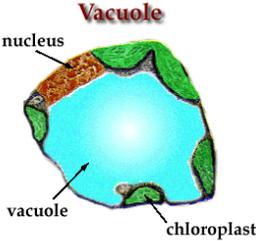
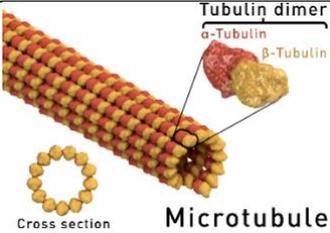
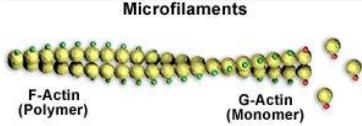
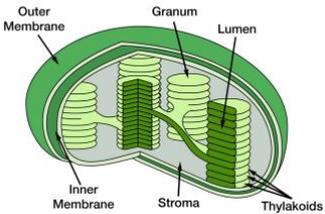
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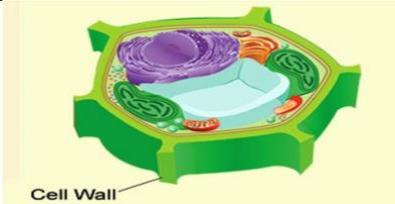
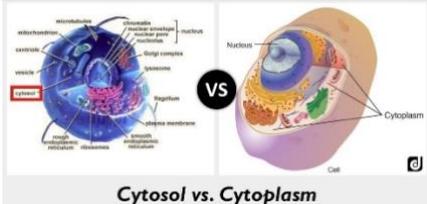
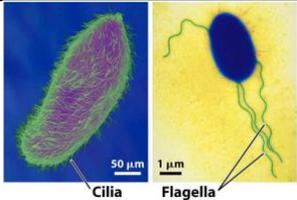
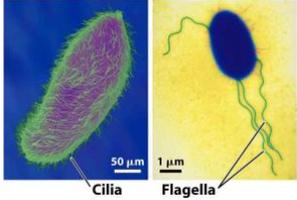
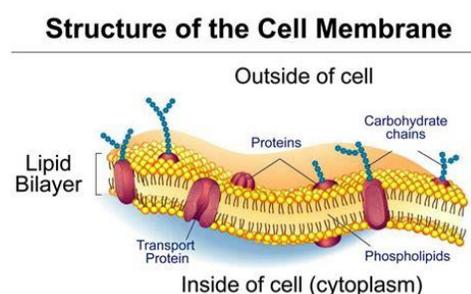
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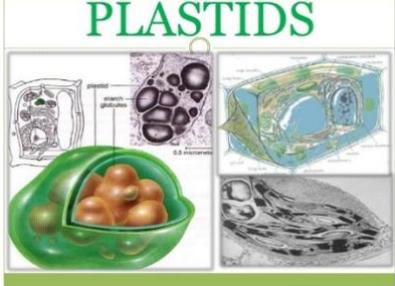
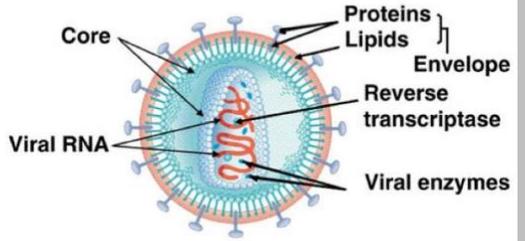
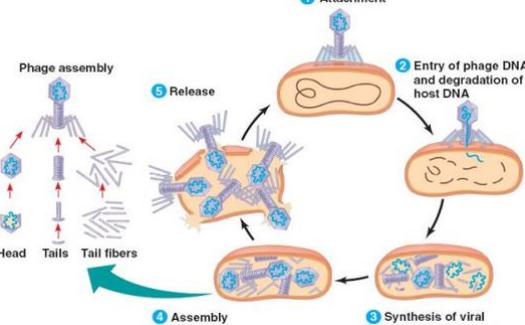
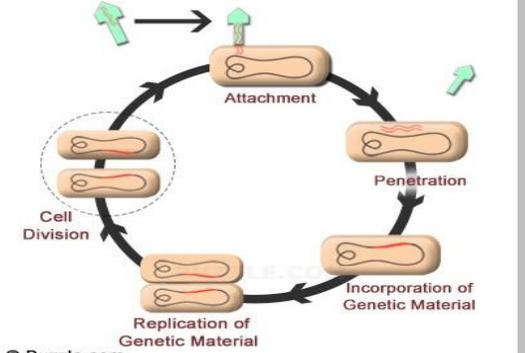
Name Organelle (Part) that aids to the cell survival	Picture	Function (Job/Purpose) that aids with survival	Located in the Plant Cell, Animal Cell or in Both
Nucleus		<ul style="list-style-type: none"> -controls the cell -contains the genetic material (DNA) -surrounded by the Rough/Smooth ER -in Eukaryotic Cells 	Both
Mitochondria		<ul style="list-style-type: none"> -“powerhouse of cell” -acts like a battery for the entire cells -mostly in Eukaryotic Cells -double membraned bounded which forms like a “maze” in the center. -uses ATP produced during cellular respiration 	Both
Smooth ER		<ul style="list-style-type: none"> -associated with protein synthesis (making of proteins) - moves cellular materials -attached to the Rough ER which is also attached to the nucleus 	Both
Rough ER		<ul style="list-style-type: none"> -makes proteins for export to the outside of the cell and enzymes to be incorporated into cellular organelles such as lysosomes. -attached to the Rough ER which is also attached to the nucleus 	Both

<p>Ribosomes</p>	 <p>Free ribosome Ribosomes associated with the rough endoplasmic reticulum</p> <p>Ribosomes are the cell's protein factories.</p>	<p>-site of biological protein synthesis (translation). Ribosomes link amino acids together in the order specified by messenger RNA (mRNA) molecules.</p>	<p>Both</p>
<p>Golgi bodies (apparatus/complex)</p>	 <p>GOLGI APPARATUS</p>	<p>-often thought of to be represented by a Postal office. it sorts proteins and other substances into vesicles. vesicles then send the proteins throughout the cell. It can also be seen as shipping and receiving as the cell is a factory. They move stuff in a cell.</p>	<p>Both (Mostly in animal)</p>
<p>Vesicles</p>	 <p>Plasma membrane Secretory product Secretory vesicle Cytoplasm</p>	<p>-the bubble-like membranous structure that stores and transports cellular products, and digests metabolic wastes within the cell. The cell forms vesicles during exocytosis, endocytosis, and intracellular transport.</p>	<p>Both</p>
<p>Lysosomes</p>	 <p>LYSOSOMES Lysosome Structure</p> <p>Single-Wall Membrane Chemicals Figure 1</p>	<p>-are membrane-enclosed organelles that contain an array of enzymes capable of breaking down all types of biological polymers— proteins, nucleic acids, carbohydrates, and lipids. Lysosomes function as the digestive system of the cell</p>	<p>Mostly in Animal</p>

<p>Vacuoles</p>	 <p>Vacuole</p> <p>nucleus</p> <p>vacuole</p> <p>chloroplast</p>	<p>-vacuoles tend to be very large and are extremely important in providing structural support, as well as serving functions such as storage, waste disposal, protection, and growth</p>	<p>Plant (mostly)</p>
<p>Microtubules</p>	 <p>Tubulin dimer</p> <p>α-Tubulin</p> <p>β-Tubulin</p> <p>Cross section</p> <p>Microtubule</p>	<p>-Are proteins that help define cell structure and movement, - microtubules are thick, strong spirals of thousands of subunits. Those subunits are made of the protein called tubulin. - got their name because they look like a tube.</p>	<p>Both</p>
<p>Microfilaments</p>	 <p>Microfilaments</p> <p>F-Actin (Polymer)</p> <p>G-Actin (Monomer)</p> <p>Figure 1</p>	<p>-Are proteins that help define cell structure and movement - are thin, strong spirals of thousands of subunits. Those subunits are made of the protein called tubulin. - got their name because they look like a tube.</p>	<p>Both</p>
<p>Chloroplast</p>	 <p>Chloroplast</p> <p>Outer Membrane</p> <p>Granum</p> <p>Lumen</p> <p>Inner Membrane</p> <p>Stroma</p> <p>Thylakoids</p>	<p>- are organelles found in plant cells and eukaryotic algae that conduct photosynthesis. -absorb sunlight and use it in conjunction with water and carbon dioxide gas to produce food for the plant.</p>	<p>Plant</p>

		-capture light energy from the sun to produce the free energy stored in ATP and NADPH through a process called photosynthesis	
Cytoskeleton	<p>Cytoskeleton Diagram</p>	a microscopic network of protein filaments and tubules in the cytoplasm of many living cells, giving them shape and coherence	Both
Centrioles		-are self-replicating organelles made up of nine bundles of microtubules and are found only in animal cells. They appear to help in organizing cell division	Both
Nucleolus		-largest structure in the nucleus of eukaryotic cells, where it primarily serves as the site of ribosome synthesis and assembly	Both
Chromosomes		-containing most of the DNA of a living organism -structured by being wrapped around protein complexes called nucleosomes	Both
Nuclear Membrane	<p>Nucleus; Nucleolus; Nuclear membrane</p>	a semi permeable protective layer that covers the surface of the nucleus. The nuclear membrane protects the nucleus. One function of the nuclear membrane	Both

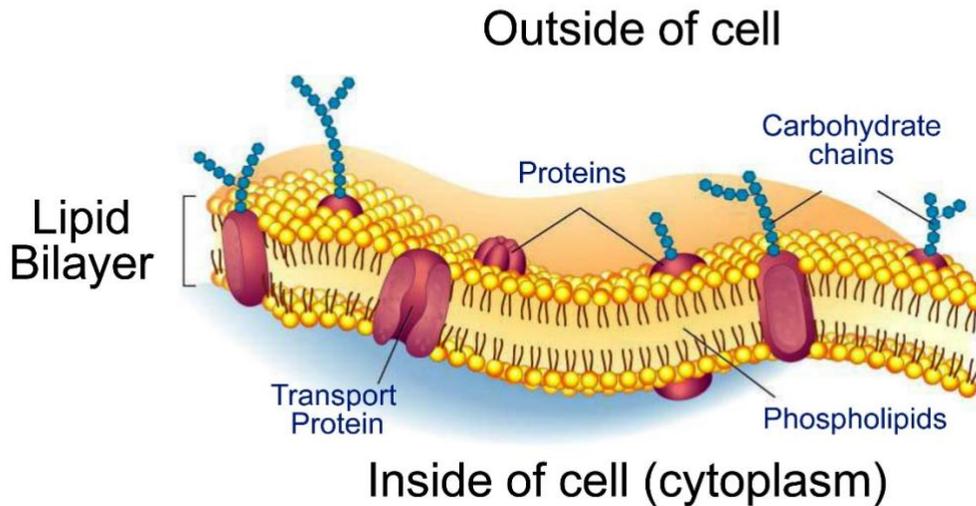
		is materials pass through this double membrane by going through pores .	
Cell Wall		- is the rigid , semi-permeable protective layer -Found on the outside of plants	Plants
Cytosol/ Cytoplasm		-the water-soluble components of cell cytoplasm	Both
Cilia		-are microscopic, hair-like structures that extend outward from the surface of many animal cells	Animal
Flagella		-a slender threadlike structure , especially a microscopic whiplike appendage that enables many protozoa, bacteria, spermatozoa, etc., to swim	Prokaryotes like Bacteria
Cell membrane		-The cell membrane is selectively permeable to ions and organic molecules and controls the movement of substances in and out of cells . -Bilayer (two layers)	In both but on the outside of Animal

<p>Plastids</p>		<p>-any of a class of small organelles, such as chloroplasts, in the cytoplasm of plant cells, containing pigment or food</p>	<p>Plants</p>
<p>Retrovirus</p>	<p>Structure of a retrovirus</p>  <p>courtesy www.andrew.cmu.edu</p>	<p>-type of RNA virus that inserts a copy of its genome into the DNA of a host cell that it invades, thus changing the genome of the cell, like HIV</p>	<p>Any Cell</p>
<p>Lytic Cycle</p>		<p>-virus results in the destruction of the infected cell and its membrane (ex. attack of a bacteria with a bacteriophage)</p>	<p>Any Cell</p>
<p>Lysogenic Cycle</p>	 <p>© Buzzle.com</p>	<p>-a viral mode of reproduction whereas time goes by. Although dormant (not active), it replicates itself by letting the host cell copy the virus' genetic material in cell division.</p>	<p>Any Cell</p>

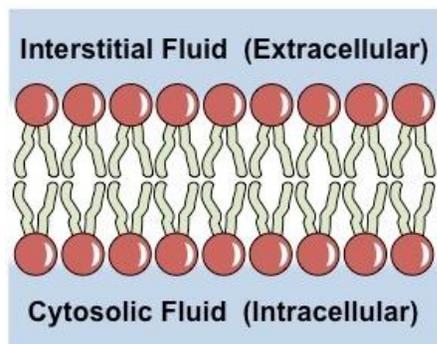
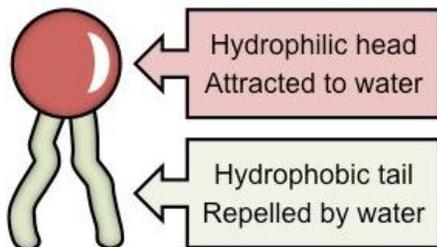


Video on the difference between the Lytic and Lysogenic Cycle on how Viruses reproduce itself

Structure of the Cell Membrane



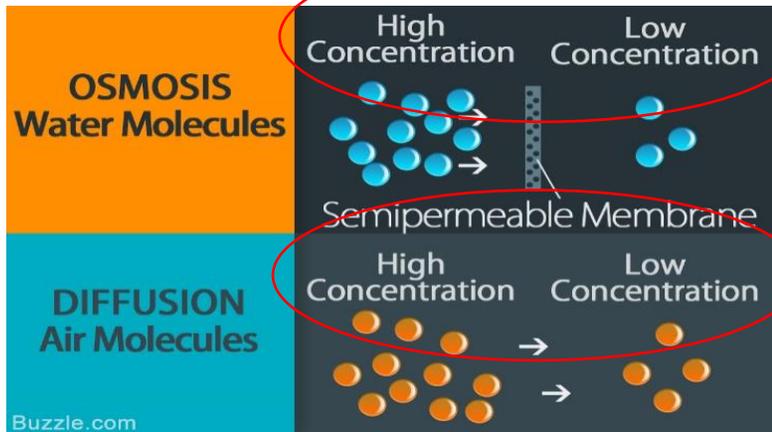
Cell membrane acts as a door  and allows certain materials in, out, and back into the cell.



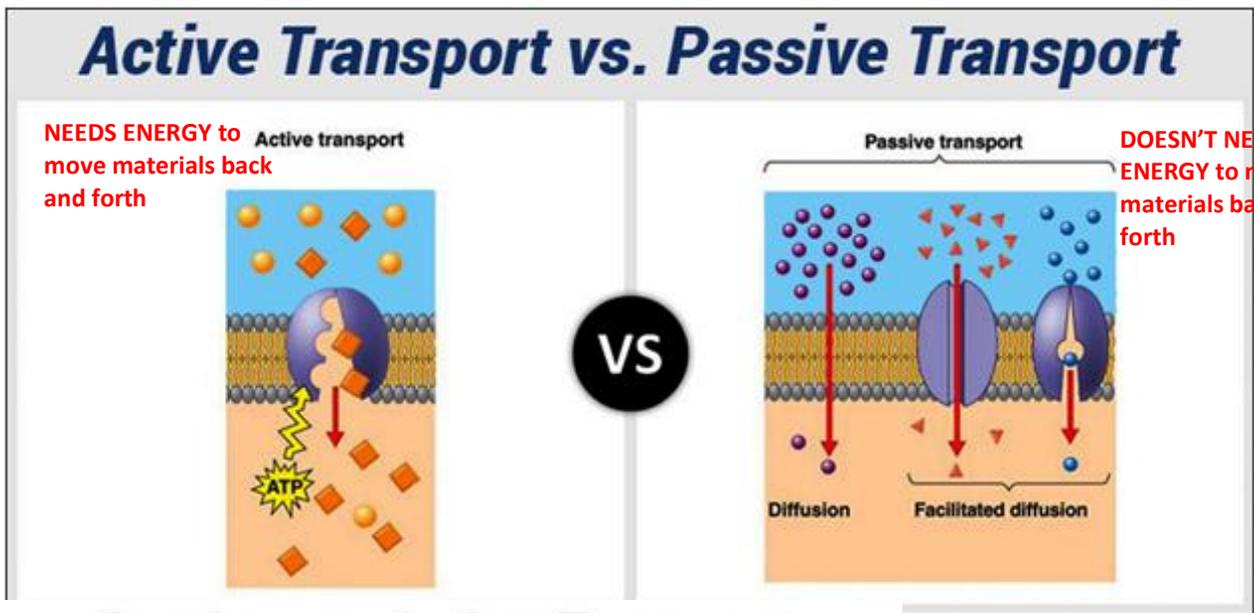
Cell
Membrane is
the door

As materials go in and out of the cell and back in the cell, materials from high concentration to low concentration or vice versa through **Active Transport & Passive Transport**

The free flow of materials from inside the cell to the outside (vice versa) creates **HOMESTATISIS** – a steady stable equilibrium between elements
KNOW THIS KEY INFORMATION:

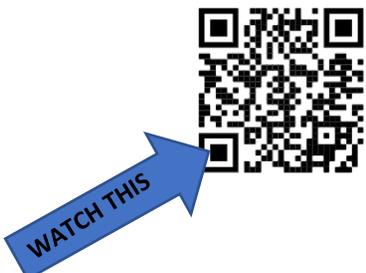


Aids in cell survival when moving from high concentration to low concentration and back (Homeostasis)



Passive vs. Active Transport

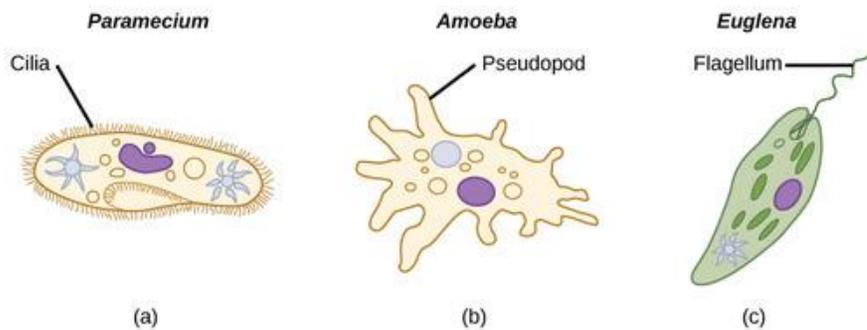
	Diffusion	Osmosis	Facilitated Diffusion	Gated Channel	Pumps	Endocytosis/ Exocytosis
Direction	High to Low	High to Low	High to Low	High to Low	Low to High	N/A
Transport Mechanism	Pores	Pores	Channels	Gated Channels	Pumps	Membrane
Energy Required?	No	No	No	No	Yes	Yes
Type of Particle	small nonpolar	water	small-medium	small-medium	ions	small-large
Examples of Particles	CO ₂ , O ₂	H ₂ O	Glucose, Fructose, Na ⁺ , Ca ⁺²	Glucose, Fructose, Na ⁺ , Ca ⁺²	Na ⁺ , K ⁺ , H ⁺	food, waste



- 3) _____ cells lack a nucleus and membrane bound organelles.
- 4) A _____ cell is an example of a prokaryotic cell.
- 5) _____ cells have a nucleus and membrane bound organelles.
- 6) _____ and _____ cells are eukaryotic cells
- 7) The _____ are responsible for making (synthesizing) proteins.
- 8) The _____ provides a framework for the cell.
- 9) The _____ acts as a selectively permeable barrier around the cell.
- 10) The tail (whip-like projections) of a cell that allows it to move from place to place is called a _____
- 11) The tiny hair-like projections on the outside of a cell that allows it to move from place to place are called _____.
- 12) The _____ is the jello-like interior of the cell that holds all of the organelles.
- 13) The _____ is the membrane that surrounds the nucleus.
- 14) The _____ is the site of ribosome synthesis.
- 15) The _____ provides structure and support for the plant cell.
- 16) The _____ modifies, sorts, and packages proteins for transport in and out of the cell.
- 17) The _____ is the powerhouse of the cell, making the energy needed to carry out cellular functions.
- 18) The _____ serves as a transport system within the cell.
- 19) The _____ endoplasmic reticulum has ribosomes attached to it.

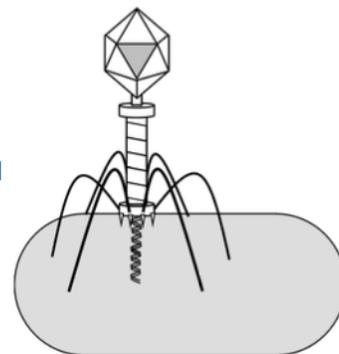
- 20) The _____ endoplasmic reticulum is the site of carbohydrate and lipid production.
- 21) The _____ is specialized plant cell structure that makes food with energy from the sun.
- 22) The _____ is the control center of the cell and stores all of the genetic information (DNA) of the cell.
- 23) _____ are the storage facilities of the cell.
- 24) _____ contain digestive enzymes and are found mainly in animal cells.

25) Identify how each of the cells below move in their environment: flagella, cilia, pseudopodia.



26) Place the following stages of the virus life cycle (lytic cycle) in the correct order by number the statements 1-5

- _____ A. The host cell lyses, or bursts, releasing copies of the replicated virus which are free to infect other cells.
- _____ B. The sheath contracts, and the tail plunges into the host cell, injecting DNA into the host's cytoplasm.
- _____ C. Tail fibers attach to specific receptors on the host cell and the base plate pins attach to the cell membrane.
- _____ D. The virus' DNA is copied, transcribed, and translated to synthesis viral proteins.
- _____ E. Capsid proteins are assembled around the replicated viral DNA forming multiple copies of the bacteriophage.



MAAP TEST PREP

1)

Which structures distinguish plant cells from animal cells?

- A ribosomes and vacuoles
- B vacuoles and mitochondria
- C chloroplasts and cell membranes
- D chloroplasts and cell walls

a) Define the following terms from the question above:

Distinguish

b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

2)

A scientist is studying a cell that has a rigid cell wall with many hair-like projections on the outer surface. The genetic material is not enclosed by a membrane.

Which cell is the scientist observing?

- A a cheek cell
- B a leaf cell
- C a blood cell
- D a bacterial cell

a) Define the following terms from the question above:

Projections

b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

3)

***E. coli* and a mammalian cell both contain DNA. However, *E. coli* is a prokaryotic cell, and a mammalian cell is a eukaryotic cell.**

What is one reason for classifying *E. coli* as a prokaryotic cell?

- A The DNA of *E. coli* contains fewer base pairs.
- B The DNA of *E. coli* does not undergo transcription.
- C The DNA of *E. coli* replicates twice prior to cell division.
- D The DNA of *E. coli* is not enclosed in a nuclear membrane.

a) (circle the correct answer) *E. coli* are (Prokaryotes / Eukaryotes) where as mammalian cells are (Prokaryotes / Eukaryotes)

b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

4)

The chart lists a few structural characteristics of viruses.

1. Viruses are extraordinarily small in size.
2. Viruses are not specific to their hosts.
3. Viruses contain either DNA or RNA as genetic material.
4. Viruses lack cellular organization.

Based on the information, which characteristic explains why viruses are unable to reproduce on their own?

- A characteristic 1
- B characteristic 2
- C characteristic 3
- D characteristic 4

a) Define the following terms from the question above:

Extraordinarily

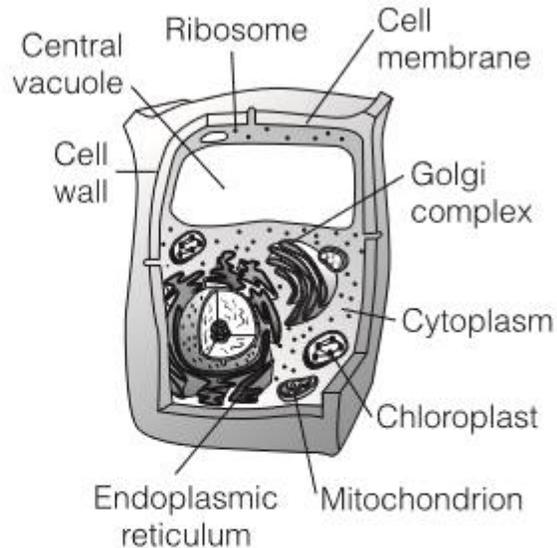
Host

b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

MDE PT. 1 # 42

A diagram of a cell is shown.



The cell shown in the diagram is found in which type of organism?

- F Bacterium
- G Moss
- H Paramecium
- J Yeast

Answer :

MDE PT. 2 # 4

After a protein is constructed at the ribosome, it can be transported to the Golgi complex for modification.

What cellular structure is used in this transport?

- F Lysosome
- G Mitochondrion
- H Nuclear pore
- J Endoplasmic reticulum

Answer

MDE PT. 2. # 16

What part of the cell has a similar function to a school security guard, whose job it is to control who enters and leaves the school?

- F Nucleus
- G Golgi body
- H Mitochondrion
- J Cell membrane

Answer

MDE PT. 2. # 36

When red blood cells are placed in distilled water, the cells swell as water molecules enter them.

By what process do water molecules move into the cells?

- F Facilitated diffusion
- G Active transport
- H Endocytosis
- J Osmosis

Answer

MDE PT. 2 # 56

In the grana of a chloroplast, sunlight energy is used to split water molecules and provide cellular energy.

In the cells of which type of organism would this process occur?

- F Tree frog
- G Bread mold
- H Bermuda grass
- J Monarch butterfly

Answer

MDE. PT. 3 # 1

Which cell structure does a bacterial cell lack?

- A Ribosome
- B Cell wall
- C Lysosome
- D Cytoskeleton

Answer

MDE PT. 3 # 5

Which of the following organelles are most common in a plant cell?

- A Centrioles
- B Flagella
- C Lysosomes
- D Plastids

Answer:

MDE PT. 3 # 11

Which of the following functions is controlled by the cell membrane?

- A Excreting waste
- B Replicating DNA
- C Producing energy
- D Assembling proteins

Answer

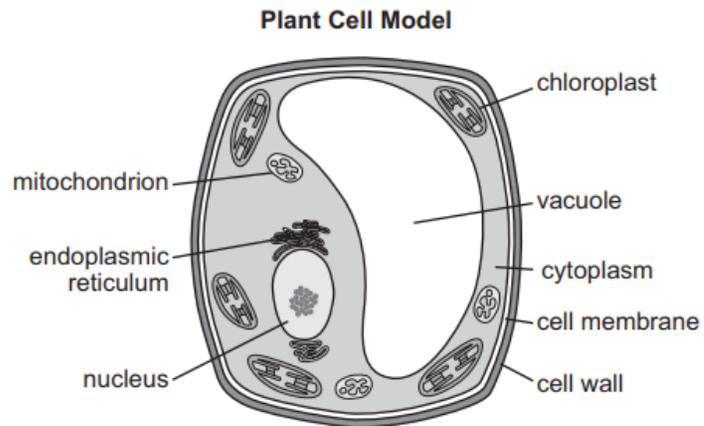
MDE PT.3 # 65

Which organelle performs digestive functions for the cell?

- A Ribosome
- B Lysosome
- C Golgi body
- D Endoplasmic reticulum

Answer

19. A labeled model of a plant cell is shown below.



Which organelles work together to help a plant cell store and remove excess nutrients?

- A. cytoplasm, nucleus, and vacuole
- B. vacuole, cell membrane, and cell wall
- C. chloroplast, mitochondrion, and cell wall
- D. nucleus, endoplasmic reticulum, and chloroplast

Answer: