Unit 4 Cells, Organelles and Life Functions

Part 1: History of cells and cell theory

Before the Scientific Revolution

1. Before the Scientific Revolution the Church and kings made decisions on widely accepted theories

Scientific Revolution

2. Occurred from **1500-1700**
3. After the Scientific Revolution theories were based on **observations** and **logic**

4. **Copernicus** → **heliocentric theory** (sun centered solar system) (1543)
5. **Anton VanLeewenhoek** → first functional microscopes (1680's)

Early discoveries

6. **Hooke** gave cells their name (1665)
7. **Robert Brown** → **nucleus** (1883)
8. Schwann and Schleidan → **Cell Theory**
9. Charles Darwin → Theory of **Evolution** (1859)
10. **Watson and Crick** → structure of DNA (1950's)

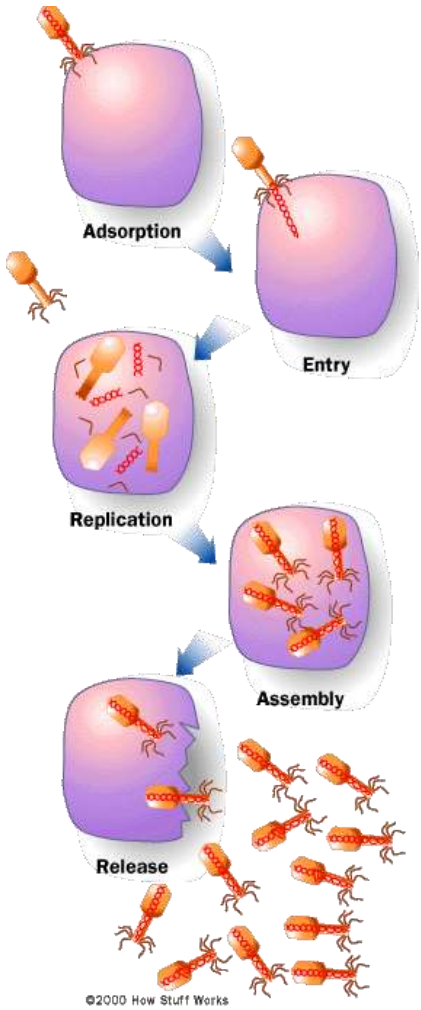
Cell Theory

1. All living things are made of cells
2. The cell is the basic unit of function for life
3. All cells come from pre-existing cells

Problems with the cell theory

1. Viruses = not made of cells

2. Where did the first cell come from?



Living things

1. Are made of cells
2. Must be able to obtain energy
   - Energy processes = photosynthesis and respiration
3. Maintain homeostasis (same state)
   - Ex: body temp, glucose levels…
4. Reproduce (because DNA can replicate)

Organization of living things

- **Organelles = things in a cell → specific job**
  - Ex: nucleus, ribosome, mitochondria, chloroplast…

- **Cells = basic unit of life**
- Unicellular = 1 cell organisms
- Multicellular = many celled (note: all cells have same DNA but look and function differently)
- How??
- Differentiation = environment controls gene expression

https://www.youtube.com/watch?v=82kZMw0Z8Z4

Smallest

↓

Cells

Tissues

↓

Organism

Body systems

↓

Organelles

↓

Organs

↓

Biggest

Simple vs complex

- Prokaryotes = no nucleus
  - (bacteria) monera kingdom
- Eukaryotes = nucleus
  - (protists, animals, plants, fungi)

Obtaining energy

- Autotrophic nutrition = photosynthesis
  - Occurs in chloroplasts

Raw materials	products
$H_2O + CO_2 +$ light energy	$C_6H_{12}O_6 + O_2$
Inorganic	organic

  - Chemosynthesis = bacteria make organic compounds using chemical energy

Obtaining energy

- **Heterotrophic nutrition** = getting food by consuming other organisms
- Involves **digestion** and **respiration**

Respiration releases energy

- **Aerobic** = with oxygen

Raw materials	Products
$O_2 + C_6H_{12}O_6$	$CO_2 + H_2O + ATP$
Stored energy	Usable energy

- **Anaerobic** = without oxygen → **less energy**
  - Produces **lactic acid** → **muscle fatigue**

Organelle Chart

https://www.youtube.com/watch?v=82kZMw0Z8Z4

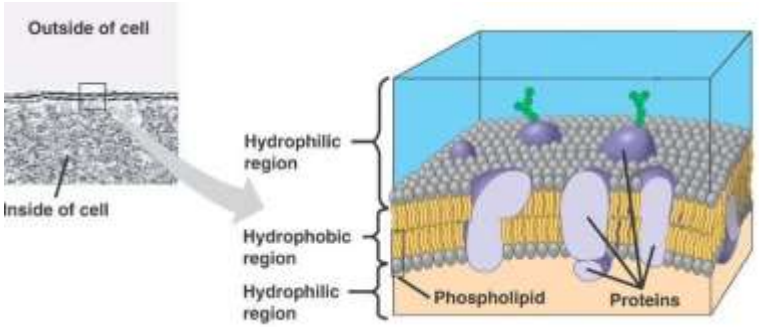
Cell Membrane

Job

- Controls what goes in and out
- Separates cell from environment
- Communicates (receptor proteins receive messages)

Structure

- Phospholipid bilayer with proteins



kvhs.nbed.nb.ca

Body system / organ

- Respiratory system
- Excretory system

- Lungs
- Kidneys

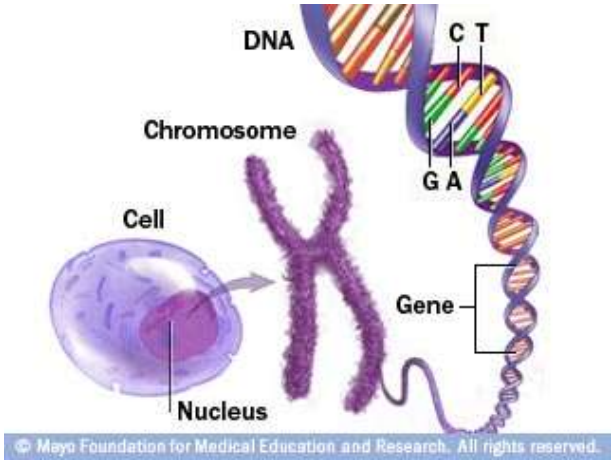
Nucleus (eukaryotes only)

Job

- Contains DNA
- Information for protein synthesis
- Controls cell functions

Structure

- DNA → genes → chromosomes → nucleus
- Surrounded by membrane



Body system/organ

- Nervous system
- Brain

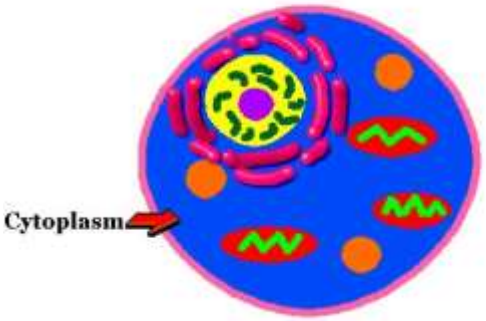
Cytoplasm

Job

- Site of chemical reactions
- Moves / Circulates
- Transports things

Structure

- Jelly like



Body system / organ

- Circulatory system
- Lymphatic system

- Blood
- lymph

Plant Organelles

Cell Wall

Job

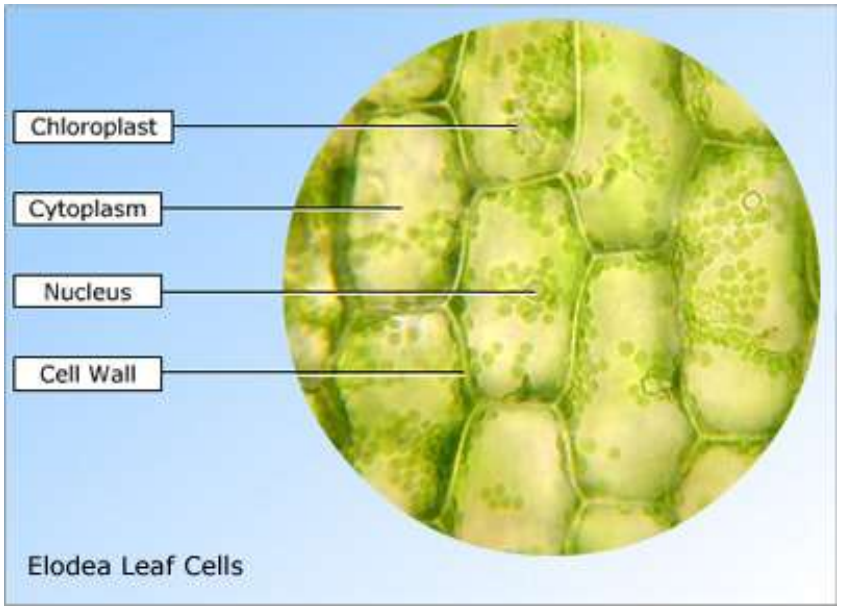
- Give plant cells definite shape
- Protect → strength

Structure

- Made of cellulose (complex sugar)
- Found on all plant and
- some protist and bacterial cells

Body system / organ

- Skeleton / bones



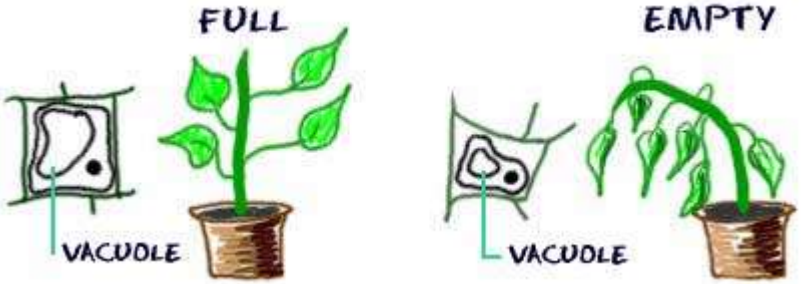
Vacuoles

Job

- Store water and food

Structure

- Large in plant cells
- Contains starch and water



http://www.biology4kids.com/files/cell_vacuole.html

Body system / organ

- Liver stores sugars in animals

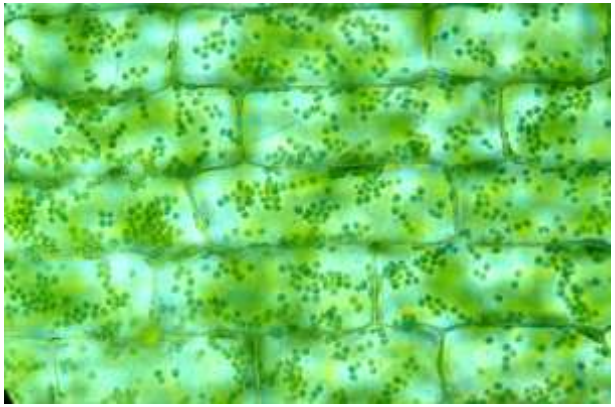
Chloroplasts

Job

- Site of photosynthesis
- Light → chemical energy
- Inorganic → organic

Structure

- Rod shaped
- Contains DNA
- Contains pigments (chlorophyll)



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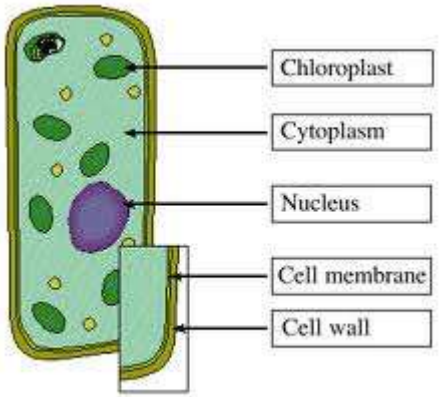


qwickstep.com

Energy Organelle

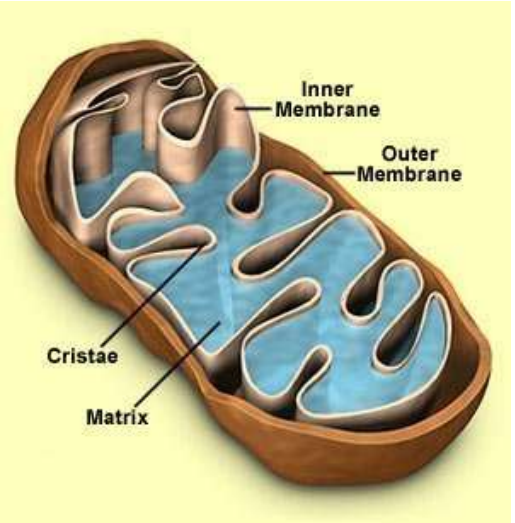
Mitochondria

Job

- Site of aerobic respiration
- Found in plant and animal cells
- Release energy
  - Glucose → ATP
- Powerhouse
  - Mighty Mitochondria

Structure

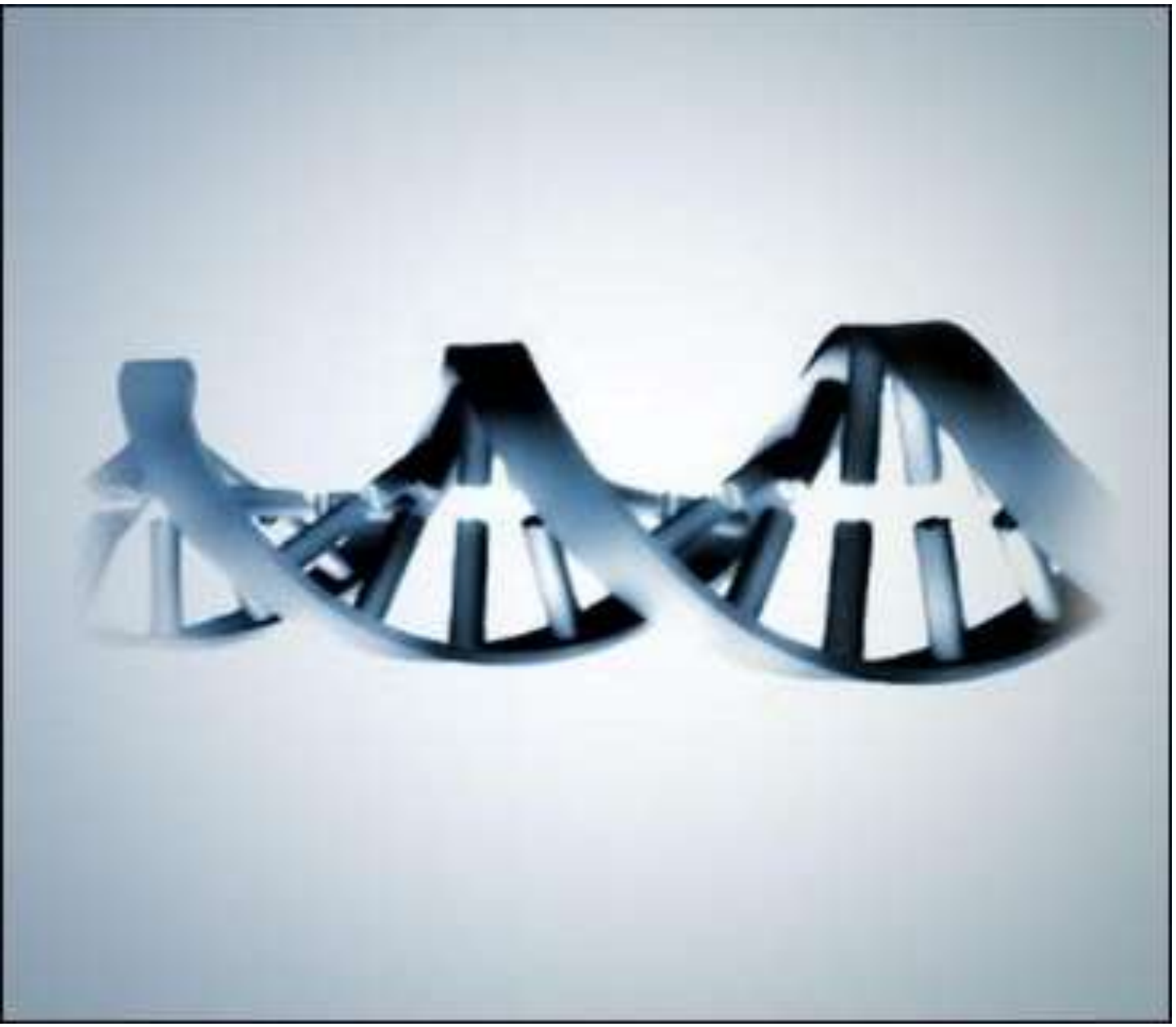
- Small, rod-shaped
- Contains DNA
  - Can replicate



mitochondrial-disorder-information.com

Energy and Protein Organelles


PROTEINS



DNA

Ribosomes

Job

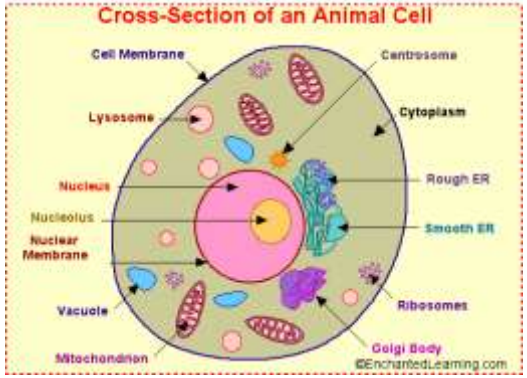
- Site of protein synthesis

Structure

- Small, round
- Attached to ER or free in cytoplasm

Body system / organ

- Liver manufactures lots of proteins



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bothbrainsandbeauty.com

Protein Processing Organelles

Endoplasmic reticulum (ER)

Job

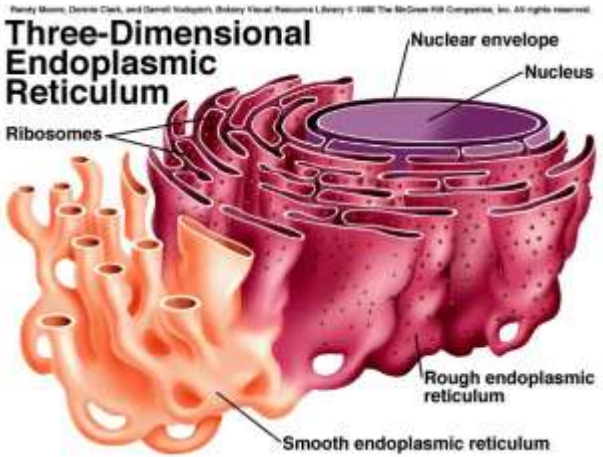
- Transport
- Moves proteins through cell

Structure

- Series of tubes and membranes attached to nucleus

Body system / organ

- Circulatory system



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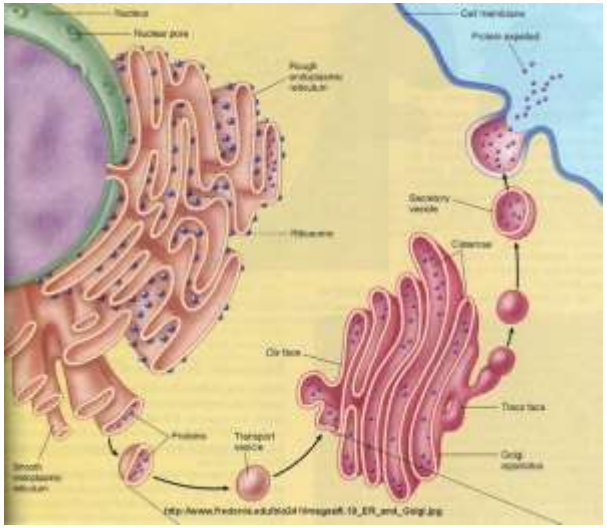
Golgi apparatus

Job

- Folds proteins → specific shape

Structure

- Smaller stack of tubes and membranes
- Not attached to nucleus



Lysosome

Job

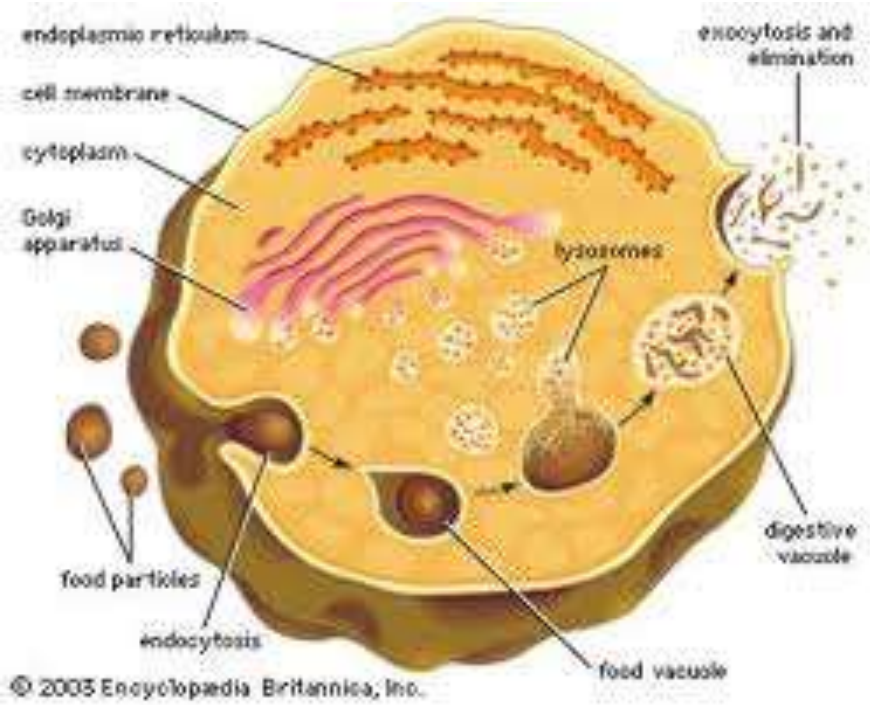
- Digestion

Structure

- Contains lots of enzymes and acids

Body system / organ

- digestive system /
- stomach



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