

Topic 03

Cells & Organelles

Learning Objectives

At the end of this module, students will be able to:

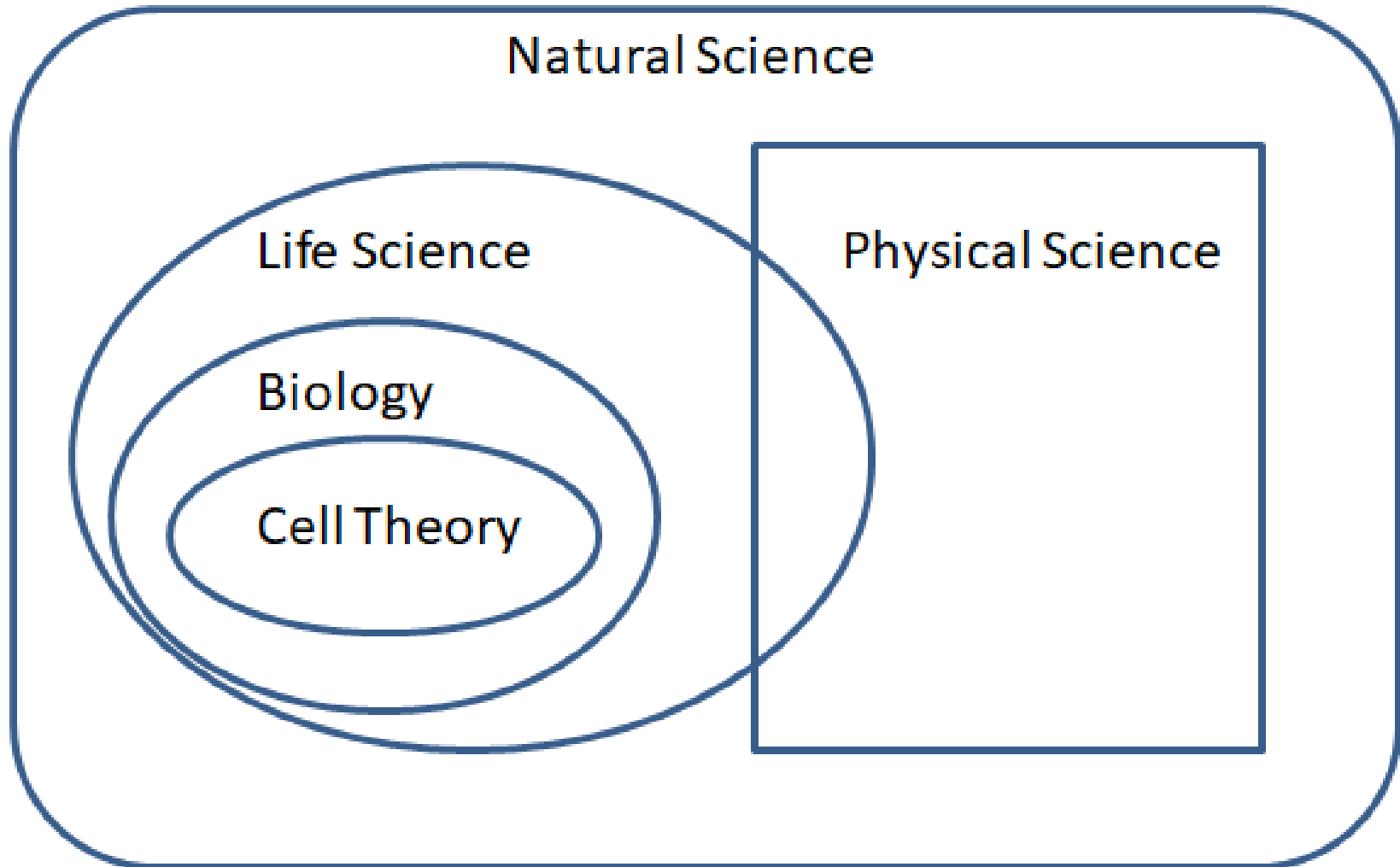
- Recognize that some organisms are unicellular and others are multicellular
- Write the name of three or more organelles without assistance
- Match three or more organelles to their generalized function given a list provided

Outline

- a. Recap Modules 1 & 2.
- b. Display and briefly discuss a list of multicellular organisms and unicellular microorganisms.
- c. Describe cells are comprised of organelles similar to a body and its organs.
- d. Discuss examples of organelles and their function
- e. Summary and questions

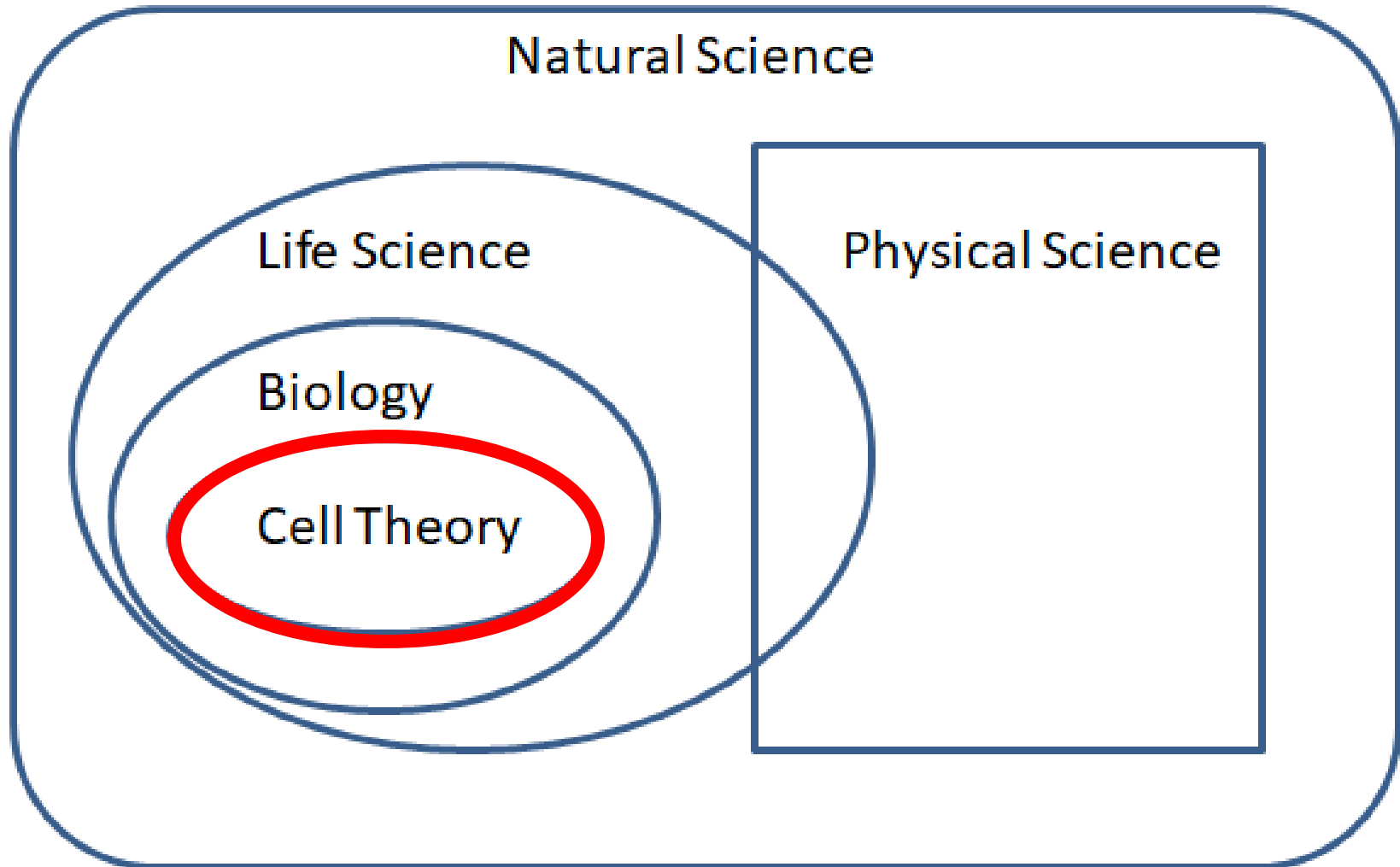
03.a

Recap Previous Lessons



03.a

Recap Previous Lessons



03.a

Recap Previous Lessons

- All living things are composed of cells.
- Cells are the basic units of structure and function in living things.
- All cells are produced from other cells.

03.a

Recap Previous Lessons

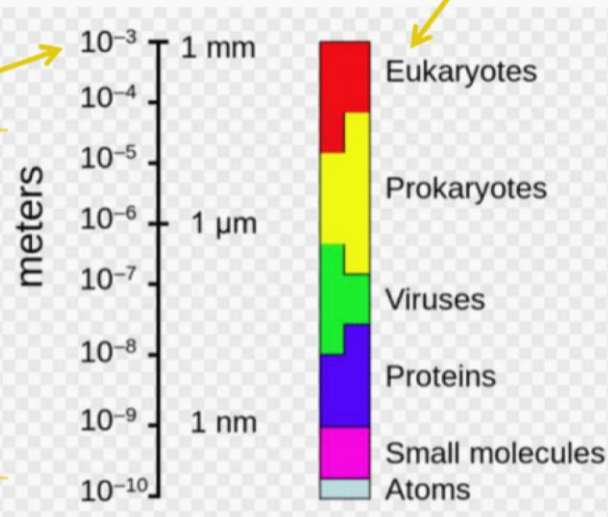
Size Comparisons



One millimeter (mm) is the small mark on a meter stick.

10^{-3} is one thousand times SMALLER than a millimeter

Each of these are 10 times smaller than the number above it.



03.a

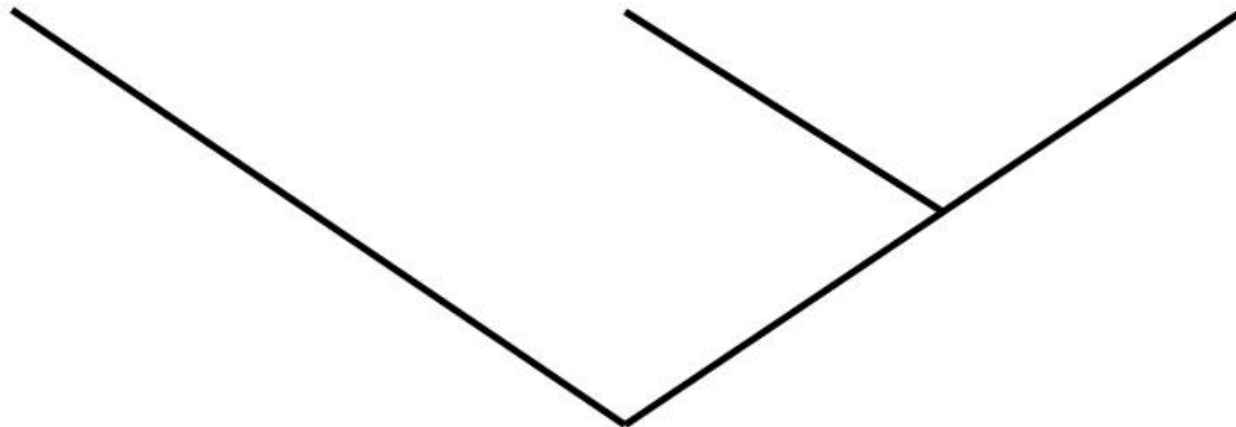
Recap Previous Lessons

Evolutionary Relationship Among Domains

Domain
Bacteria

Domain
Archaea

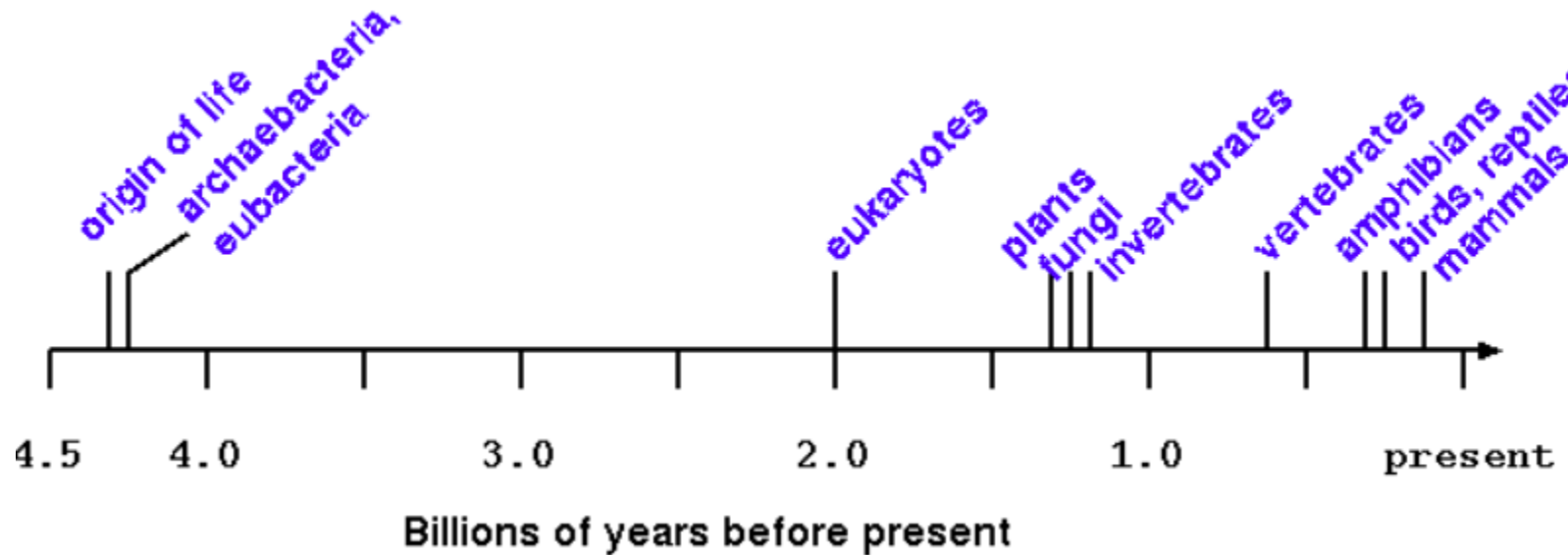
Domain
Eukarya



Common Ancestor

03.a

Recap Previous Lessons



<https://home.cc.umanitoba.ca/>

03.b

Multi & Unicellular Organisms

03.b

Multi & Unicellular Organisms

Single-celled organisms are able to carry out all the processes of life without help from other cells.

Multicellular organisms carry out their life processes through division of labor. They have specialized cells that do specific jobs.

03.b

Multi & Unicellular Organisms

Single-celled organisms are able to carry out all the processes of life without help from other cells.

03.b

Multi & Unicellular Organisms

Single-celled organisms are able to carry out all the processes of life without help from other cells.

- **All** prokaryotes are single-celled organisms.
- **Some** eukaryotes are single-celled.

03.b

Multi & Unicellular Organisms

Bacteria is a prokaryote. Bacteria is diverse. There are many types. Bacteria comes three major shapes. Examples are listed here:

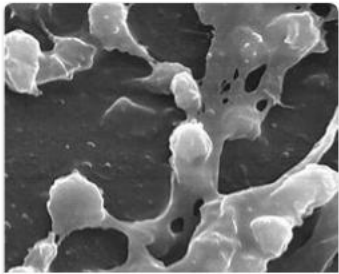
- Spherical - Staphylococcus
- Rod shaped - Bacilli
- Spiral - Vibrio cholerae 2 Spirilla

You do not need to know this. Rather this is just an interesting thing to hear.

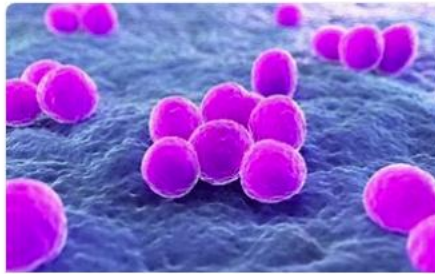
03.b

Multi & Unicellular Organisms

Staphylococcus is an example of a spherically shaped bacteria.



What Is a Staph Infection? Symptoms, Pictures

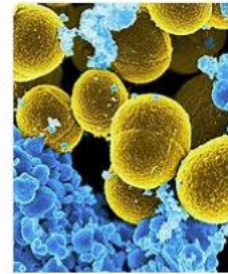


Common Skin Bacterium Puts Children with Severe Eczema at ...

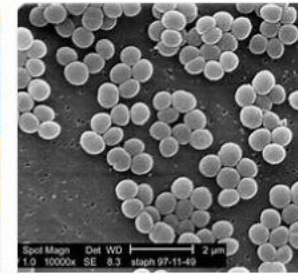


Magnified Staphylococcus Bacteria
Photo Courtesy of Wikipedia
User:Janice Haney Carr, Public Domain License

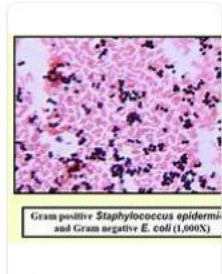
Staph Aureus Infection



Staph Infection Symptoms, Causes, ...



What Does A Staph Skin Infection Look Like

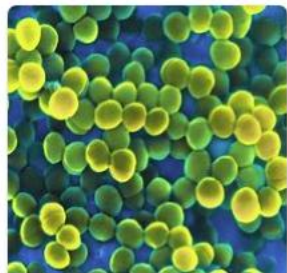


Gram positive Staphylococcus epidermi and Gram negative E. coli (1,000X)

What Does Staphylococcus Epi...



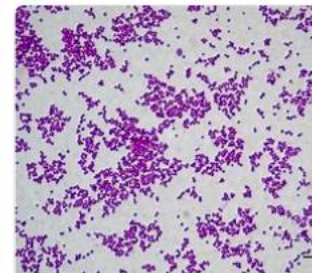
Staphylococcus Epidermidis



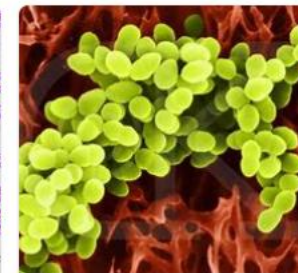
Staphylococcus Bacteria Photograph by Cnri



Staphylococcal infection – causes, side effects and ...



Staphylococcus aureus and ...



Health And Diseases Blog: Staph Infection OR ...



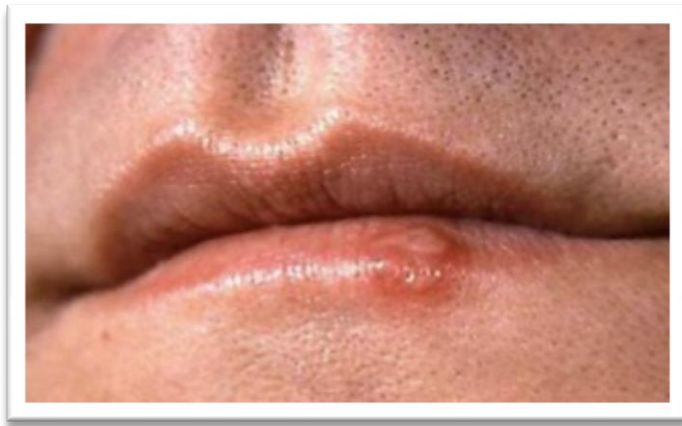
What Does Staphylococcus Ep...

This image is a screen print from Google Images search. Some of these images may be under copyright. This is included under Fair Use (Section 110 of U.S. Copyright Law).

03.b

Multi & Unicellular Organisms

Staphylococcus is an example of a spherically shaped bacteria. This causes a “staff infection” in humans (usually on the skin).



In the U.S., there are typically about 200,000 cases of staff infections reported each year.

03.b

Multi & Unicellular Organisms

Protists are interesting. They are (almost always) a single cell. They are eukaryotes because they have a nucleus.

Protists are eukaryotes that are not an animal, plant, or fungus.

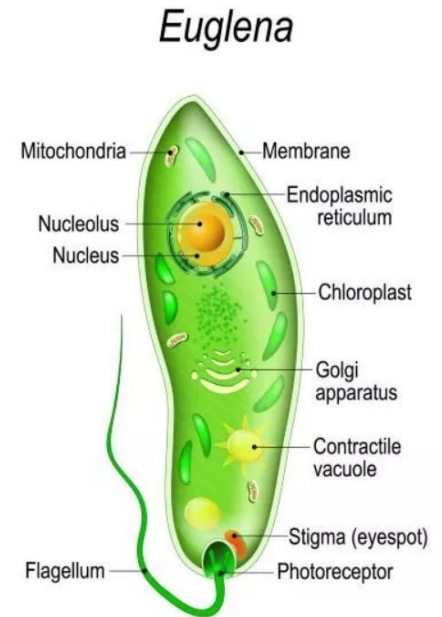
Some protists are photosynthetic, others are heterotrophs (organisms that get food in the form of organic material).

03.b

Multi & Unicellular Organisms

Euglena one of many types of protists. These are a single cell *flagellate* eukaryotes.

They can live in fresh & salt water.



03.b

Multi & Unicellular Organisms

Powdered euglena is contains minerals, vitamins and a nutritious omega-3 acid. The powder is used as ingredient in other foods to make them healthier.



Here is a picture of powdered euglena used as a food supplement in Japan.

03.b

Multi & Unicellular Organisms

Multicellular organisms carry out their life processes through division of labor. They have specialized cells that do specific jobs.

- All eukaryotes are multi-cell organisms.
- Plants & animals have a variety of cell types.

~ obvious examples ~

- Tree bark and leaves have different cells.
- Human skin and bones have different cells.

03.b

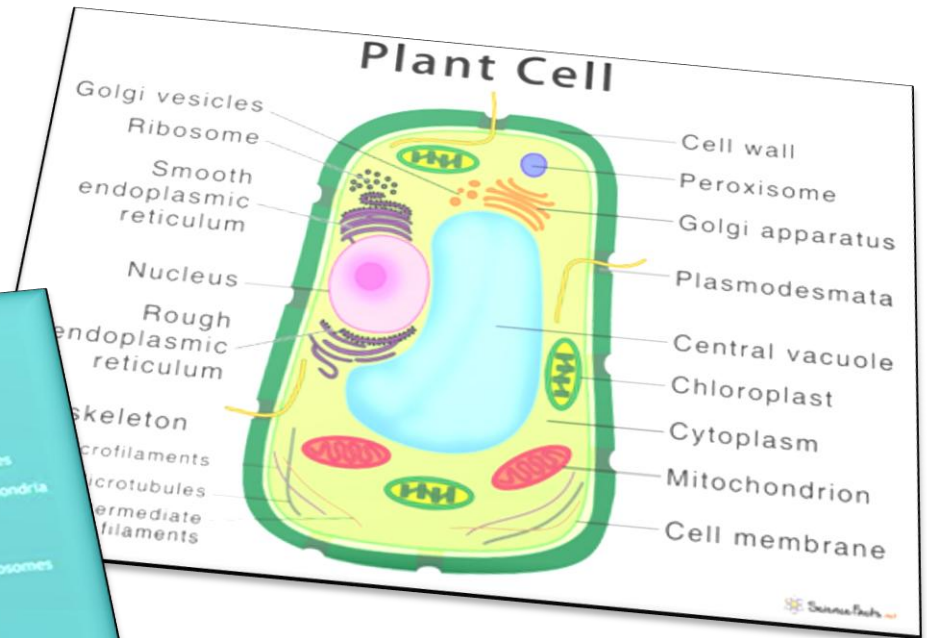
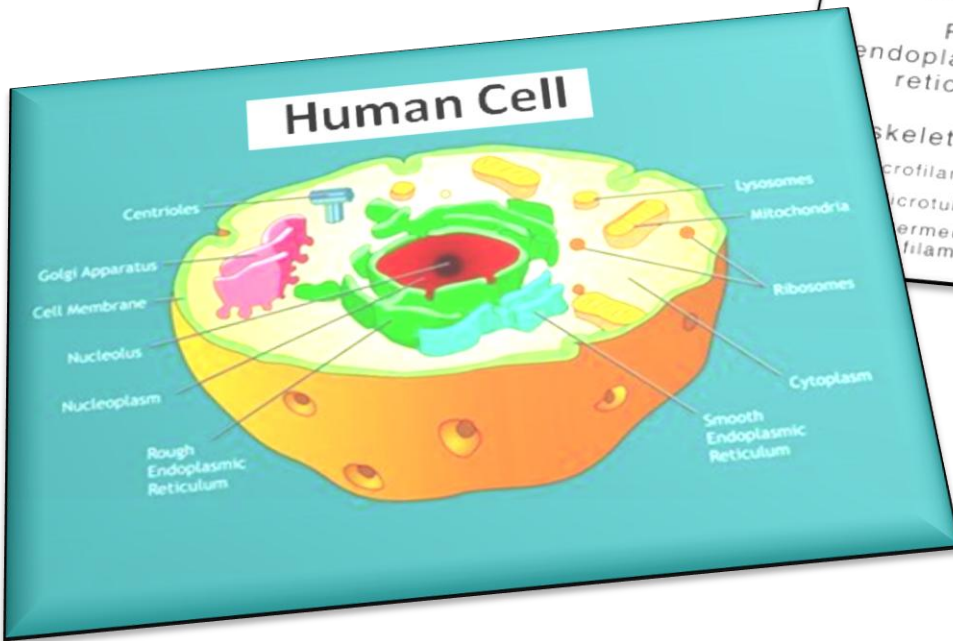
Multi & Unicellular Organisms

Multicellular organisms carry out their life processes through division of labor. They have specialized cells that do specific jobs.



03.c

What are Organelles?



03.c

What are Organelles?

Organelles are found in eukaryotic cells.

Each is a specialized cellular part that has a specific function. They are analogous to an organ.

Most organelles are membrane-bound. This means they have a membrane around them.

03.c

What are Organelles?

Organelle membranes function to keep the inside "in" and the outside "out."

You can think of a membrane as a protective coating – or maybe a balloon – around each organelle. Science books won't call membranes this – rather, it's just an easy way to think about them.

Different membranes let different molecules in and out – depending on the chemical processes done by the organelle it surrounds.

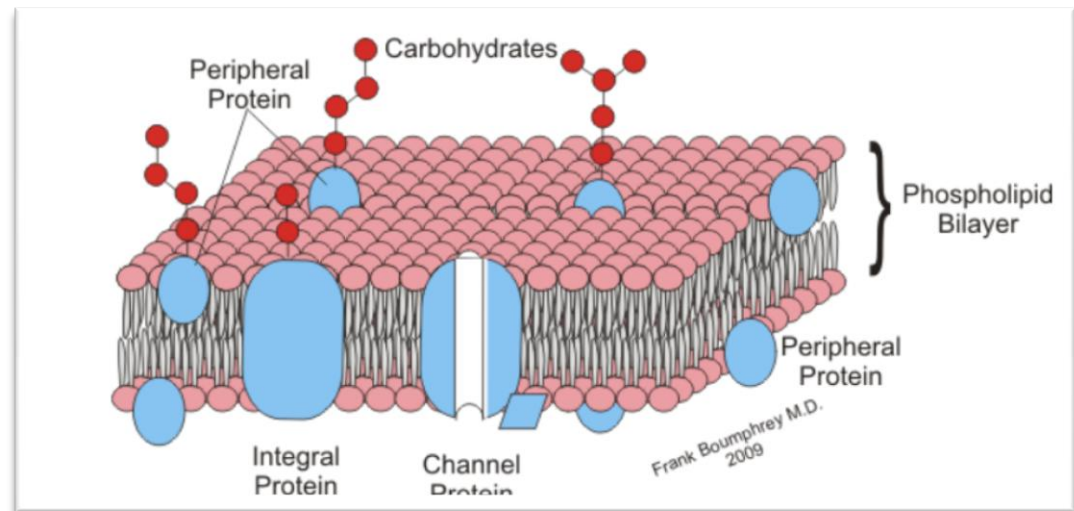
03.c

What are Organelles?

Organelle membranes function to keep the inside "in" and the outside "out."

Three factors influence whether a molecule can move or cross through a cell membrane

1. Molecular Size
2. Concentration
3. Molecular Charge (polarity)



You do not need to know this right now. In later classes you will need to know this.

03.d

Organelle Functions

The main organelles are nucleus, cell membrane, chloroplast, mitochondria, endoplasmic reticulum, cell wall and Golgi apparatus.

Most organelles are membrane-bound; they have a membrane around them.



Golgi is capitalized because it is named after Camillo Golgi, an Italian biologist who discovered it in 1898.

YOUR TEACHER MIGHT NOT KNOW THIS LITTLE FACT.

03.d

Organelle Functions

Too small to read ... we'll go through each one.

Nucleus – “computer room” (The nucleus can be likened to the main control center of the cell.)

Cell membrane – “fence & gate” – blocks unwanted stuff but allows nutrients in and waste out.

Mitochondria – “power house” - turn food into energy that the cell can use (ATP).

Cytoplasm – “jello” – a medium for the organelles to remain suspended

Vacuole - “water tower” – empty of cytoplasm and lined and filled with fluid.

Golgi apparatus – “post office” - sorts and processes proteins.

Endoplasmic reticulum – “delivery truck” – regulates and transports proteins.

Chloroplast – “kitchen” – uses sunlight to convert CO₂ and water into food (photosynthesis).

Cell wall – “cinder blocks” The cell wall provides mechanical strength and support.

03.d

Organelle Functions

Nucleus

The computer room

The nucleus can be likened to the main control center of the cell.

03.d

Organelle Functions

Cell Membrane

A fence & gate

The cell membrane blocks out unwanted stuff but allows nutrients in and waste out.

03.d

Organelle Functions

Mitochondria

The power house

The mitochondria turns food into energy that the cell can use (ATP).

03.d

Organelle Functions

Cytoplasm

Jello

The cytoplasm is a medium for the organelles to remain suspended inside the cellular membrane.

03.d

Organelle Functions

Vacuole

Water tower

Vacuoles are empty of cytoplasm, but lined and filled with fluid.

03.d

Organelle Functions

Golgi apparatus

Post office

The Golgi apparatus sorts and processes proteins.

03.d

Organelle Functions

Endoplasmic reticulum

Delivery truck

Endoplasmic reticulum regulates and transports proteins.

03.d

Organelle Functions

Chloroplast (plants only)

Kitchen

Chloroplasts use sunlight to convert CO_2 and water into food (photosynthesis).

03.d

Organelle Functions

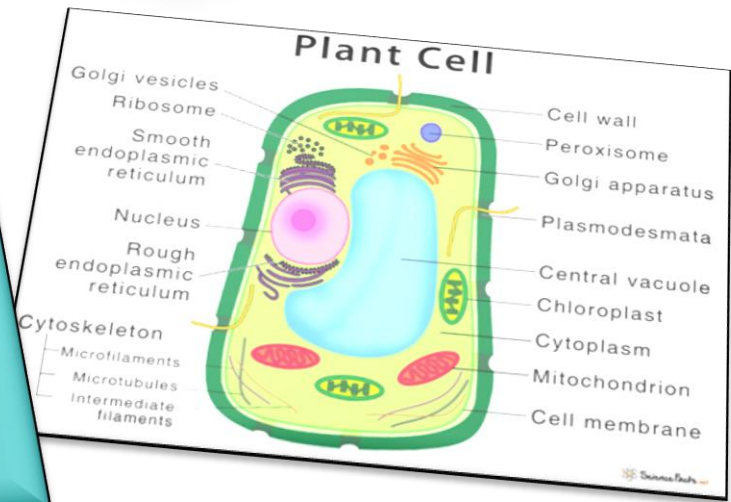
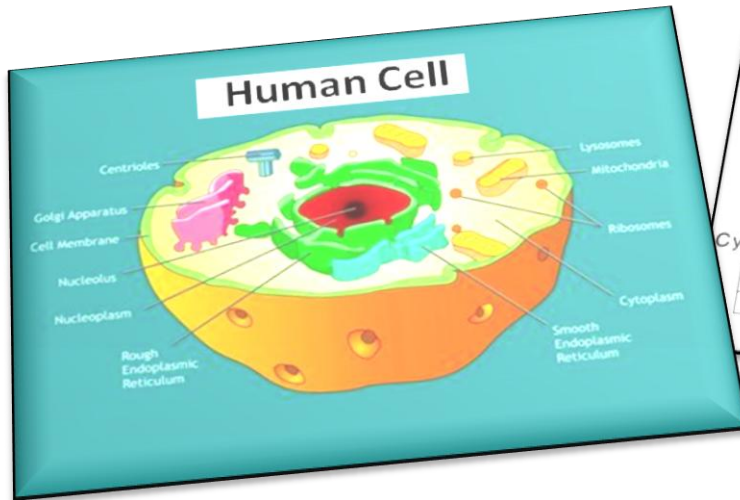
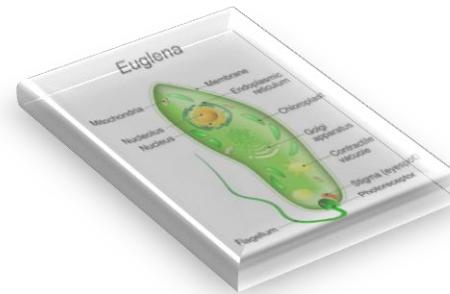
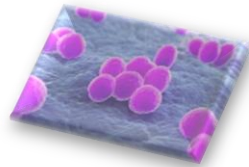
Cell wall (plants only)

Cinder blocks

The cell wall provides mechanical strength and support.

03.e

Summary & Questions



Check

At the end of this module, students will be able to:

- Recognize that some organisms are unicellular and others are multicellular
- Write the name of three or more organelles without assistance
- Match three or more organelles to their generalized function given a list provided