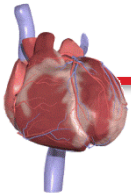


Intermediate Science 8

UNIT 4: CELLS, TISSUES, ORGANS AND SYSTEMS

Topic 1: Introduction To Using A Microscope

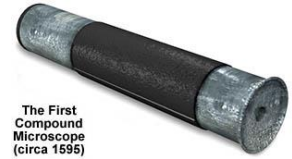




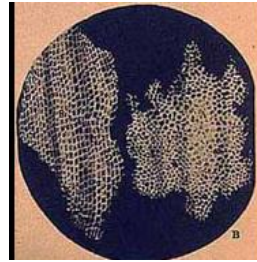
This animal, called a tardigrade, is small enough that you need a magnifying device such as a microscope to see it.

History of the Microscope

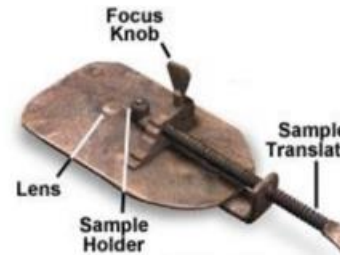
-1590 – Hans and Zacharis Janssen: first compound microscope.



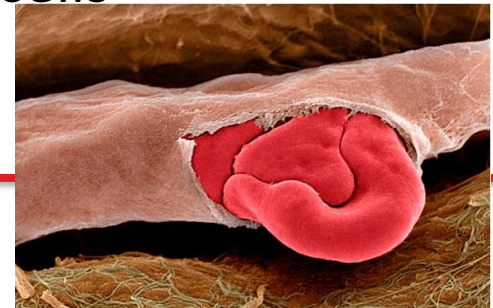
-1655 – Robert Hooke: used a compound microscope to observe pores in cork. He called them “cells”



-1675- Antoine van Leeuwenhoek: 1st to see single-celled organisms in pond water



-1926- Knoll and Ruska: first Electron Microscope Used to observe VERY small objects: viruses, DNA, parts of cells
Uses beams of electrons rather than light
Much more powerful



• Compound Light Microscope

-1st type of microscope, most widely used

-Light passes through 2 lenses Can magnify up to 2000x



INTRODUCTION TO THE MICROSCOPE

MICROSCOPE



- Care
 - Parts
 - How it works
 - Magnification
 - Create a Wet Mount Slide
-

CARE OF MICROSCOPE

- Always carry with 2 hands
- Do not force knobs
- Always store covered
- Only use lens paper for cleaning
- Keep objects clear of desk and cords



Figure 10.2 Always carry a microscope with one hand on the arm and one hand on the base.

Microscope Parts

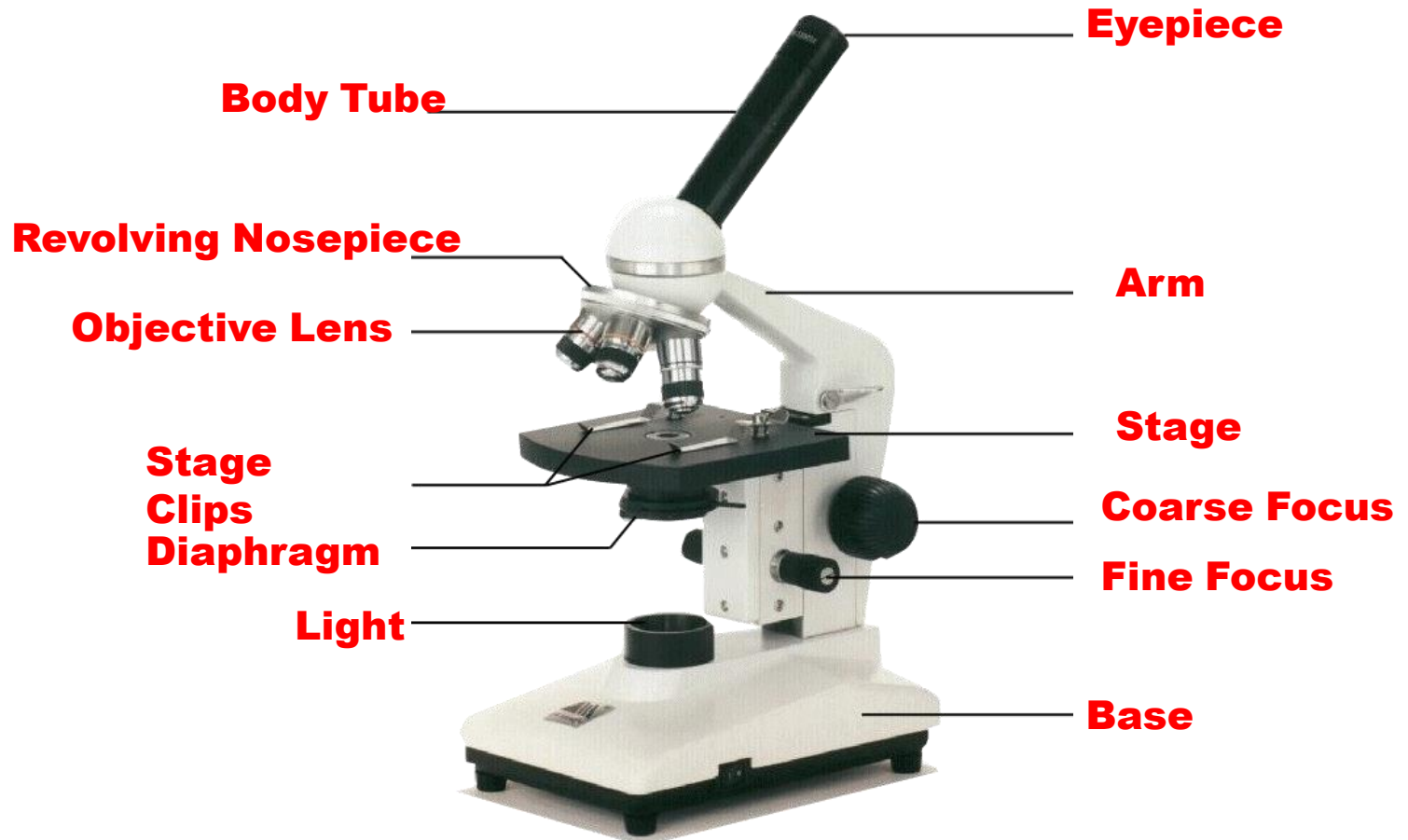


Table 10.2 The Parts of a Compound Light Microscope

| Part | Function |
|-------------------------------|---|
| Eyepiece | Is used for viewing and contains a lens that magnifies |
| Tube | Holds the eyepiece and objective lenses at proper distance from each other |
| Arm | Supports the eyepiece |
| Coarse adjustment knob | Brings an object into focus at low or medium power |
| Fine adjustment knob | Brings an object into focus at high power |
| Objective lenses | Magnify the image. Most microscopes have three or four lenses. |
| Revolving nosepiece | Holds the three objective lenses |
| Stage | Supports the slide. Some microscopes have stage clips to hold the slide in place. |
| Iris diaphragm | controls the amount of light reaching the specimen |
| Light source | Supplies the light needed to view the slide |
| Base | Supports the entire microscope |

HOW A COMPOUND MICROSCOPE WORKS

- Two sets of lenses work together to magnify and focus an image. When you look through this microscope, you see an image that is magnified (made larger), inverted (upside down), and reversed (backwards).

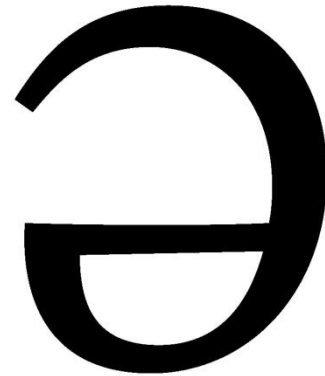


Figure 10.4 The letter "e" seen through the lens of a microscope will appear like this.

MAGNIFICATION

- The magnification power of a lens is the number of times larger an image looks under the lens.
- Each objective lens has a number that states its magnification power
- Most school microscopes have these magnification powers:
 - low-power objective lens (4×)
 - medium-power objective lens (10×)
 - high-power objective lens (40×)

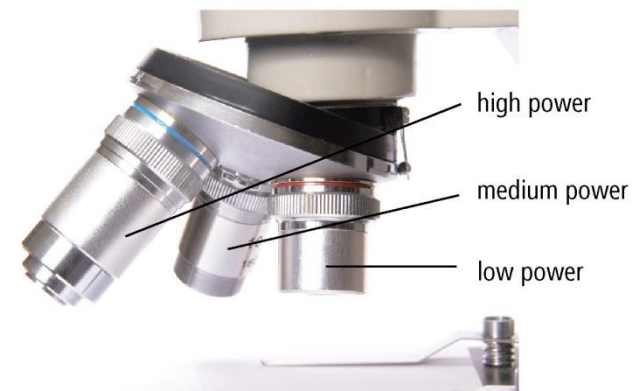
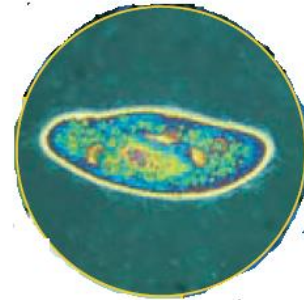


Figure 10.5 Magnification power of the three objective lenses

TOTAL MAGNIFICATION POWER

- Usually the eyepiece lens has a magnification power of 10X.



To find the total magnification of the microscope for each objective lens, you multiply the power of the objective lens by the power of the eyepiece.

For example:

$$\begin{aligned} \text{Total Magnification} &= \text{low-power objective lens} \times \text{eyepiece lens} \\ &= 4 \times 10 \\ &= 40 \end{aligned}$$

QUESTION

- What is the total magnification Power for the medium and high power lens?

Medium power objective (10X)



$$\text{Total magnification} = \frac{10}{\text{(ocular)}} \times \frac{10}{\text{(objective)}}$$

High power or high dry objective



$$\text{Total magnification} = \frac{10}{\text{(ocular)}} \times \frac{40}{\text{(objective)}}$$

SETTING UP AND USING A MICROSCOPE

Keep the microscope in an upright position at all times. Tell your teacher if your microscope is dirty or if the parts do not move freely. Do not try to force any parts of the microscope to move. If you are examining a liquid, use only a small drop. Keep the stage clean and dry.

Start focussing by using the low-power objective lens. (To focus means to make something sharp or clear.) Observe the microscope from the side as you use the coarse adjustment knobs. Lower the lens as close as possible to the stage without touching it.

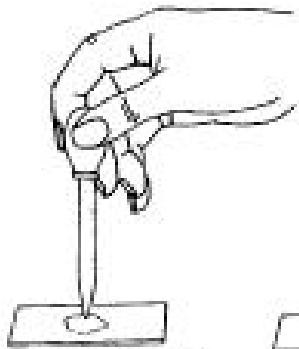
When you focus, look through the eyepiece and slowly turn the coarse adjustment knobs so that the lens moves upwards from the stage. The fine adjustment knobs may then be used to sharpen your view of the object.



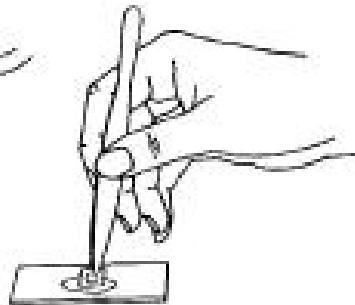
FINISHED WITH MICROSCOPE

- remove the glass slide
 - place both stage clips so that they point forward
 - ensure the low-power lens clicks into place below the eyepiece
 - turn off light
 - unplug microscope
 - coil electrical cord
 - return to appropriate space on shelf
 - Cover your microscope when it is not in use.
-

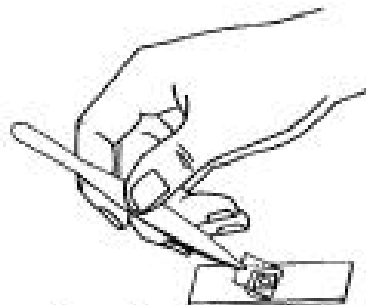
Create a Wet Mount slide



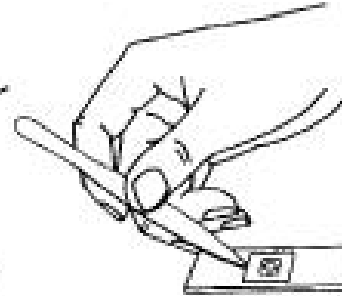
Add a drop of water to a slide.



Place the specimen in the water.

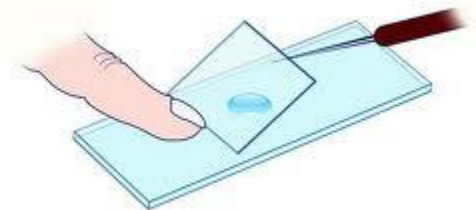


Place the edge of a coverslip on the slide so that it touches the edge of the water.



Slowly lower the coverslip to prevent forming and trapping air bubble

<http://www.youtube.com/watch?v=UrEqG9ISTXU>





Place a drop of water on the slide.



Use tweezers to place your specimen in the drop of water.

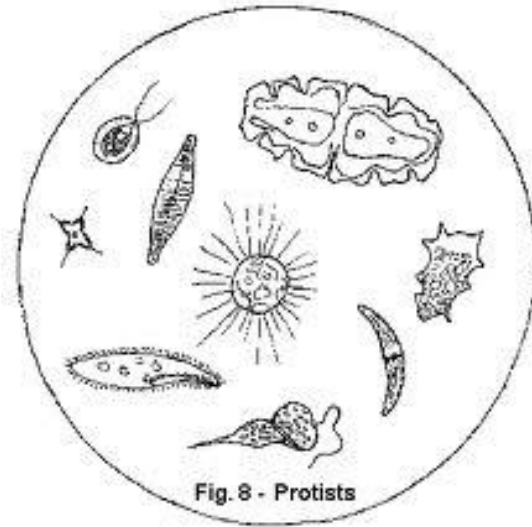










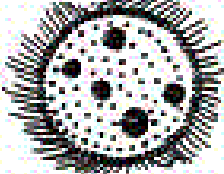




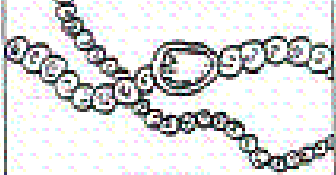


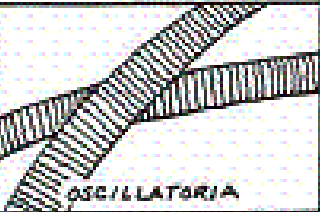

Hold the cover slip at a 45° angle and gently lower it onto the slide. There should be no air bubbles under the cover slip. If there is any excess water on the slide, dab a piece of tissue paper on the slide.

Analyze

OBSERVING ORGANISMS IN POND WATER

- See page 397



| | | |
|--|--|--|
|  <p>STENTOR</p> |  <p>VORTICELLA</p> |  <p>PARAMECIUM</p> |
|  <p>MICROSPORA</p> |  <p>SPIROGYRA</p> |  <p>PHLOCLADINA / ROTIFER</p> |
|  <p>KERATELLA / ROTIFER</p> |  <p>DAPHNIA</p> |  <p>VOLVOX</p> |
|  <p>EUGLENA</p> |  <p>DIATOMS</p> |  <p>CHROOCOCCUS</p> |
|  <p>HYDRA</p> |  <p>NOSTOC</p> |  <p>CULAMYDOMONAS</p> |
|  <p>VOLVOX</p> |  <p>OSCILLATORIA</p> |  <p>AMOEBIA</p> |

Student Work

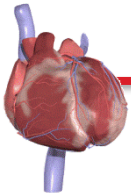
- Page 397 #2, #3, #4



Intermediate Science 8

UNIT 4: CELLS, TISSUES, ORGANS AND SYSTEMS

Topic 2: Characteristic Of A Living Thing



CLASSIFYING THINGS

- How to classifying things in your surrounding:
 - =>Living
 - =>Non Living
 - =>Dead

Scientists use a classification system to study, compare & identify living things.



LIVING THINGS

- **Living things:** Something that is alive or having characteristics of life.



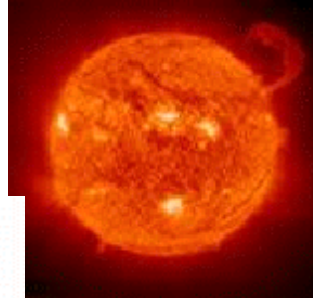
There are three things that all living things can be classified as:

- animal
 - plant
 - micro-organism
-

NON -LIVING

- **Non-living:** never having all the signs of life.

Examples air, water, soil, sunlight, temperature and landscape.





DEAD

- **Dead**: refers to something that was once alive, but no longer has any signs of life.





Which objects in this scene are living? Which ones are non-living?

What is a Characteristic?

- **Characteristic** refers to a feature.

What are the characteristics of a Moose?



CHARACTERISTICS OF LIVING THINGS

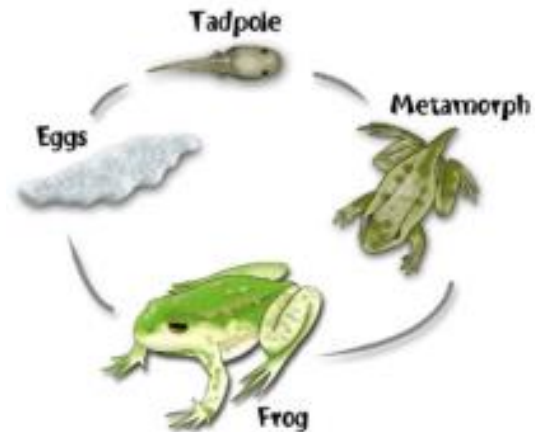
BRAINSTORM ACTIVITY

- What are some characteristics of living things?
-

1. GROWTH

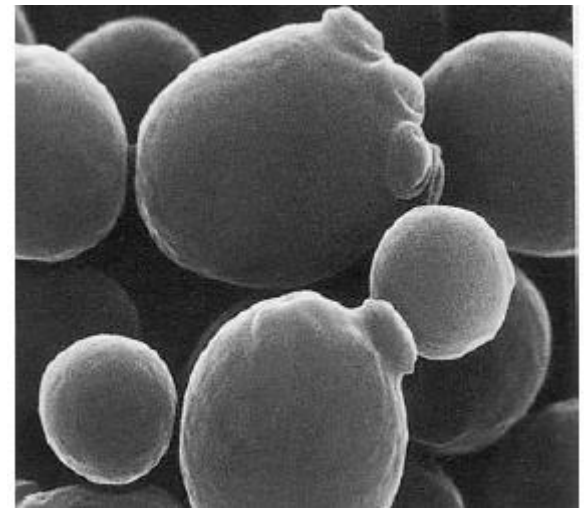
- **GROWTH:** the characteristic of life that allows organisms to get bigger, change and repair themselves. It means more than just getting bigger.

Growth is a part of a life cycle



2. REPRODUCTION

- **Reproduction:** The replacement of an old generation by a new generation.



3. MOVEMENT

- **Movement** - any motion or activity that changes the shape, position or location of an organism.
- **Locomotion** - movement from one place to another. For example, humans use legs for locomotion



4. RESPONDS TO THE ENVIRONMENT

- **Stimulus:** Anything which causes activity or change in an organism and can be either internal or external.

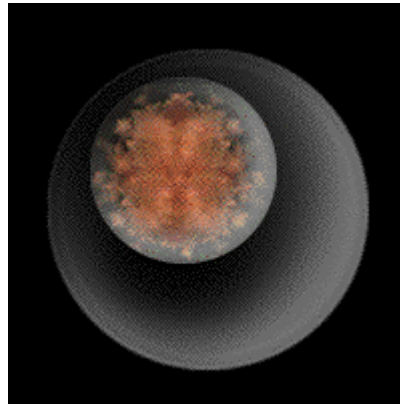
- *Some Stimuli are :*

- Odours
- temperature
- lights
- taste
- touch
- gravity
- electric shock



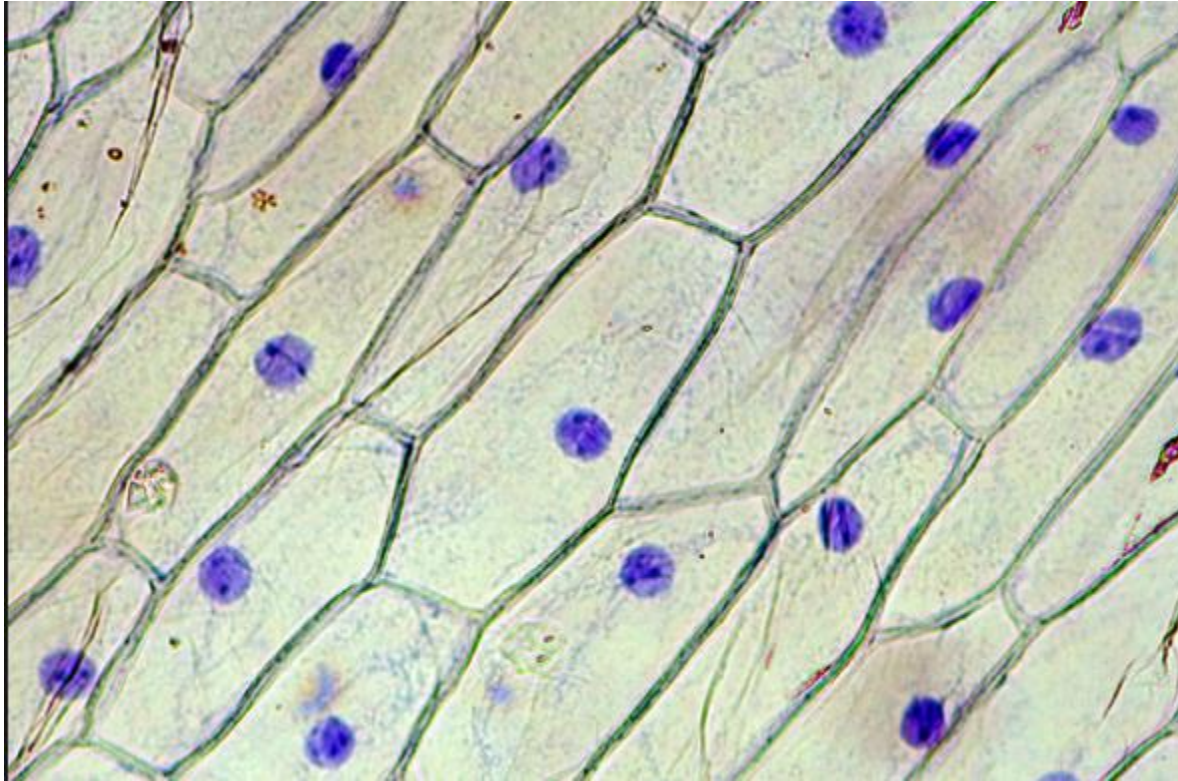
5. MADE OF CELLS

Cell refers to the tiny, living building block which makes up all living things



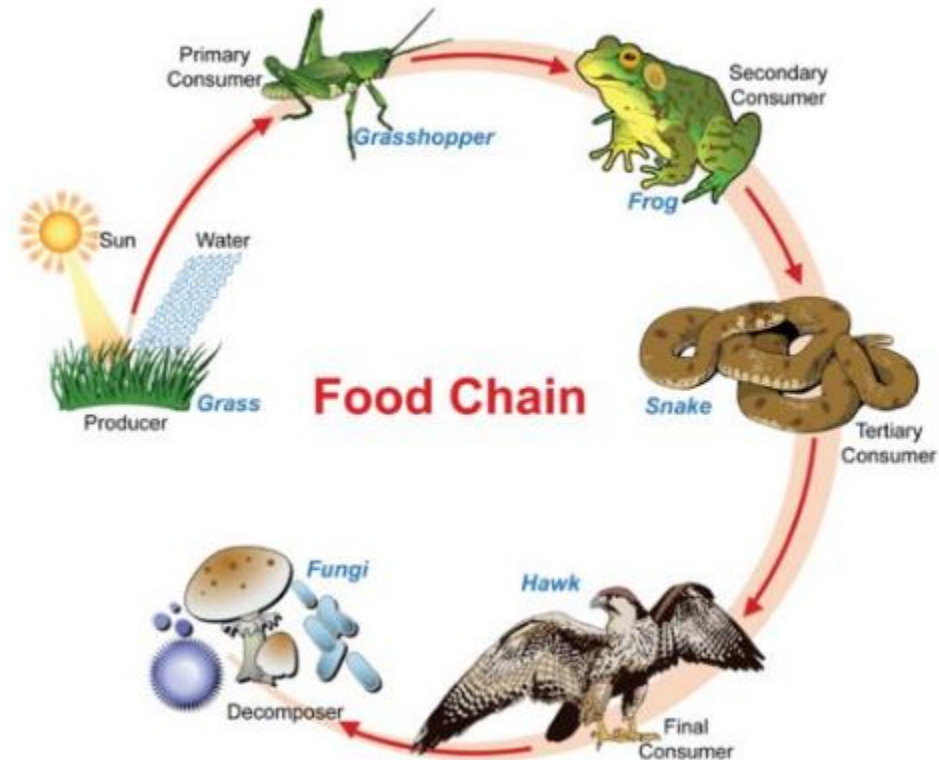
Organelles refer to structures of a cell that perform a specific function. Each organelle has a role to play in the activities that are necessary for the life of the cell.

OBSERVING AN ONION CELL WITH A MICROSCOPE



6. Obtain and Use Energy

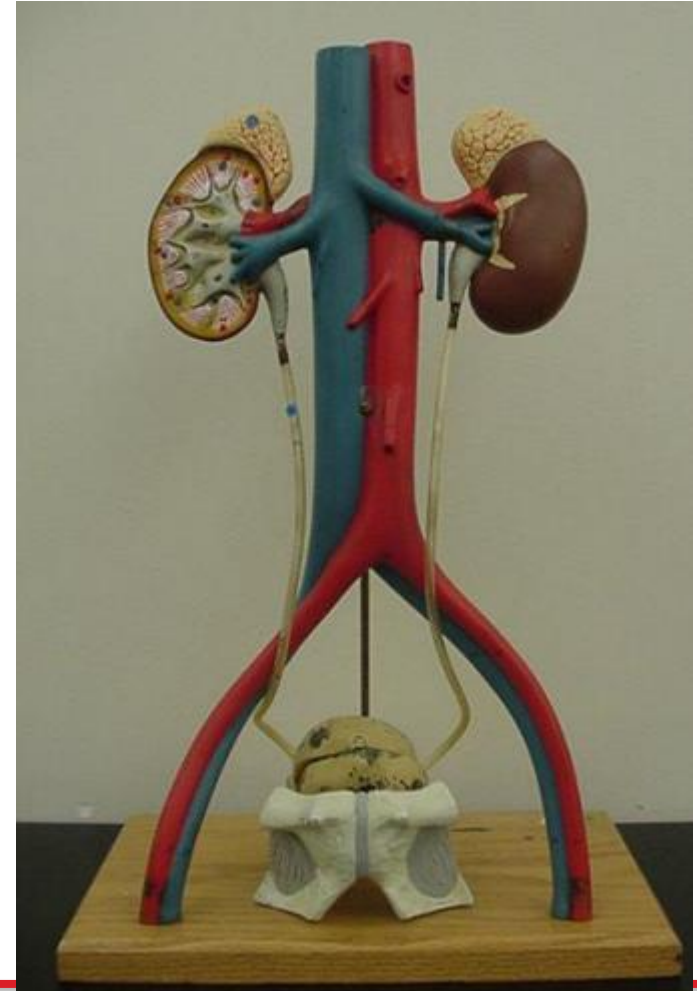
Cells cannot survive on their own. They need power to stay alive. They need energy to perform functions such as growth, maintaining balance, repair, reproduction, movement and defense. This means all living organisms must obtain and use energy to live.



7. Gets rid of wastes that build up in its body:

What kind of waste does your body produce?

The breakdown of substances in the body are eliminated through the excretory system

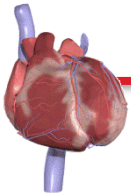




Intermediate Science 8

UNIT 4: CELLS, TISSUES, ORGANS AND SYSTEMS

Topic 3: The Cell

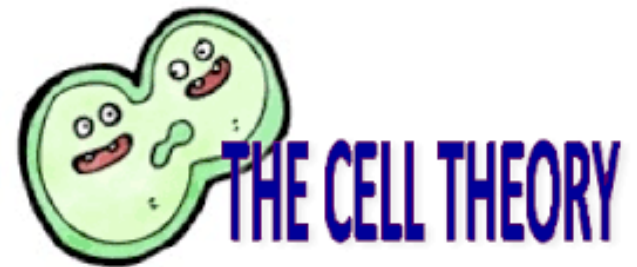


The Cell Theory

- The cell theory is one of the key ideas of biology. It helps scientists to describe and explain their observations of living things.

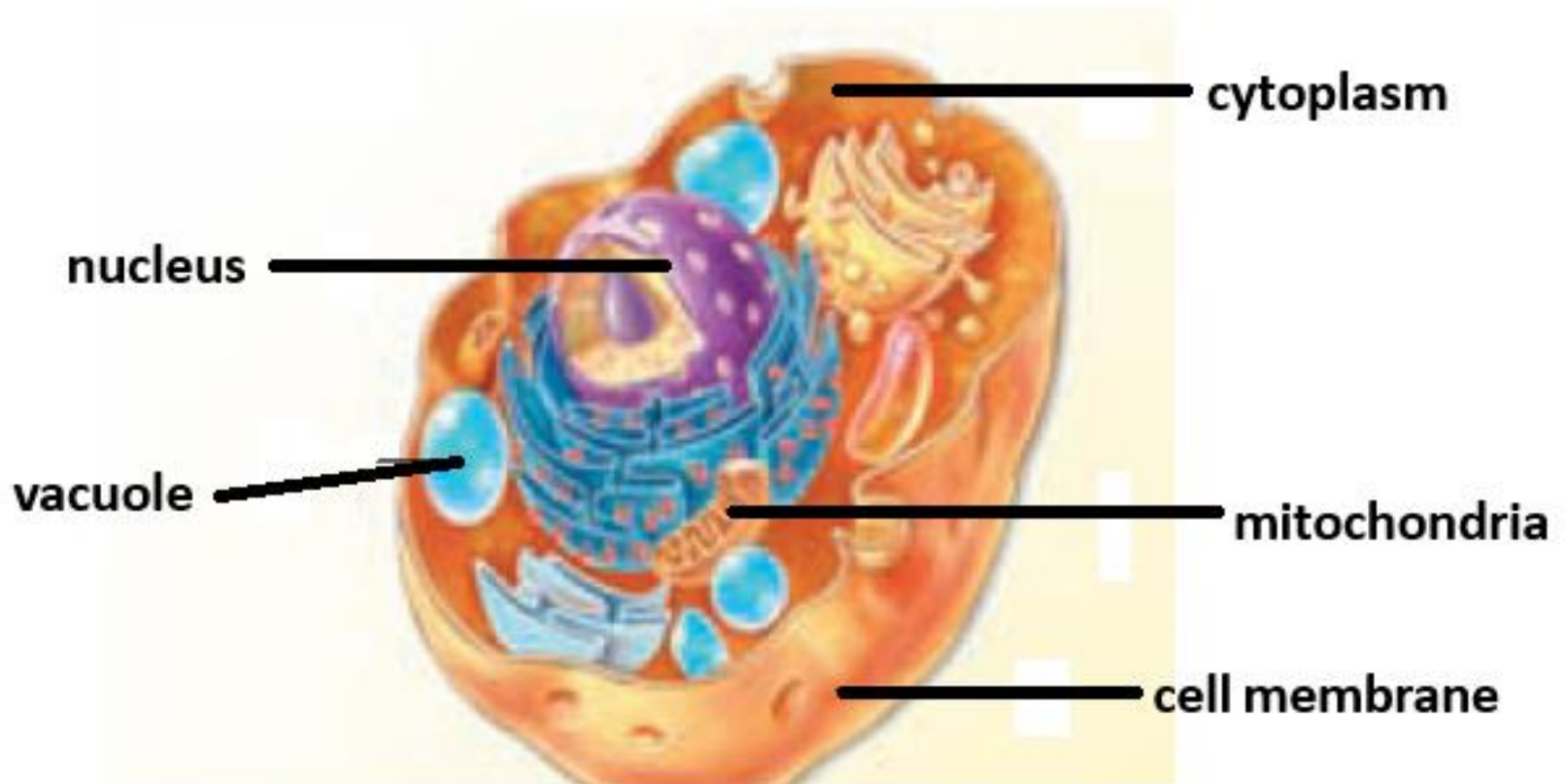
The Cell Theory states:

- The cell is the basic unit of life.
- All living things are made up of one or more cells.
- All cells come from other living cells.

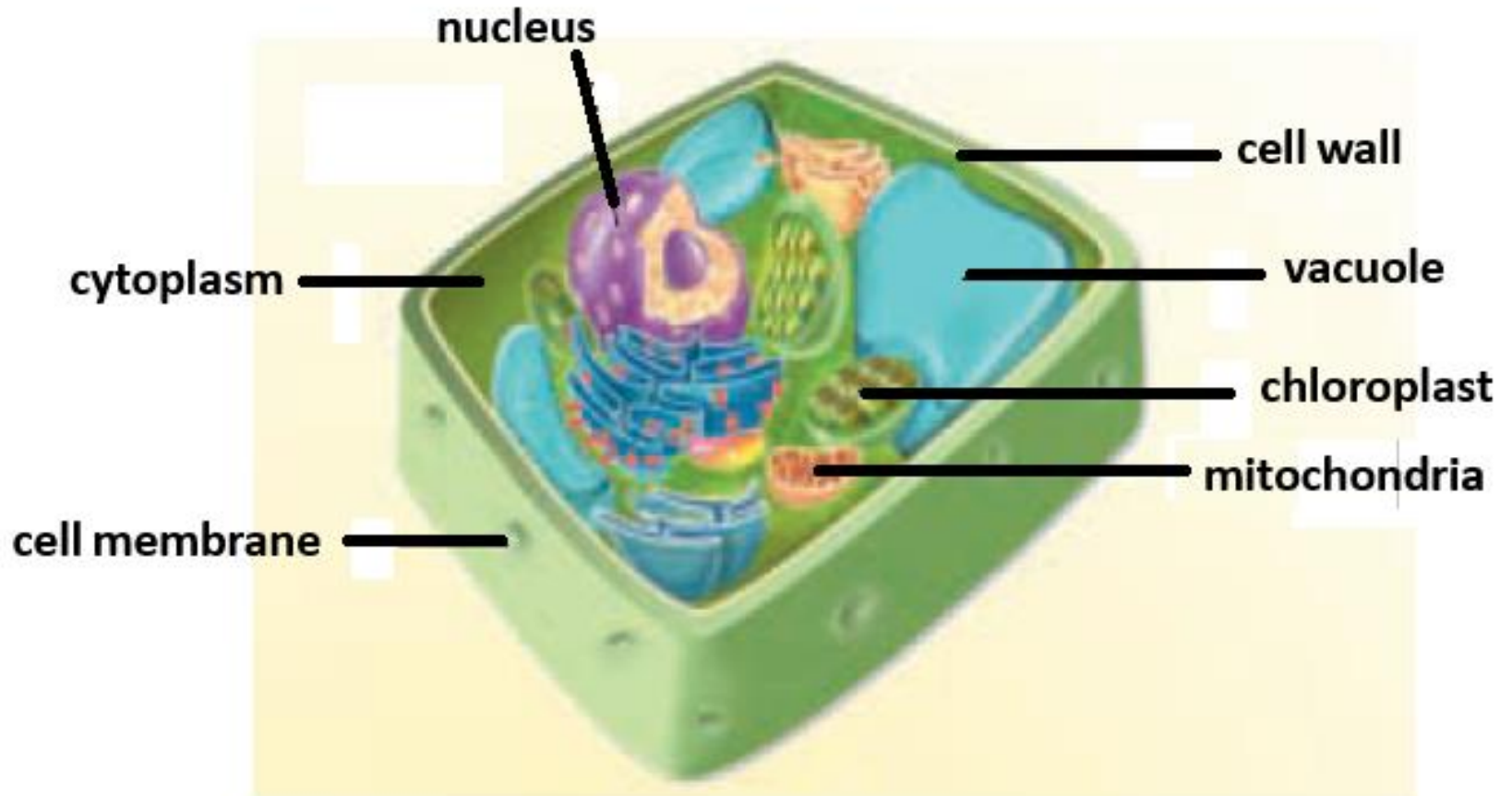




ANIMAL CELL



PLANT CELL



Cell Organelle

| | |
|----------------------|---|
| cell membrane | <ul style="list-style-type: none">• surrounds and protects the contents of the cell• helps to control the movement of foods, wastes, and other substances into the cell and out of the cell |
| cytoplasm | <ul style="list-style-type: none">• jelly-like, watery fluid in which internal organelles float• helps to distribute materials such as food and oxygen to different parts of the cell |
| cell wall | <ul style="list-style-type: none">• tough, rigid structure that surrounds the cell membrane and gives plant cells a regular, box-like shape |
| nucleus | <ul style="list-style-type: none">• contains the chromosomes—the structures that are made of genetic material that control a cell's growth, reproduction, and other life-sustaining activities |
| vacuole | <ul style="list-style-type: none">• provide space to store extra food, wastes, and other substances that the cell cannot use right away |
| mitochondria | <ul style="list-style-type: none">• produce energy for the cell by breaking down food particles to release their stored energy |
| chloroplast | <ul style="list-style-type: none">• green structures that contain a green pigment (coloured substance) called chlorophyll• capture energy from the Sun, which is used to produce food (sugars) in the leaves and green stems of plants (this process is called photosynthesis) |

PLANT CELL VERSUS ANIMAL CELL

- Animal cell are circular and animals cells are rectangular
 - Plant cells are green because they contain chloroplast
 - Plant cells have a cell wall, therefore they have a regular shape
 - Plant cells have fewer and larger vacuoles
-

PLANT

ANIMAL

Cell membrane



Cytoplasm



Cell wall



Brick shape

Round shape

Nucleus



Vacuole



Large & few



Small & many

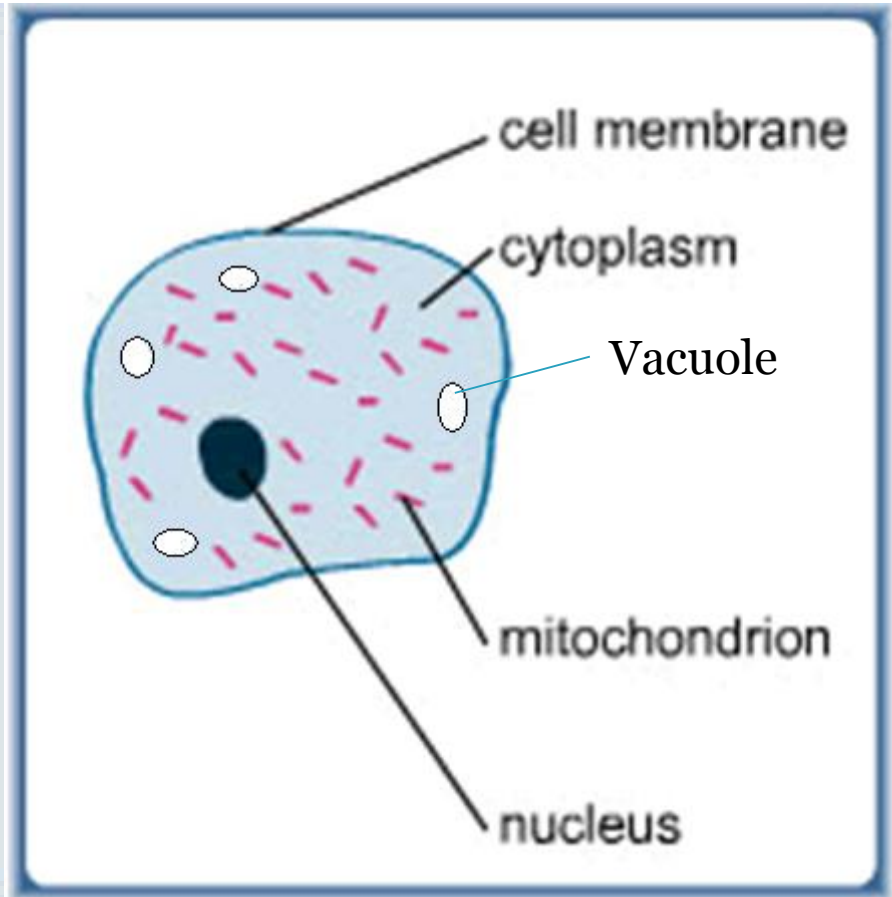
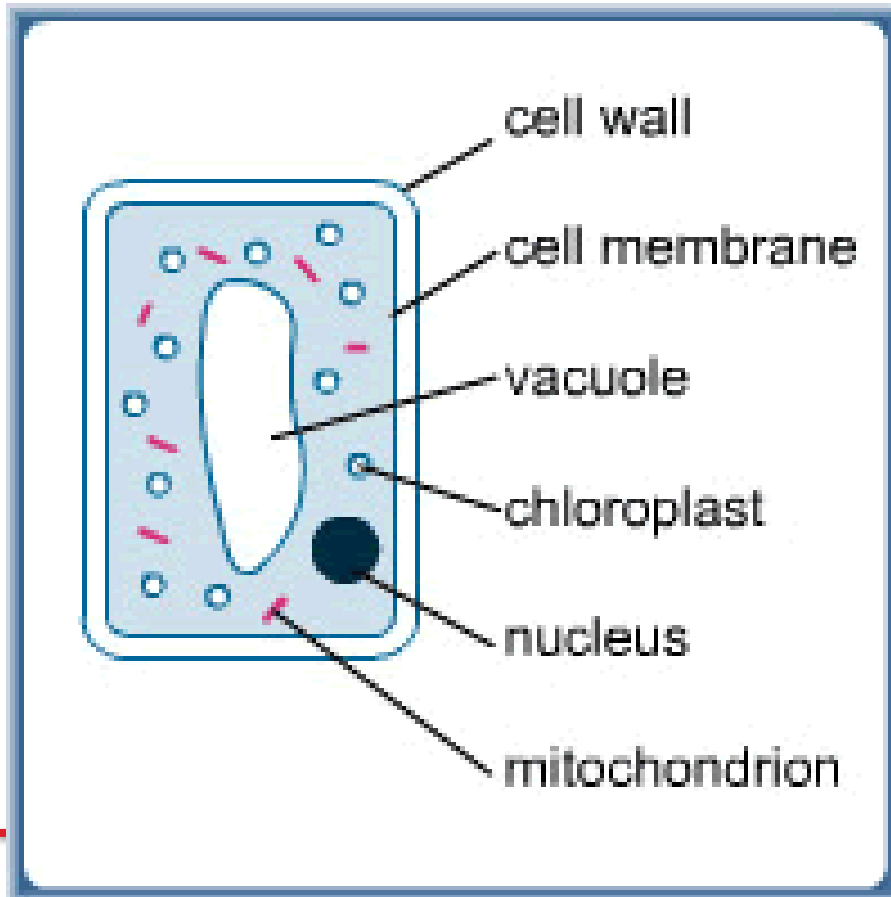
Mitochondrion



Chloroplast



Plant vs. Animal Cells



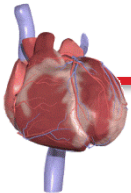
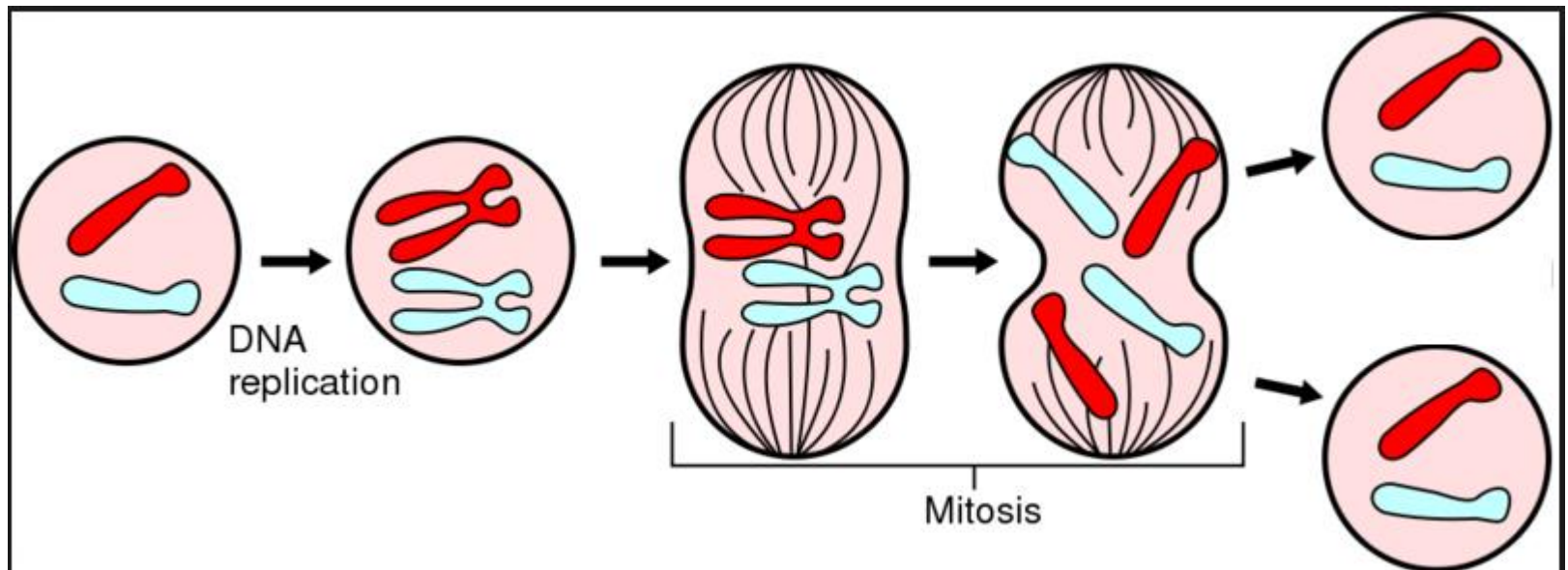
Use playdough to make a cell



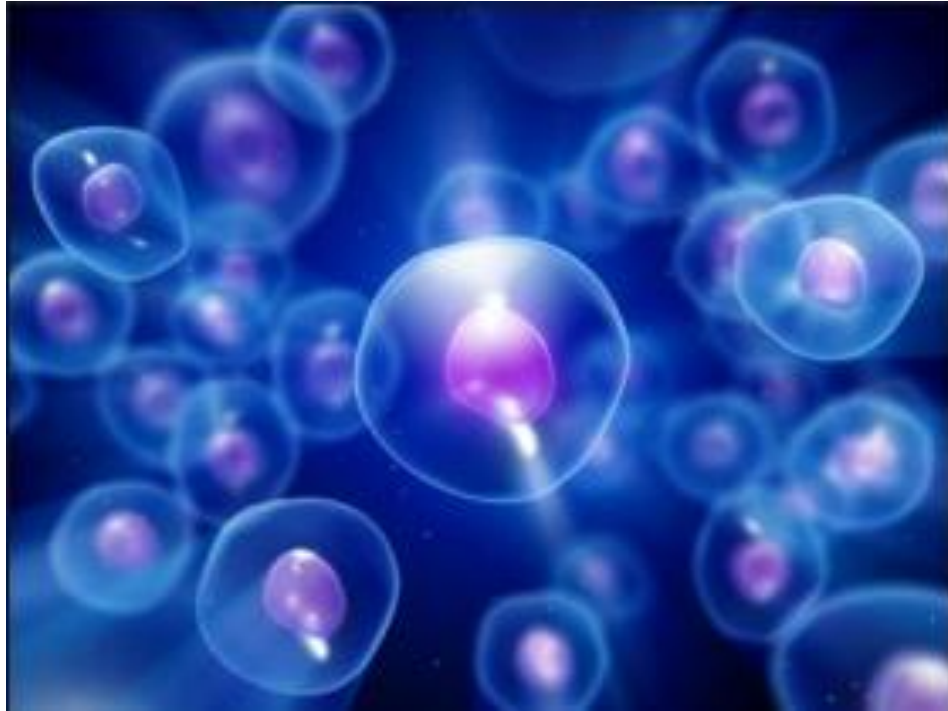
Intermediate Science 8

UNIT 4: CELLS, TISSUES, ORGANS AND SYSTEMS

Topic 4: The Growth Of New Cells

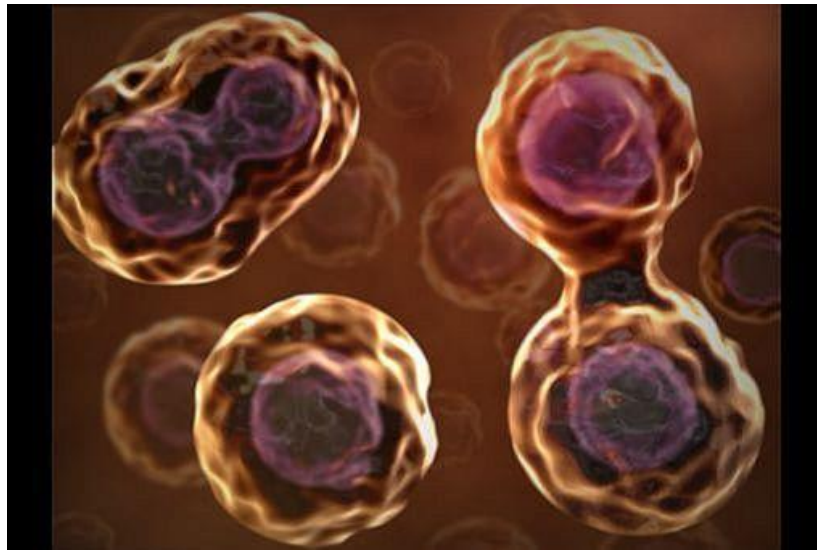


- All living things are made of cells. The human body has trillions of cells. How does it get so many?



Mitosis – Body Cells

Mitosis refers to the process by which body cells divide to produce more ,identical cell.



Many cells are created due to cell division. One cell divides to become two, two divides to become four, and so on

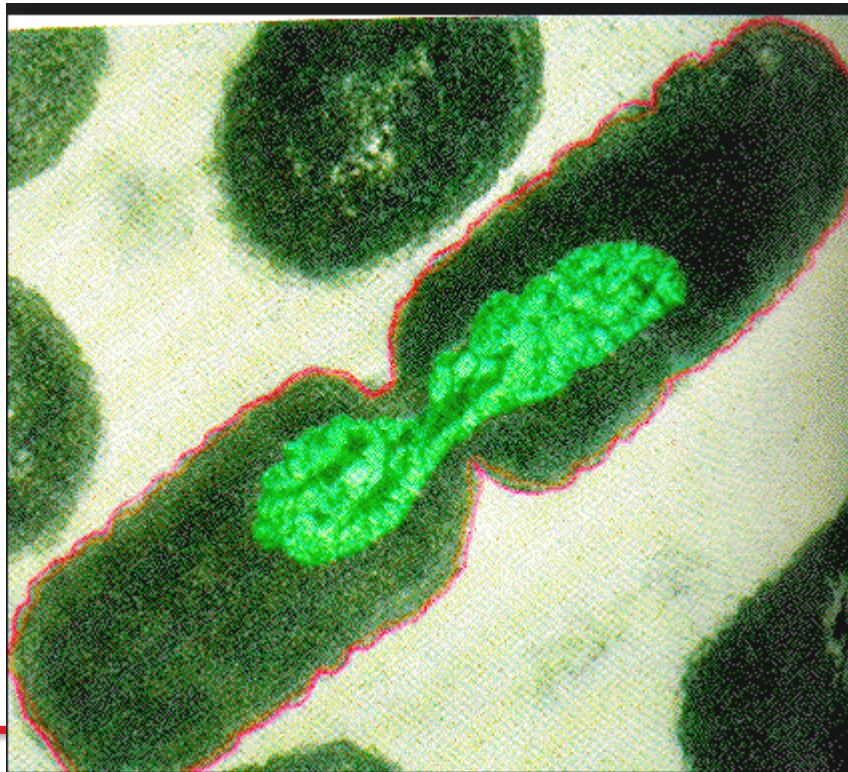
Mitosis for Growth

- Cell production for growth. For example, skin cells divide to produce more skin cells to heal a cut or injury



Mitosis for Reproduction

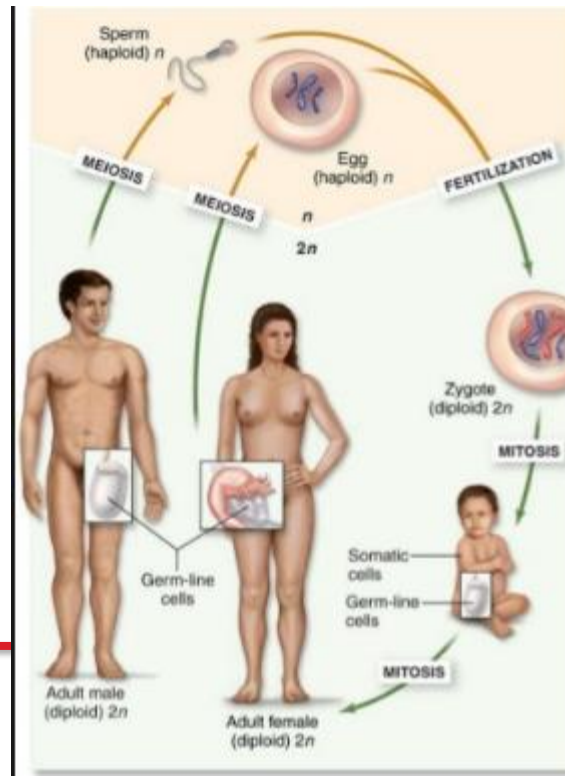
- Cell production for reproduction. For example, bacteria cell divides to become two new cells.



Mitosis- Sex Cells

Meiosis is a type of cell division that produces sex cells.

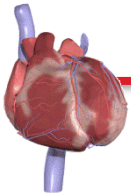
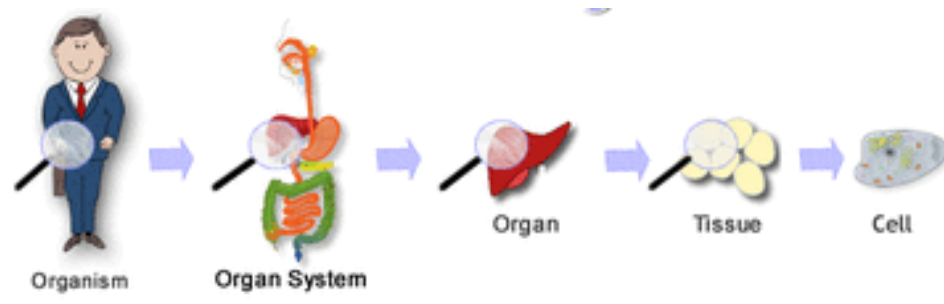
- - Sperm is the male sex cell that is produced in the testes
- Egg is the female sex cell that is produced in the ovaries.

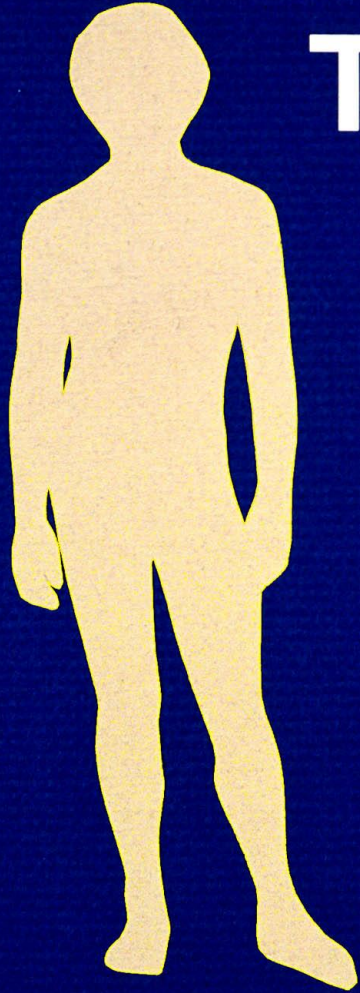


Intermediate Science 8

UNIT 4: CELLS, TISSUES, ORGANS AND SYSTEMS

Topic 3: Tissues, Organs, and Organs Systems





THE ORGANISM

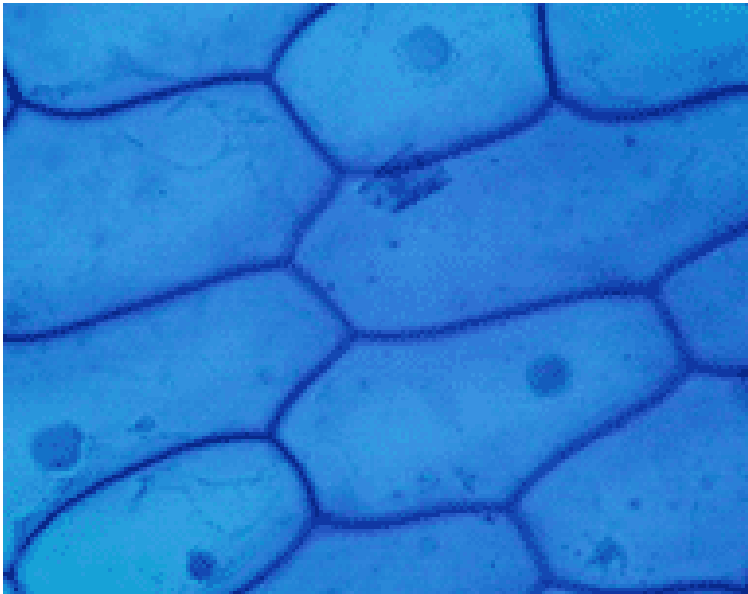
– Organ Systems

– Organs

· tissues

· cells

Now: all living things are made of cells (cell theory)

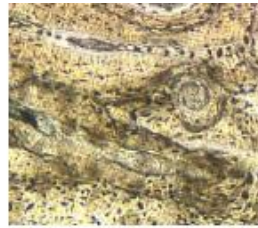


Cell: *the basic, functional unit of life*

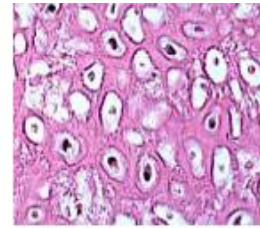
Tissues

- Groups of similar cells
- Found in all multicellular organisms
- Ex. Muscle tissue, nerve tissue, epithelial tissue, etc.

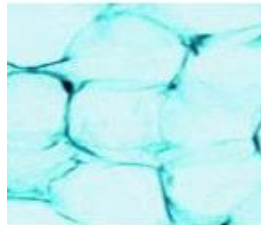
Histological images
of various tissues
in the body



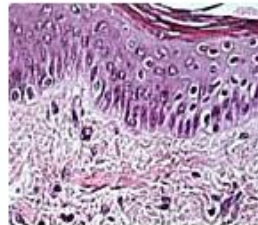
Bone



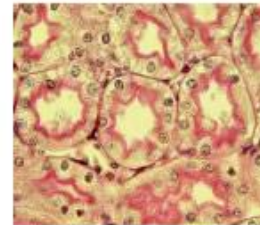
Cartilage



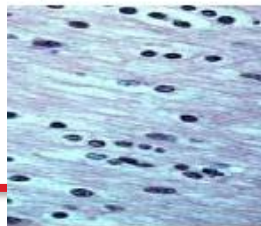
Adipose Tissue



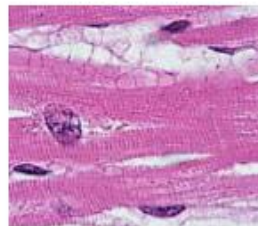
Skin



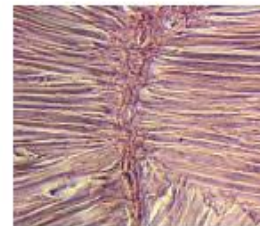
Intestinal Villi



Neural Tissue

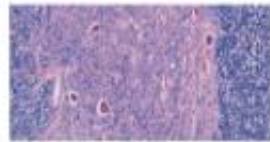


Cardiac Muscle



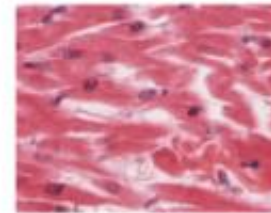
Skeletal Muscle

Four Types of Tissue: Body



Nervous tissue

Brain
Spinal cord
Nerves

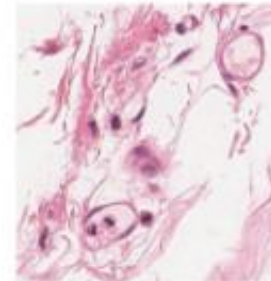
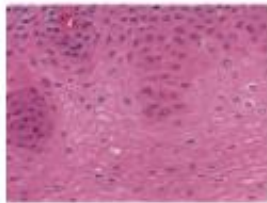


Muscle tissue

Cardiac muscle
Smooth muscle
Skeletal muscle

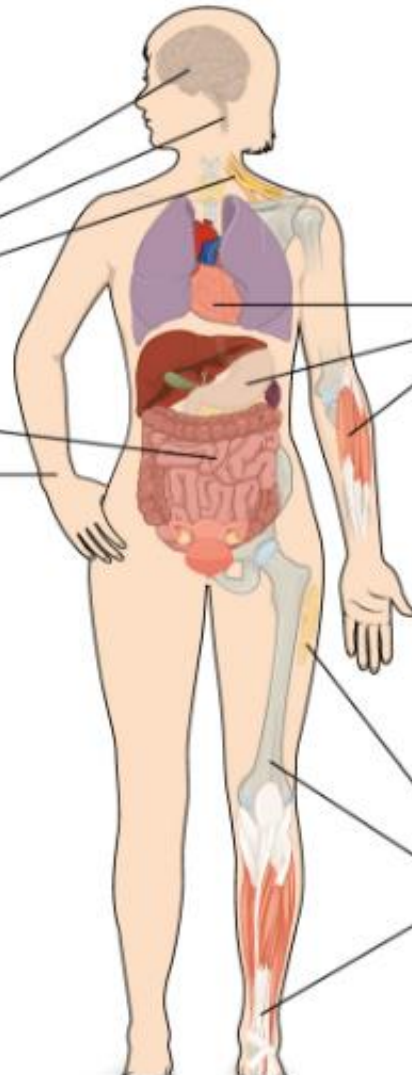
Epithelial tissue

Lining of GI tract organs
and other hollow organs
Skin surface (epidermis)



Connective tissue

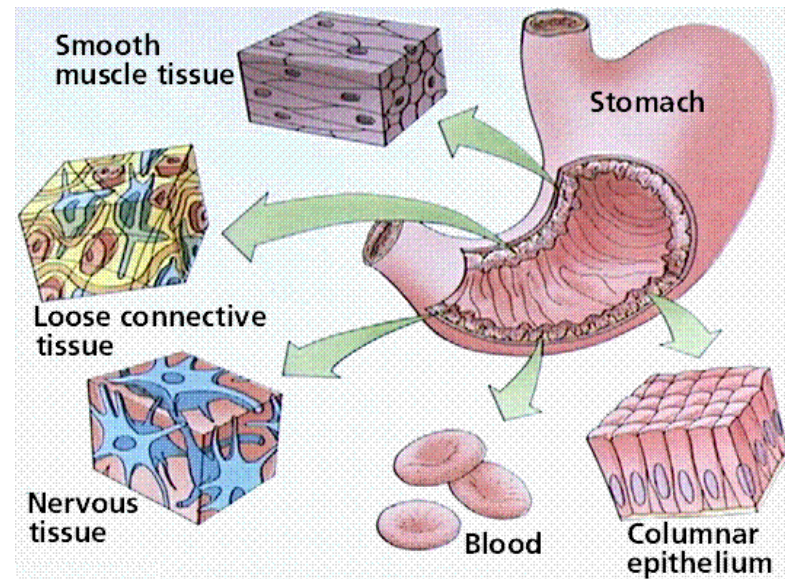
Fat and other soft
padding tissue
Bone
Tendon



Organs

- Groups of tissues. Made up of two or more types of tissues.
- They are distinct structures that perform specific functions.

Ex. Lungs, kidneys, heart, etc.



Systems

All systems have the following characteristics:

- Made up of individual parts that work together as a whole
- Often connected to one or more systems
- If one part of a system is missing or damaged, the system will not function well or may not function at all.
- There are 11 systems in the human body



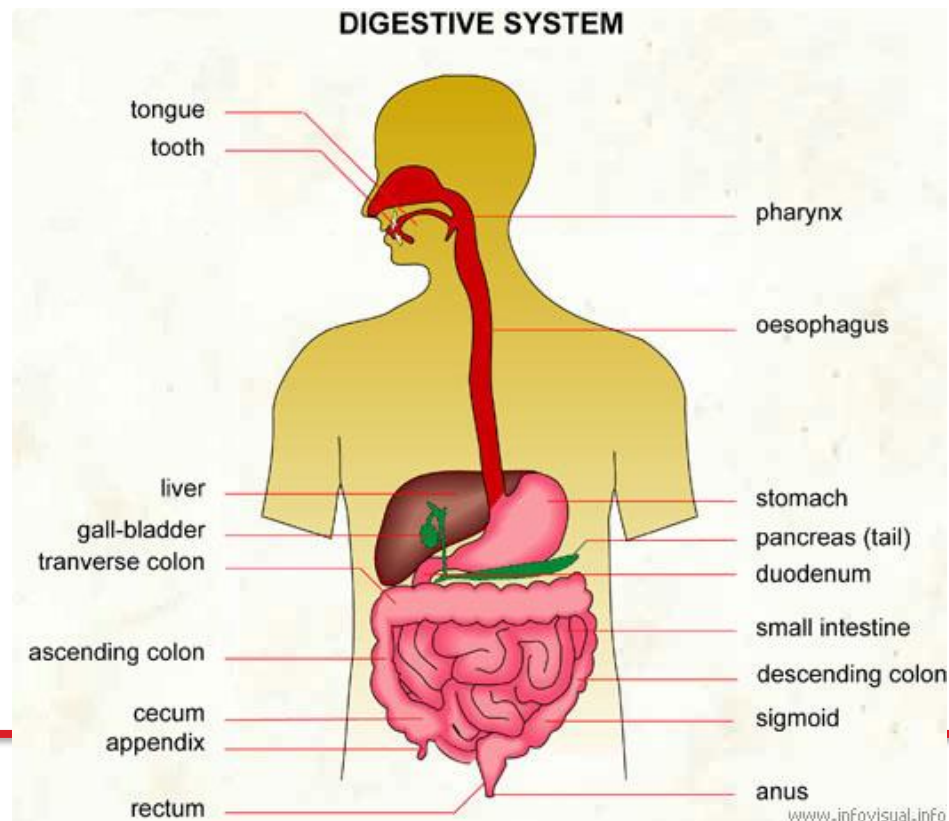
Organ Systems

- A group of organs that perform activities that help the body as a whole.
 - 6 examples of organ systems are...
 1. Digestive System
 2. Circulatory system
 3. Nervous System
 4. Respiratory System
 5. Excretory System
 6. Muscular System
-

1. Digestive System

Function:

- To take in and break down food, absorb nutrients, and eliminate solid waste



Consists of:

Mouth

Gall Bladder

Pancreas

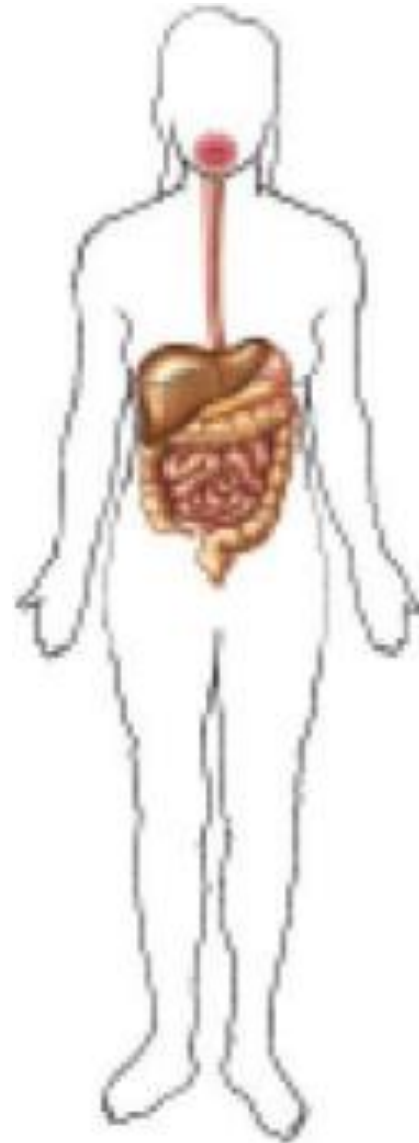
Liver

Esophagus

Stomach

Small Intestine

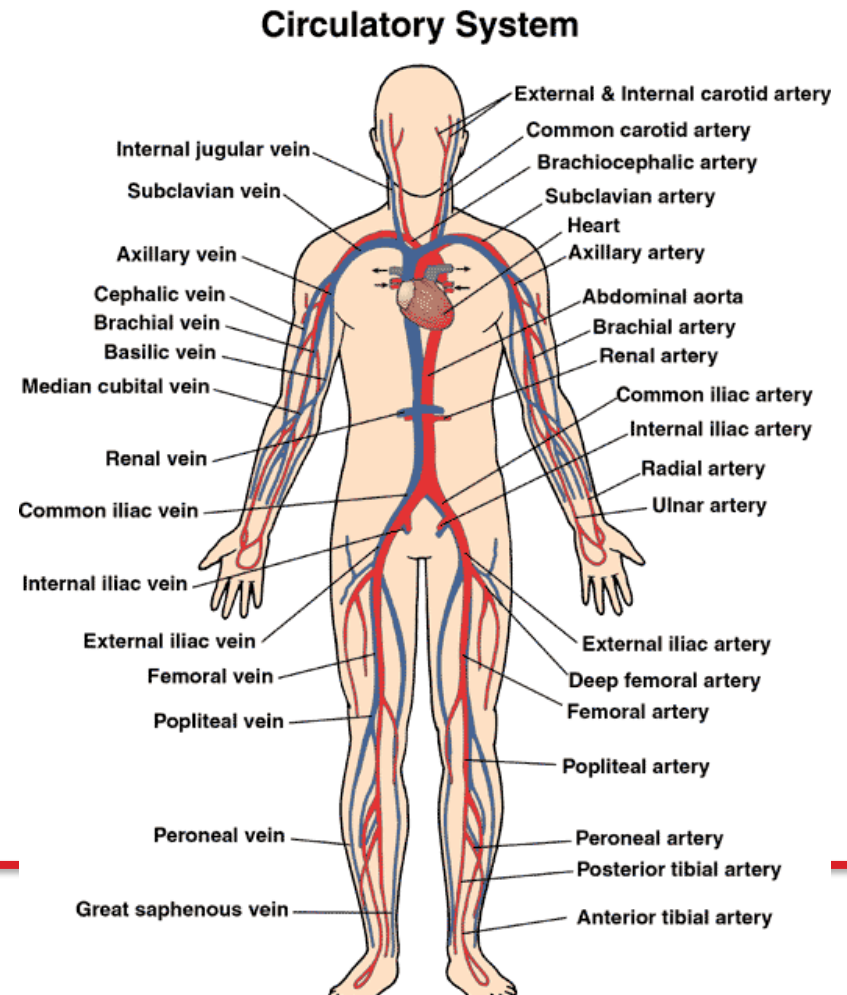
Large Intestine



2. Circulatory System

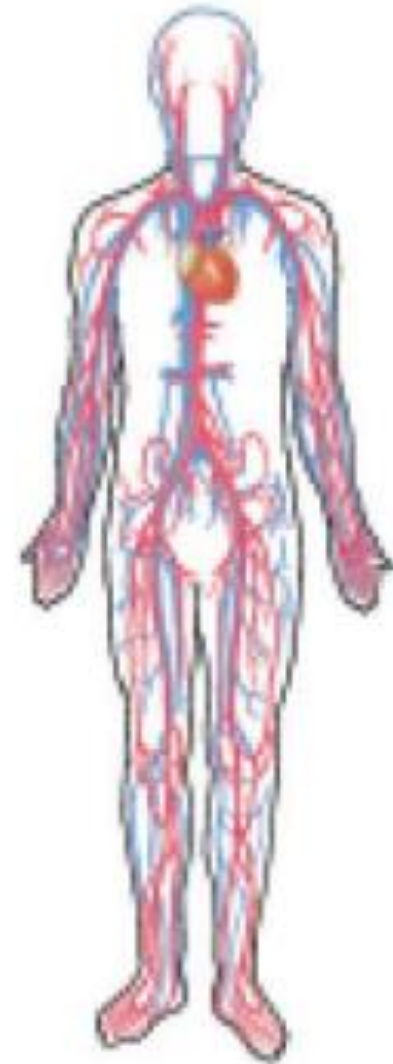
Function:

- To transport blood, nutrients (chemicals needed for survival), gases and wastes.



Consists of:

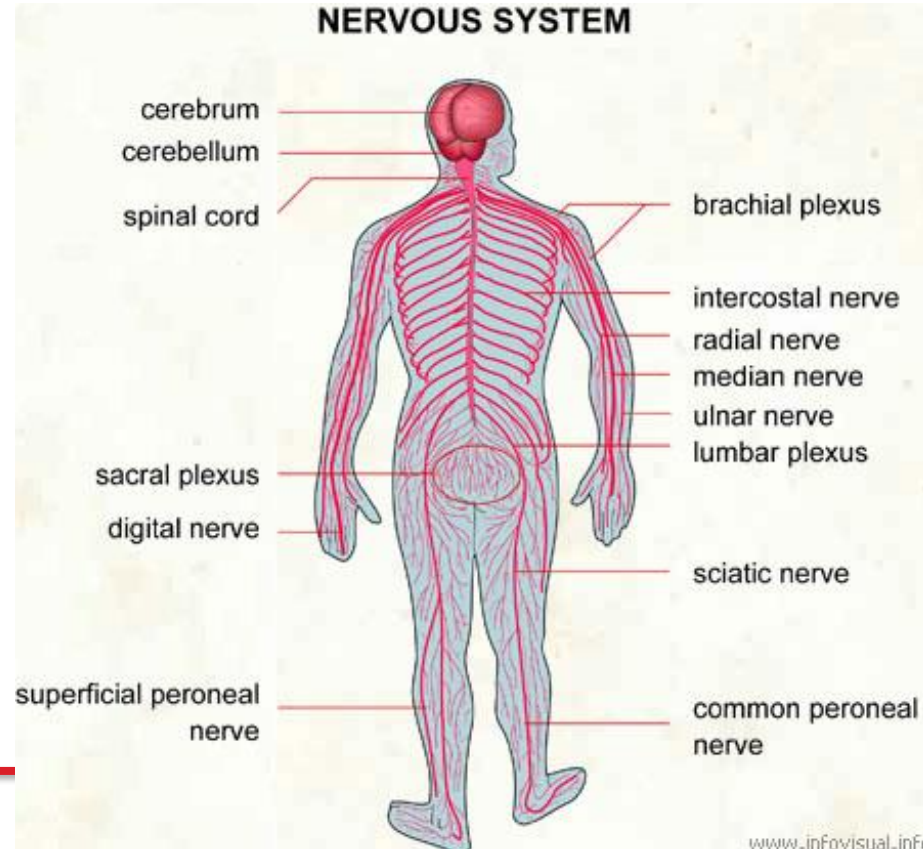
- Heart
- Arteries,
- Veins
- Capillaries



3. Nervous System

Function:

- To detect changes in the environment and to signal these changes to the body which then carries out a response.



Consists of:

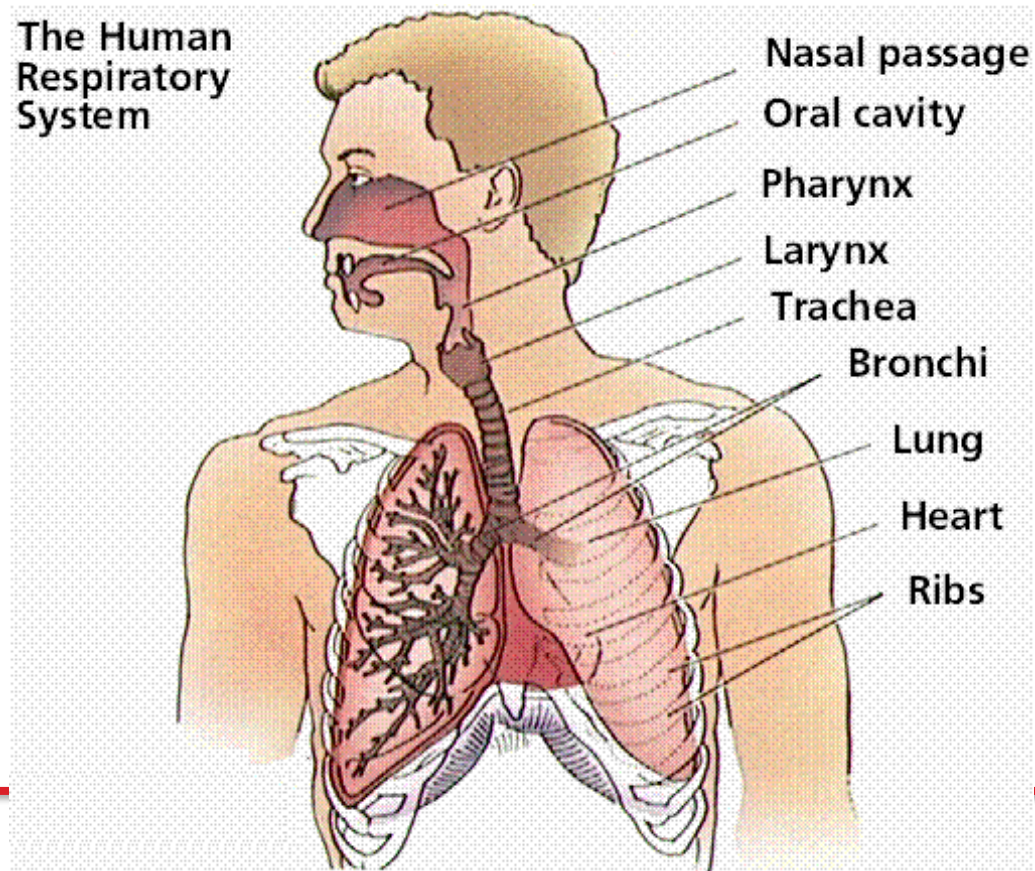
- Brain
- Spinal cord
- Nerves
- Sense organs



4. Respiratory System

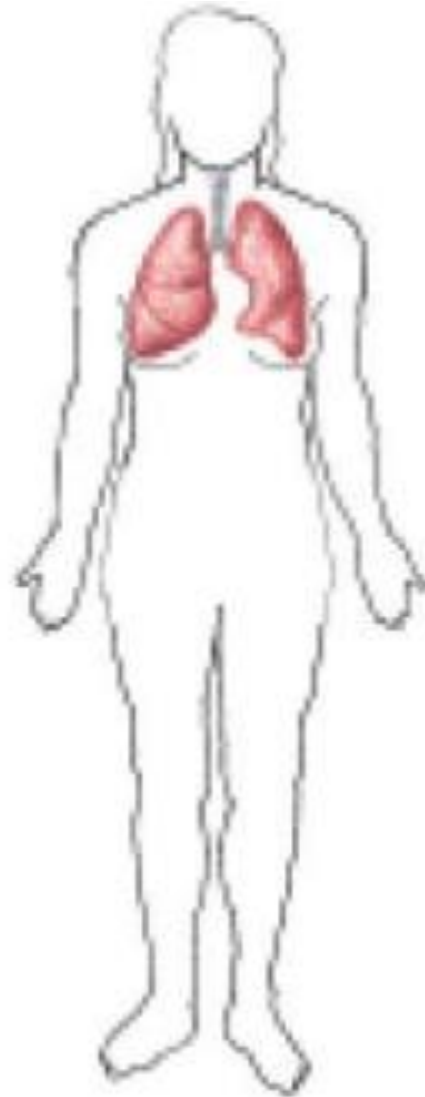
Function:

- To control breathing, and exchange gases in lungs and tissues.



Consists of:

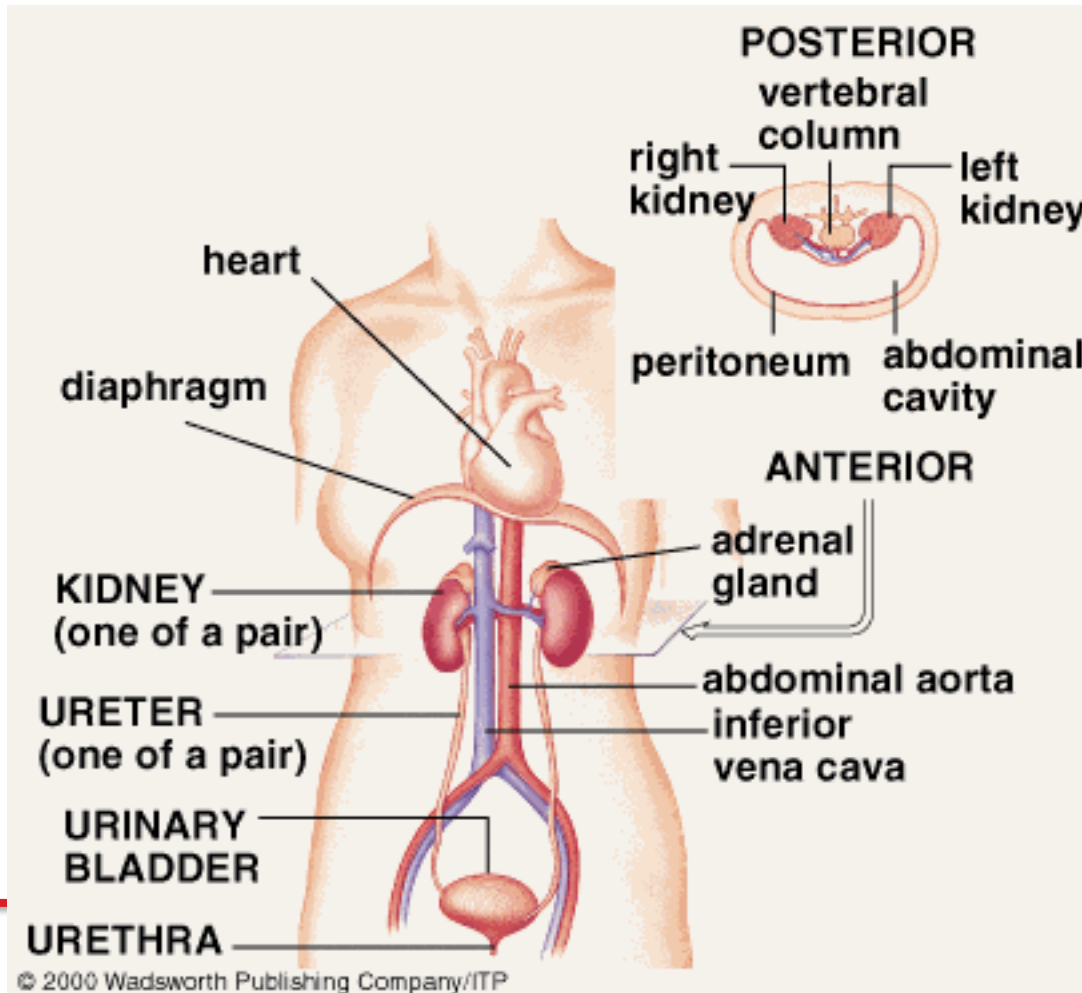
- Nasal cavity
- Trachea
- Lungs



5. Excretory System

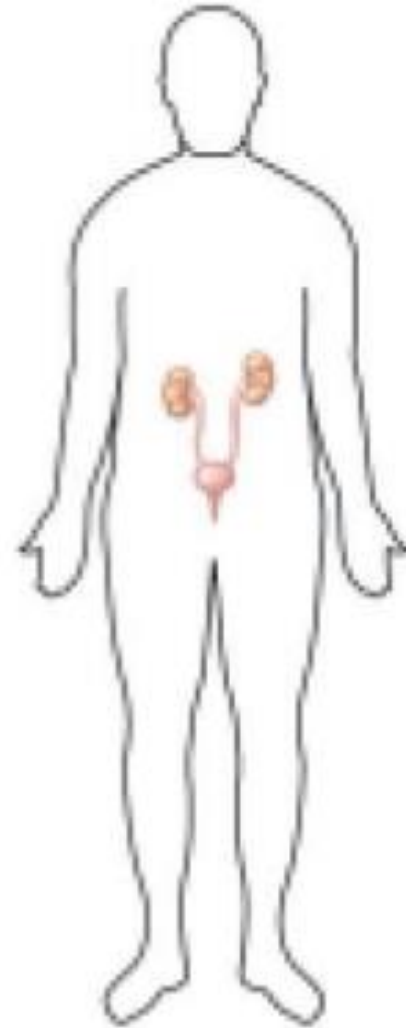
Function:

- To remove liquid and gas wastes from the body



Consists of:

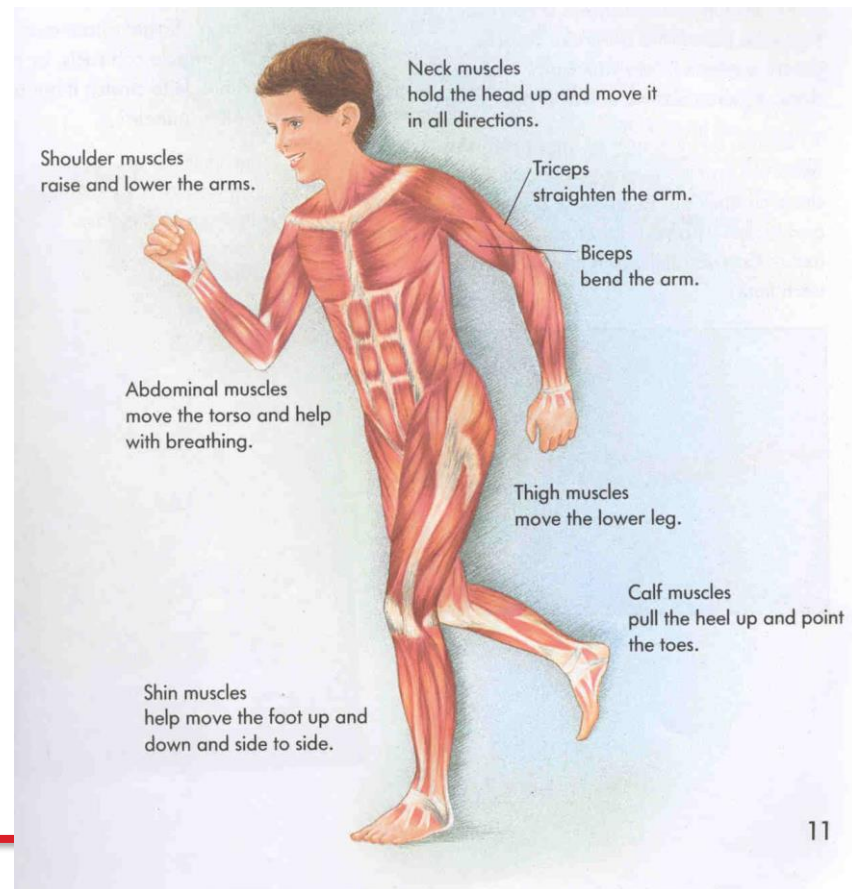
- Lungs
- Kidneys
- Urinary bladder



6. Muscular System

Function:

- To work with the bones to move body parts

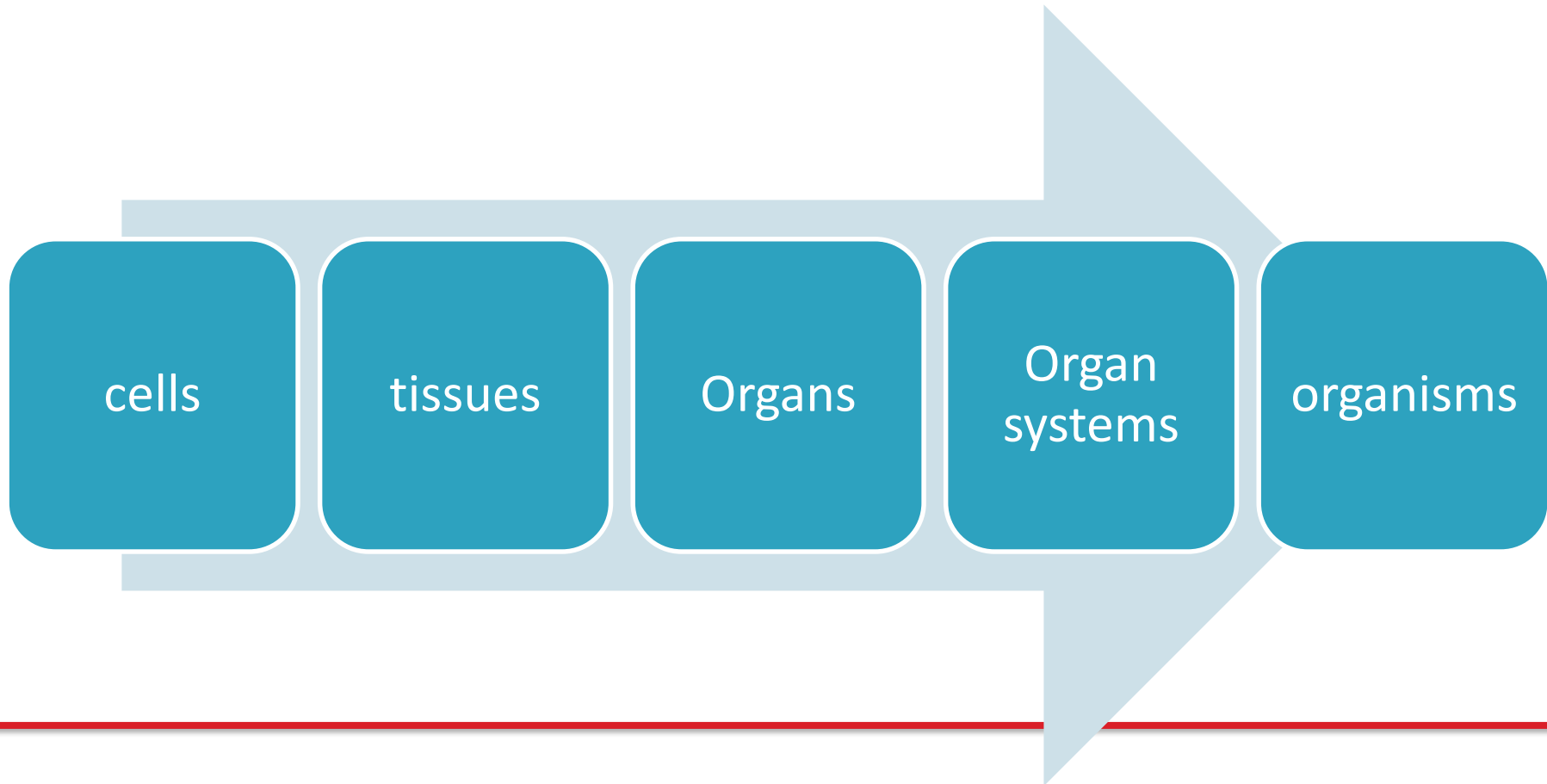


Consists of:

- Muscle tissue connected to bones throughout the body.

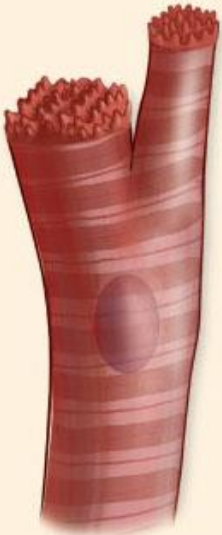

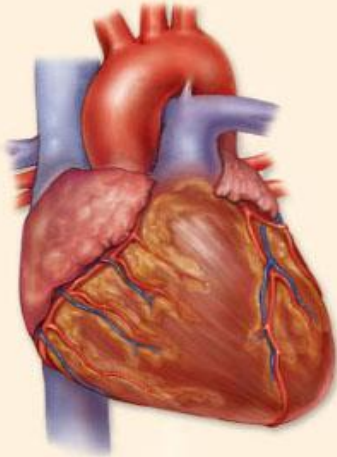
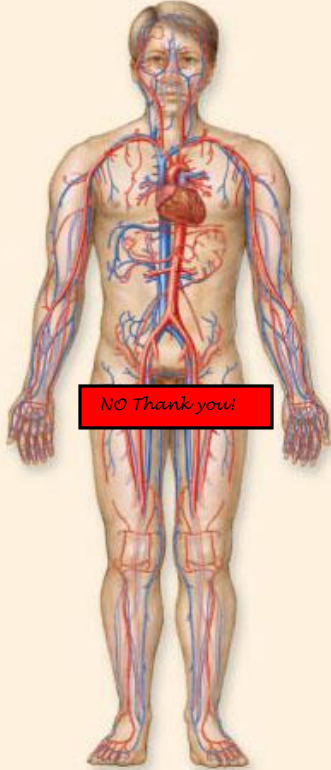


Levels of Organization



Organization of Human Body

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| Cell | Tissue | Organ | Organ System |
|--|--|--|--|
| Cardiac Muscle Cell | Cardiac Muscle | Heart | Circulatory System |
|  |  |  |  |