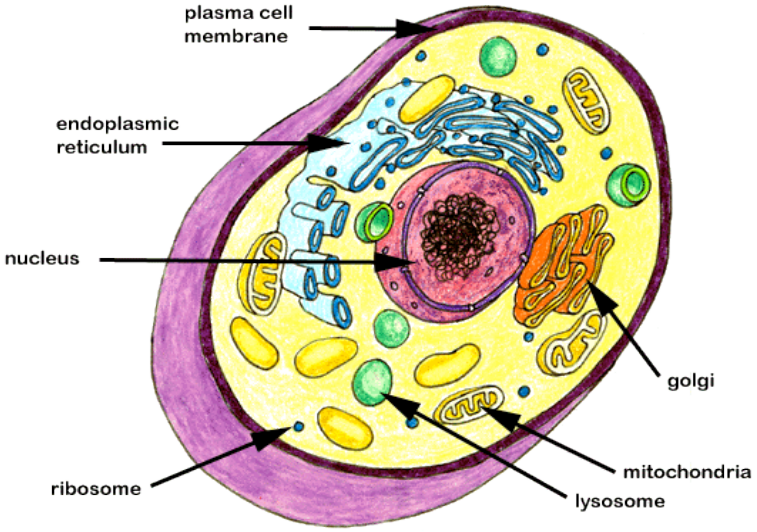
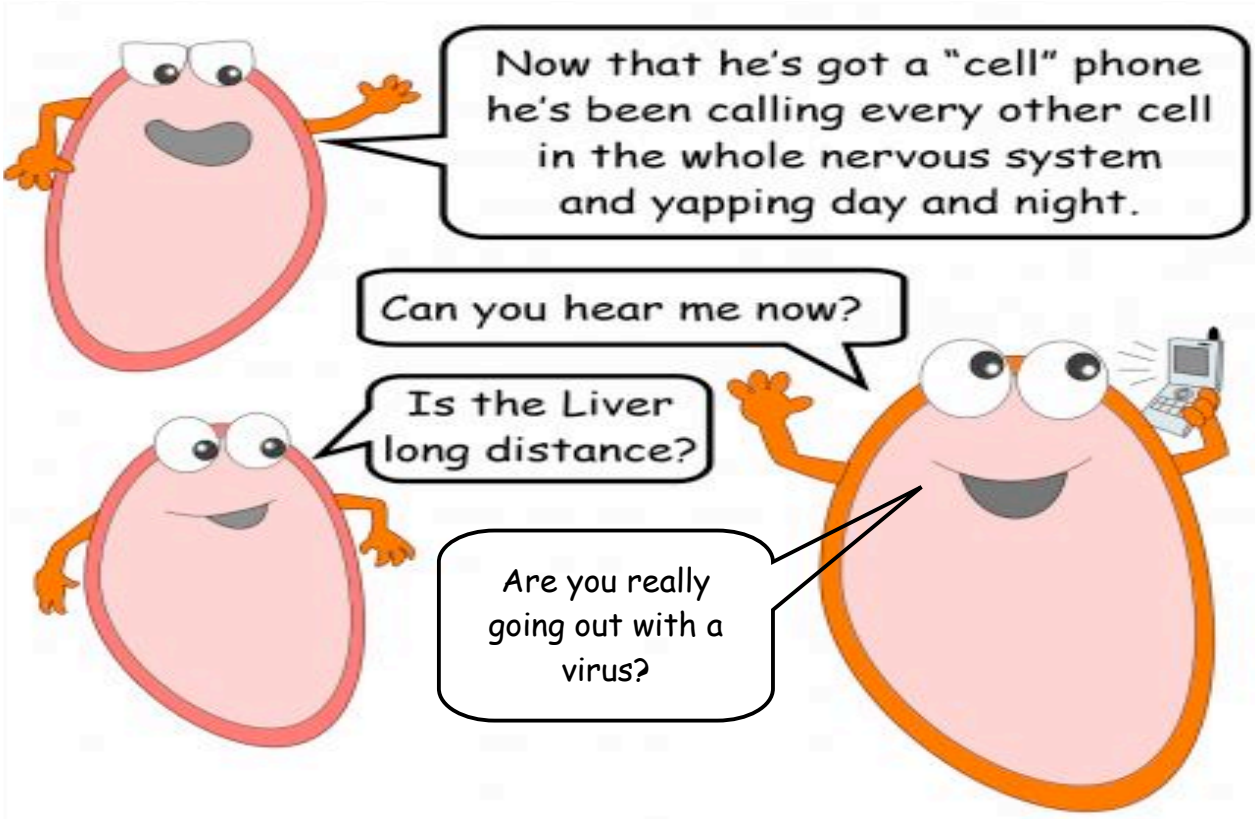
The Cell: A User's Guide





-Marvin Double

CELL STRUCTURE STUDY GUIDE

FIRST THIS IMPORTANT MESSAGE FROM YOUR TEACHER:

This study guide contains lots of valuable information. There are examples of some of the questions I may have on the tests and quizzes, diagrams that will help you understand the different parts of cells and some suggestions for learning all this stuff. My advice is to do whatever it takes to learn this material. It is hard. It can seem overwhelming and time consuming. But it can be done! And it's worth doing and knowing!

LEARNING GOALS:

By the end of this unit…

- **I will be able to** explain the differences between plant and animal cells.
- **I will be able to** identify what's inside a cell and explain what goes on there.
- **I will be able to** explain what cells are and why they're are so important to life.
- **I will be able to** classify living things into six groups based on their cell type.
- **I will be able to** use a microscope to identify the parts of plant and animal cells

HELPFUL HINTS:

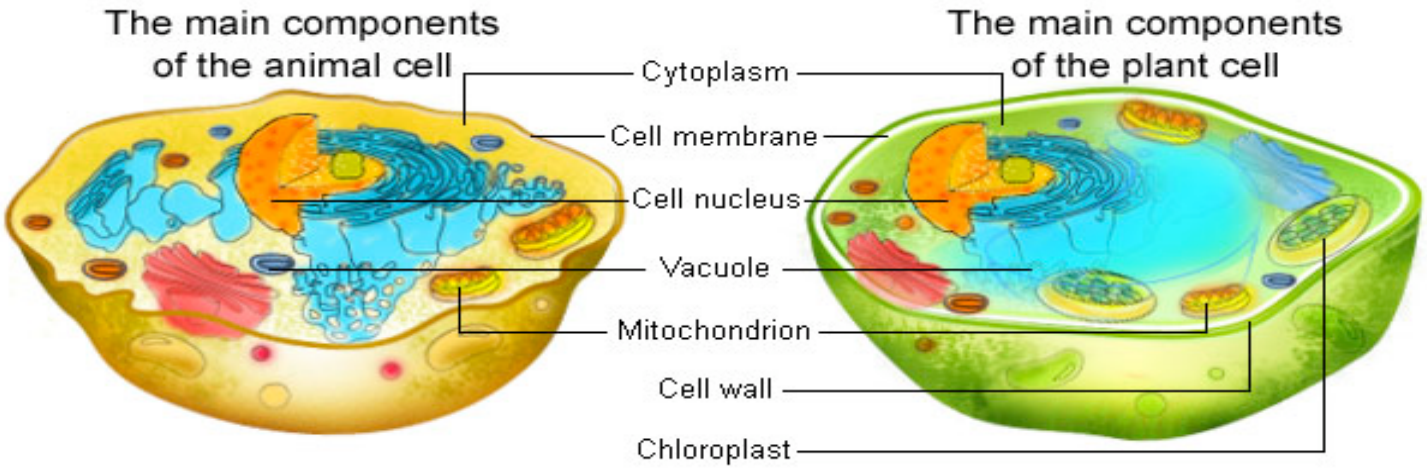
- Use your textbook and read the questions, section review questions, and Chapter Review questions.
- Make flash cards.
- Make up your own test.
- Study with a friend and/or with your parent/sister/brother/dog/cat.
- DOUBLE NICKEL STUDYING: Pick **5** words you do not know. Say the definition, example, description, or explanation OUT LOUD **5** TIMES. Then cover up each word and see if you can remember what it means. Do this EVERY night adding 5 new words each night and reviewing the previous 5 words.
- Minimum time to spend studying is 10 minutes each night. Review your notes, this study guide, your textbook, and the web links on my page www.lincnet.org/joseph

KEY TERMS

- **Animal –** living things that are multicellular, have a nucleus, do not have cell walls, and are consumers
- **Bacteria** – single celled microorganism that has a cell wall but no nucleus
- **Cell** – the basic unit of life found in all living things
- **Cell Membrane** –gives the cell its shape and controls what goes through it such as food, water, oxygen, and wastes.
- **Cell wall** – a rigid layer of nonliving material that surrounds plant cells.
- **Chlorophyll** – a green pigment found in the chloroplasts of plants, algae and some bacteria.
- **Chloroplast** – the part in plant cells that captures energy from sunlight and uses it to produce food.
- **Cytoplasm –** the gel-like fluid that contains all the cell's organelles.
- **Diffusion** – the movement of molecules through a membrane from an area of higher concentration to an area of lower concentration.
- **Fungi** – living things that have a nucleus, cell wall, are usually multicellular, and get their food from dead and organic matter (ex: mushrooms, yeast)
- **Microorganism** – a living thing that can only be seen with a microscope.
- **Mitochondria** - the parts of the cell that help change food into energy.
- **Multicellular** - living things that are made of many cells.
- **Nucleus** – the cells' control center
- **Nuclear membrane**- surrounds the nucleus and controls what goes into and comes out of the nucleus.
- **Organelle** – a tiny cell structure that carries out a specific function within the cell.
- **Organism** - any living thing.
- **Osmosis** – the movement of water molecules through a selectively permeable barrier.
- **Photosynthesis** – the process by which plants capture light energy from the sun and use it to make food.
- **Plant – living** things that are multicellular, have a nucleus and cell walls, and are producers.
- **Protists** – living things that have a nucleus, are usually singled celled microorganisms, and are not plants, animals, or fungus (ex: amoeba, paramecium).
- **Selectively Permeable** – a property of cell membranes that allows some substances to pass through, while others cannot.
- **Specialized cell** - cell that carries out a specific function within an organism.
- **Tissue** - a group of specialized cells.
- **Vacuole** – a sac inside a cell that stores food.

CELL BASICS

- Naturalist Robert Hooke first discovered cells in 1665. He thought the little "boxes" in a thin slice of cork, seen under the microscope, resembled monk's cells. He did not know what the cells were for, but noted that they were "full of juices" in living plant tissue.
- Anton van Leeuwenhoek, a cloth merchant, made lenses and studied cells in the 1670's, making the first discoveries of bacteria, protozoans, and other microorganisms.



All living organisms on Earth are made of tiny pieces called cells. Cells are the smallest form of life. Your body contains trillions of cells, organized into more than 200 major types. At any given time, each cell is doing thousands of jobs. A single cell holds lots of pieces and each piece has a different job. Scientists call those pieces **organelles.** Your body contains many different cell types, each one having s specific job. Red blood cells carry life-giving oxygen to every corner of your body, white blood cells kill germ invaders, intestinal cells squirt out chemicals that chisel away at your food so you can absorb its nutrients, nerve cells sling chemical and electrical messages that allow you to think and move, and heart cells constantly pump blood, Cells also must make the products your body needs, such as sweat, saliva, enzymes, hormones, and antibodies.

Living cells are divided into two types - **PROCARYOTIC** and **EUKARYOTIC**.

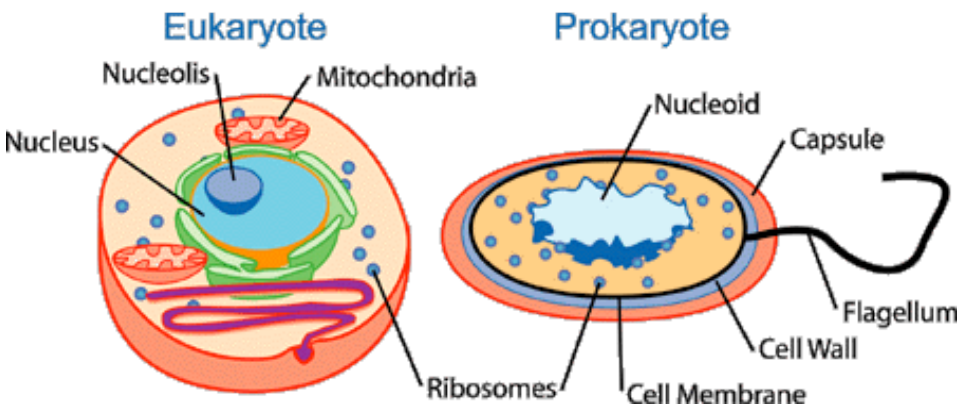
- **Prokaryotic** cells were here first and for billions of years were the only form of life.
- **Eukaryotic** cells came next and are more complex. Most of the living things that we are familiar with are made of eukaryotic cells; animals, plants, fungi and protists.

REMEMBER THIS ⇒ ALL cells, no matter what kind, share common characteristics:

- A cell membrane
- DNA
- A cytoplasm
- Get energy and nutrients from their environment.

The BIG Idea

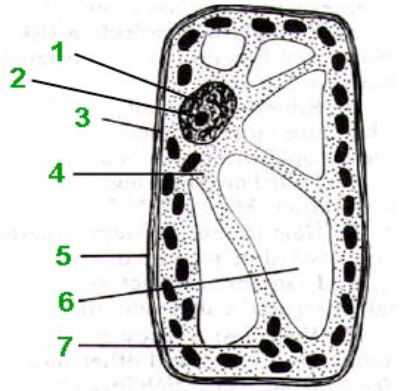
Cells are the basic unit of life and contain specific parts that do specific jobs.



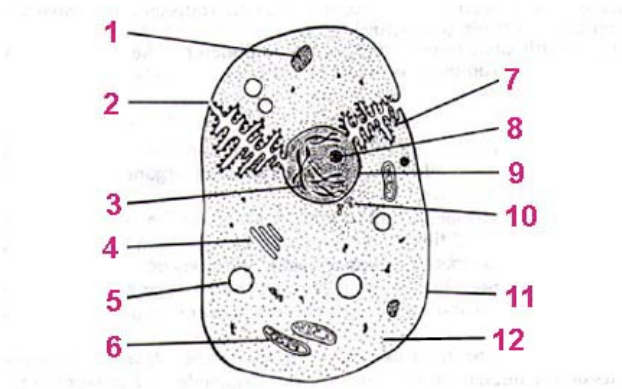
CELL QUESTIONS & ANSWERS

1. What organelles are found in plant cells, but not in animal cells? **cell wall and chloroplast**
2. What organelles are found in both plant and animal cells ? **cell membrane, nucleus, and mitochondria**
3. What organelle holds the cell together and allows nutrients in and waste products out? **cell membrane**
4. What are the energy-converting organelles? **mitochondria and chloroplast**

Cell 1



Cell 2



5. Which of the cells in the diagram above is a plant cell? Why? **Cell 1, because it has a cell wall**
6. Which of the cells in the diagram above is an animal cell? Why? **Cell 2, because it does not have a cell wall**
7. What organelle is #3 (Cell 1) pointing to? **Cell membrane**
8. What organelle # 11 (Cell 2) pointing to? **Cell wall**
9. What organelle is #1 (Cell 1) pointing to? **Nucleus**
10. What organelle is #6 (Cell 2) pointing to? **Mitochondria**
11. What organelle is # 7 (Cell 1) pointing to? **Chloroplasts**
12. Which letter shows the structure that holds the genetic information in Cell 1? Cell 2? **2 and 8**
13. What is the cell organelle, which holds the hereditary information of the cell called? **Nucleus**
14. Which organelle uses sunlight to make energy? **Chloroplasts**
15. Why do plants need chloroplasts? **Plants do not eat and need to convert light energy into sugar**
16. Why do animal cells not need chloroplasts? **Animals eat food to get sugar, which is converted, to energy**
17. Why do both plant and animal cells have mitochondria? **Both need to convert sugar into energy**
18. What is the heredity material in a cell called? **DNA- deoxyribonucleic acid**
19. What is the function of DNA? **Provide instructions for the function of the cell**
20. What are the basic units of all living things? **Cells**

21. What are the basic needs of a cell? **Reproduce, use energy, remove wastes, and transport nutrients**

22. Why are cells considered the basic unit of life? **Cells are the basic unit of life because cells are the smallest units (things) that can perform all of the functions of life.**

23. A person has about 200 different kinds of cells; each specialized to do a particular job. This means that a person is what type of organism? **Multicellular**

True or False?

____ 1. A microscope is an instrument that makes distant objects look larger. **FALSE**

____ 2. A microscope that enlarges an object 400 times is said to have a resolution of 400. **FALSE**

____ 3. Organelles that use energy from sunlight to produce food are called mitochondria. **FALSE**

____ 4. Plant and animal cells usually are larger than bacterial cells. **TRUE**

____ 5. The cells in a many-celled organism often have different sizes and shapes. **TRUE**

____ 6. Water helps keep the temperature of cells from changing rapidly. **TRUE**

____ 7. In passive transport, materials move from an area of higher concentration to an area of lower Concentration through a cell membrane. **TRUE**

____ 8. The cell theory states that cells are produced from nonliving cells. **FALSE**

____ 9. You can't see the cells in your body because most of them are very small. **TRUE**

____ 10. Electron microscopes use a beam of light to produce a magnified image. **FALSE**

CHECK OUT THESE QUESTIONS & ANSWERS

All matter on Earth can be classified as either BIOTIC OR LIVING or ABIOTIC OR NOT LIVING. If something is alive, it is either living NOW or once was LIVING.

How do we know if something is alive? List the six characteristics of all living things. 1. ALL LIVING THINGS HAVE CELLS. 2. ALL LIVING THINGS HAVE DNA. 3. ALL LIVING THINGS SENSE AND RESPOND TO CHANGE. 4. ALL LIVING THINGS USE ENERGY. 5. ALL LIVING THINGS REPRODUCE. 6. ALL LIVING THINGS GROW AND DEVELOP.

What is a cell? A MEMBRANE COVERED STRUCTURE THAT IS THE BASIC UNIT OF LIFE.
What is the genetic material in the nucleus of a cell that gives us our heredity and tells cells what they are to do? DNA

When a living thing (organism) reacts to a loud stimulus, it may jump or run away. Everything that is living shows a RESPONSE to change when a STIMULUS is present.

Everything the cell needs, from food to oxygen, enters the cell through the cell membrane. Harmful waste products exit through the cell membrane as well. In this way, the cell stays in smooth-running order, keeping conditions inside the cell the same even though conditions outside the cell may change. The ability to

maintain a stable internal environment is one of the important needs of all living things. What is this process called? HOMEOSTASIS Two examples of this are: (1) MAINTAINING A NORMAL BODY TEMPERATURE BY SHIVERING OR SWEATING, AND
(2) SLOWING DOWN THE HEART BEAT AFTER A SUDDEN SCARE.

Organisms can be made of one cell, which is called UNICELLULAR, or they can be made of many cells, which is called MULTICELLULAR.

All organisms need what four things to survive. Explain each one.
1. FOOD – Organisms can be producers like plants that make their own food or consumers like animals that eat other organisms for food. A predator hunts food, a scavenger eats organisms that are already dead and rotting, and a gatherer collects producers. A decomposer breaks down and rots away organisms.
2. WATER – All organisms need water because they are 70% or more water. Water is needed for chemical activities to take place during metabolism.
3. AIR – All organisms need oxygen and/or carbon dioxide to live. Animals take in oxygen and release carbon dioxide. Plants take in carbon dioxide to make food and take in oxygen to release energy. Organisms that use oxygen are aerobic. Organisms that do not use oxygen are anaerobic.
4. A PLACE TO LIVE – Organisms compete with each other for the resources they need. The space must be large enough for the size of the organism. It must have all the resources it needs.

Life is organized into two different types of cells.
If the cell does not have a nucleus or any other membrane-covered organelle, is very small and simple, and has circular DNA, it is a PROKARYOTE cell. An example of this is BACTERIA.

If it does have a nucleus, membrane-covered organelles, is larger and more complex, and has linear DNA, then it is a EUKARYOTE cell.

Life can be organized from cells to organisms to ecosystems. Put them in order from smallest to largest.
CELL, TISSUE, ORGAN, ORGAN SYSTEM, ORGANISM, POPULATION, COMMMUNITY, ECOSYSTEM, BIOME, BIOSPHERE

What are organelles? SMALL STRUCTURES INSIDE A CELL THAT PERFORM FUNCTIONS TO KEEP THE CELL ALIVE.
Who first saw a cell and when? ROBERT HOOKE IN 1665
Who used a simple microscope to look at microscopic organisms in water? LEEUWENHOEK IN 1671
What are the three main parts of the cell theory? 1. ALL CELLS COME FROM OTHER EXISTING CELLS. 2. CELLS ARE THE BASIC UNIT OF LIFE. 3. ALL ORGANISMS ARE MADE OF ONE OR MORE CELLS.

There are two basic eukaryote cells, an ANIMAL cell and a PLANT cell. The difference between them are two special organelles in each one that is not in both cells. List these four organelles and explain their function.
THE PLANT CELL HAS A CELL WALL, A THICK STRUCTURE THAT SUPPORTS THE OUTSIDE OF THE PLANT CELL, AND CHLOROPLASTS, STRUCTURES THAT MAKE FOOD FOR THE PLANT.
THE ANIMAL CELL HAS LYSOSOMES, ROUND STRUCTURES WITH ENZYMES TO EAT AWAY OLD CELL PARTS, AND CENTRIOLES, A PAIR OF T-SHAPED STRUCTURES TO HELP THE ANIMAL CELL DIVIDE.

Name the five similarities all cells have. THEY ALL HAVE CYTOPLASM, A CELL MEMBRANE, ORGANELLES, DNA, AND A SMALL SIZE.

Why is it important for a cell to be small? CELLS MUST BE SMALL ENOUGH TO TAKE IN THE NUTRIENTS IT NEEDS TO SURVIVE AND TO REMOVE THE WASTE MATERIAL.

What is the advantage of being multicellular and why is that important? BEING MULTICELLULAR IS AN ADVANTAGE BECAUSE EACH CELL ONLY HAS TO DO ONE SPECIALIZED JOB. THE ORGANISM FUNCTIONS BETTER AND MORE EFFICIENTLY AS A RESULT. A UNICELLULAR ORGANISM HAS TO DO ALL THE JOBS IN ORDER TO STAY ALIVE AND DOES NOT FUNCTION AS WELL.

What are the three parts that belong to the brain of the cell or the NUCLEUS and what do they do? NUCLEAR MEMBRANE ALLOWS MATERIALS TO ENTER AND LEAVE THE NUCLEUS; NUCLEOLUS MAKES THE RIBOSOMES; CHROMATIN HOLDS THE DNA

What are the small, grain-like bodies that are everywhere in the cell? RIBOSOMES
These organelles are the most abundant organelles in the entire cell, but they do not have a MEMBRANE. Their job is to hook together amino acids to make PROTEIN.

What cells have the most mitochondria, the animal cell or the plant cell and why? AN ANIMAL CELL BECAUSE IT MOVES MORE THAN A PLANT CELL IN ORDER TO GET FOOD.
What is a large, irregularly shaped green structure floating in the cytoplasm of plant cells and what is its function? CHLOROPLAST. IT CAPTURES SUNLIGHT ENERGY TO MAKE FOOD FOR THE PLANT CELL

CELL PARTS AND THEIR FUNCTIONS

Nucleus
- Large Oval body near the center of the cell.
- The control center for all activity.
- Surrounded by a nuclear membrane.
- Contains genetic material ---> CHROMOSOMES (DNA)

Nucleolus
- Is found in the nucleus.
- Contains more genetic information (RNA)

Cell Membrane
- The outer boundary of the cell.
- It separates the cell from other cells.
- It is porous ---> allows molecules to pass through.

Cell Wall (Plant Cells Only)
- Non-living structure that surrounds the plant cell.
- Protects + supports the cell.
- Made up of a tough fiber called cellulose.

Cytoplasm
- Cell material outside the nucleus but within the cell membrane.
- Clear thick fluid.
- Contains structures called organelles.

Vacuoles

- Are clear fluid sacs that act as storage areas for food, minerals, and waste.
- In plant cell the vacuoles are large and mostly filled with water. This gives the plant support.
- In animal cells the vacuoles are much smaller.

Mitochondria

- Powerhouse of the cell.
- Center of respiration of the cell.
- They release energy for cell functions.

Chloroplasts (Plant cells only)

- Contains a green pigment known as chlorophyll, which is important for photosynthesis.

Ribosomes

- Tiny spherical bodies that help make proteins.
- Found in the cytoplasm or attached to the endow plasmic reticulum.

Endo Plasmic Reticulum (ER)

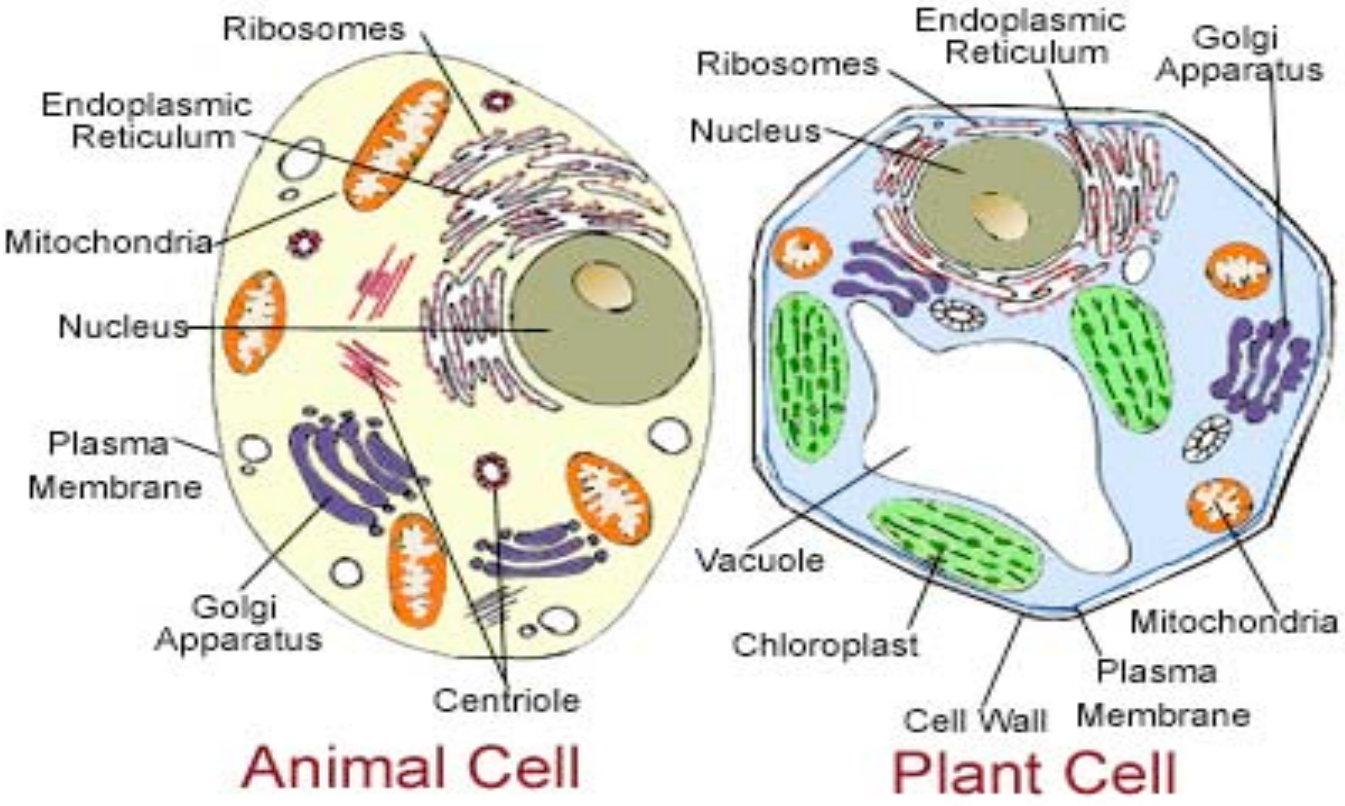
- Systems of membranes throughout the cytoplasm.
- It connects the nuclear membrane to the cell membrane.
- Passageway for material moving though the cell.

Golgi Bodies

- Tube like structures that have tiny sacs at their ends.
- They help package protein.

Lysosomes

- Small structures that contain enzymes, which are used in digestion.
- If a lysosome were to burst it could destroy the cell



JUST A FEW MORE POSSIBLE TEST QUESTIONS & ANSWERS

1. What are the three main concepts of the cell theory?
   1) All living things are made of one or more cells
   2) Cells are the basic unit of structure and function in living things.
   3) All cells come from other cells.

2. Describe in your own words what an organelle is?
There are special parts called organelles that help the cell function as a living thing. They serve a certain purpose for the cell to maintain life.

3. Are organelles living things? Explain.
No, they are not living on their own. They make up a cell and the cell is considered the basic unit of life.

4. Do animal and plant cells have all of the same organelles? Explain.
They have many of the same organelles. But, plants have additional organelles called chloroplasts and cell wall.

5. Why would your heart cells have more mitochondria than your eye cells?
Your heart cells need a lot of energy to beat constantly. The mitochondria produce energy for a cell, so heart cells need a lot of mitochondria. The eye cells to not need as much energy, so they would have less mitochondria.

6. How do mitochondria and chloroplasts differ?
Mitochondria make energy from food and chloroplasts make food from sunlight.

7. Why is it unnecessary for our cells to have a cell wall?
W*e have an internal skeleton that helps to support us. Plants do not have a skeleton, so the rigid cell wall helps it to maintain its structure*.

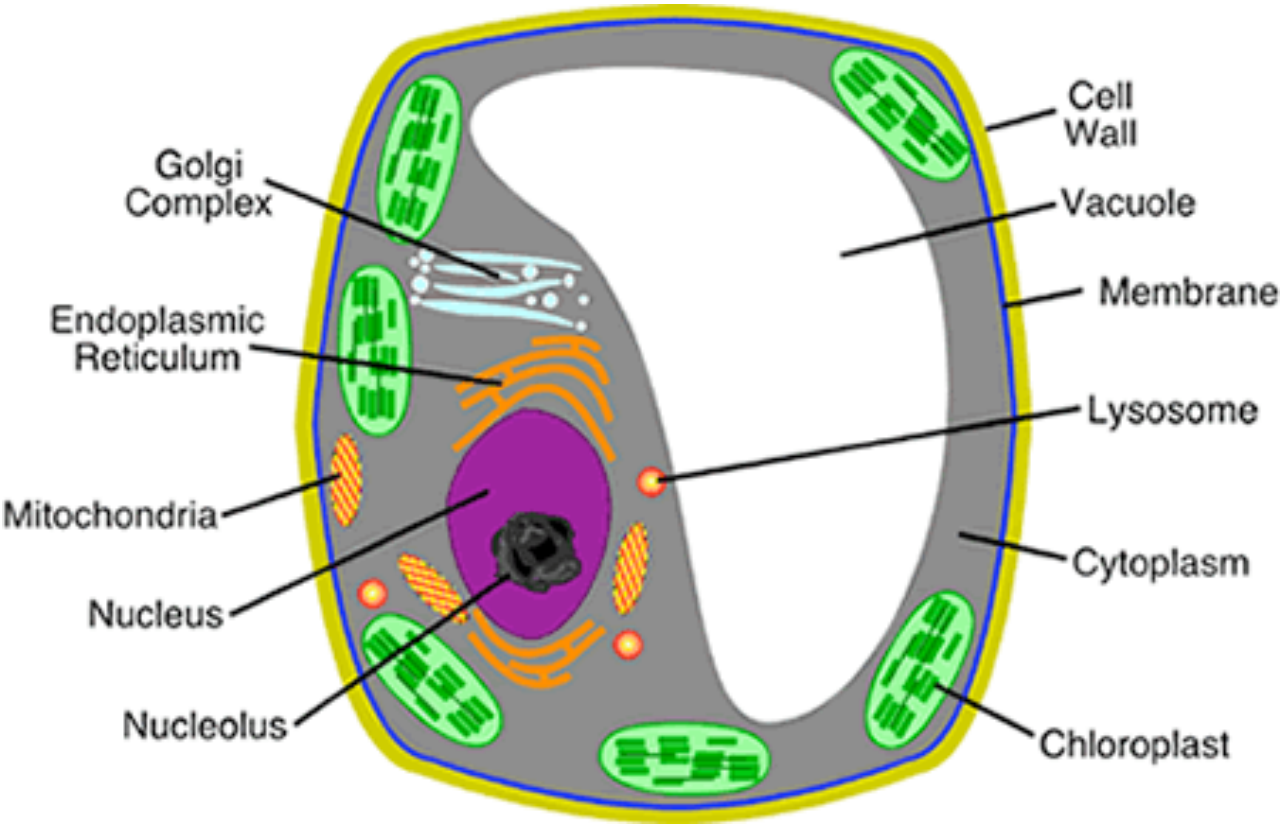
8. What might happen if the lysosomes inside a cell stopped working properly?
Waste materials and large particles of food would build up and eventually overcrowd the cell and it would no longer be able to function properly.

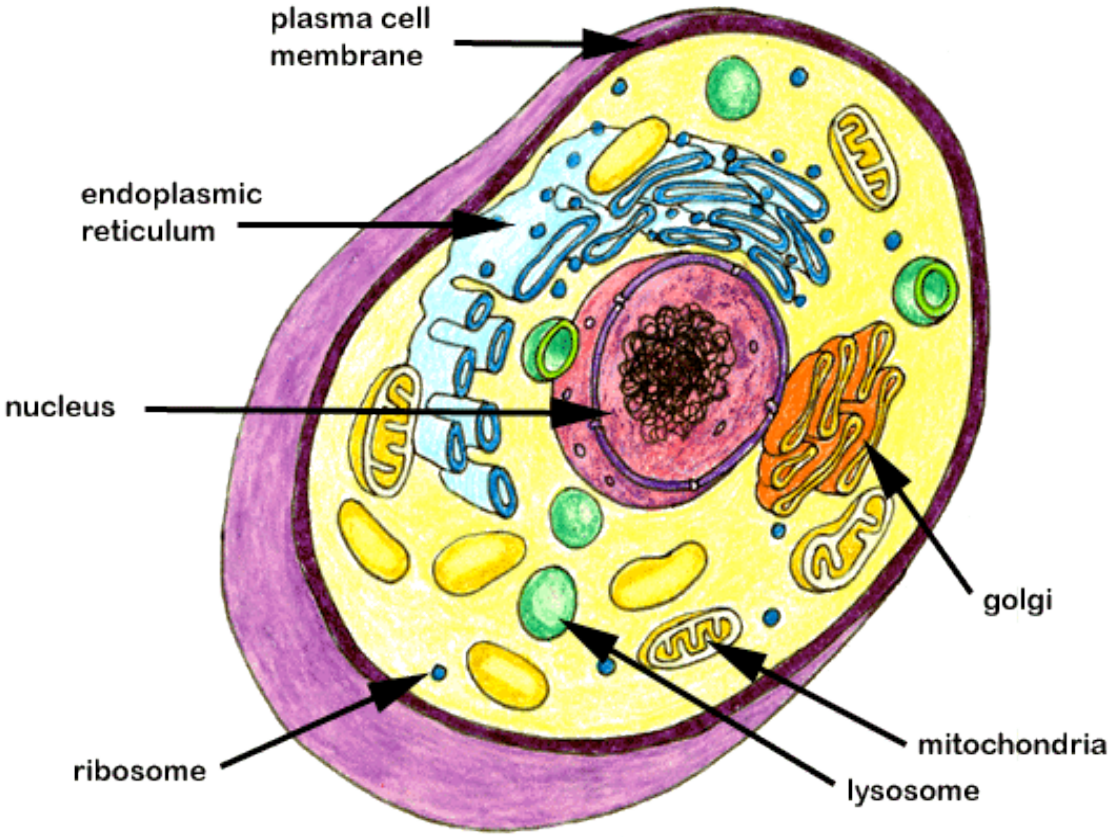
Study the diagrams on the next page and make sure you

1.Know what each organelle does

2. Where it's located in the cell AND,

3. Which type of cell each it belongs to…….


Cell Wall
Golgi Complex
Vacuole
Endoplasmic Reticulum
Membrane
Lysosome
Mitochondria
Cytoplasm
Nucleus
Nucleolus
Chloroplast


plasma cell membrane
endoplasmic reticulum
nucleus
golgi
ribosome
mitochondria
lysosome