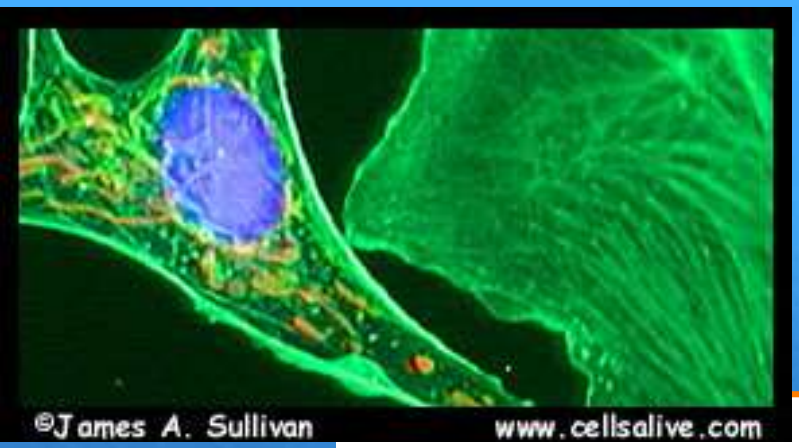
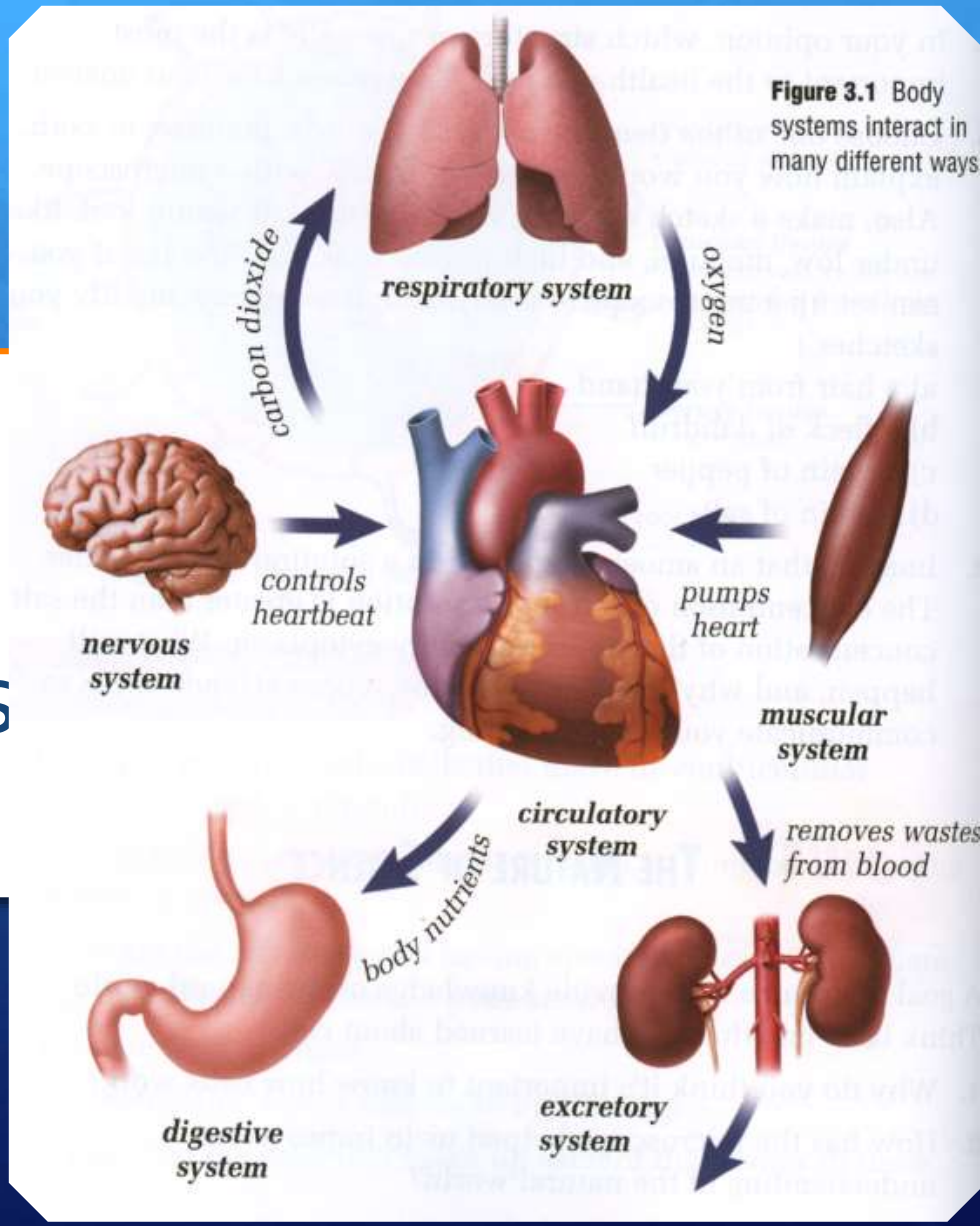


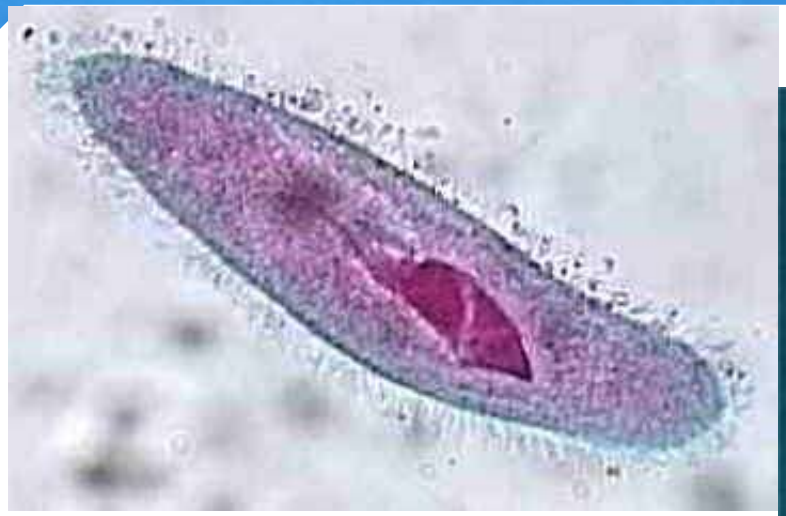
Unit B: Cells and Systems



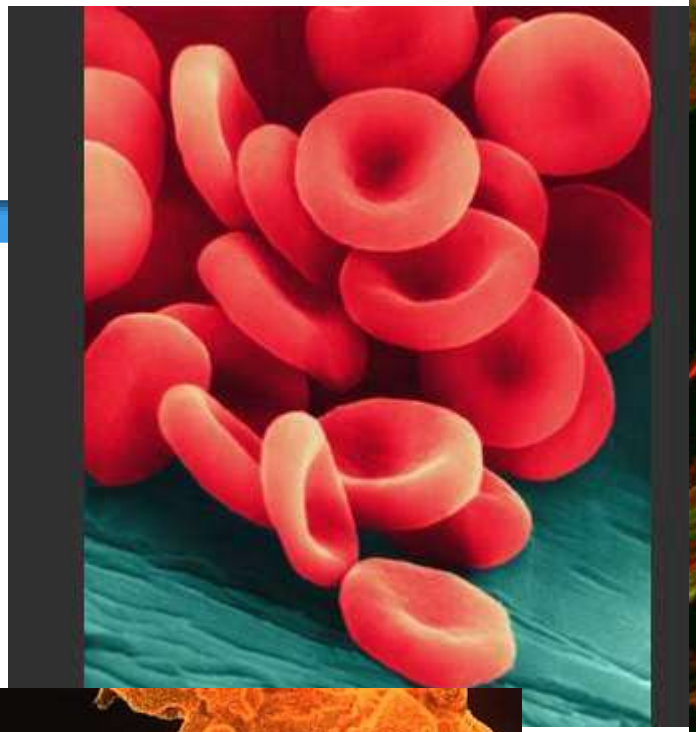
Unit B: Cells and Systems

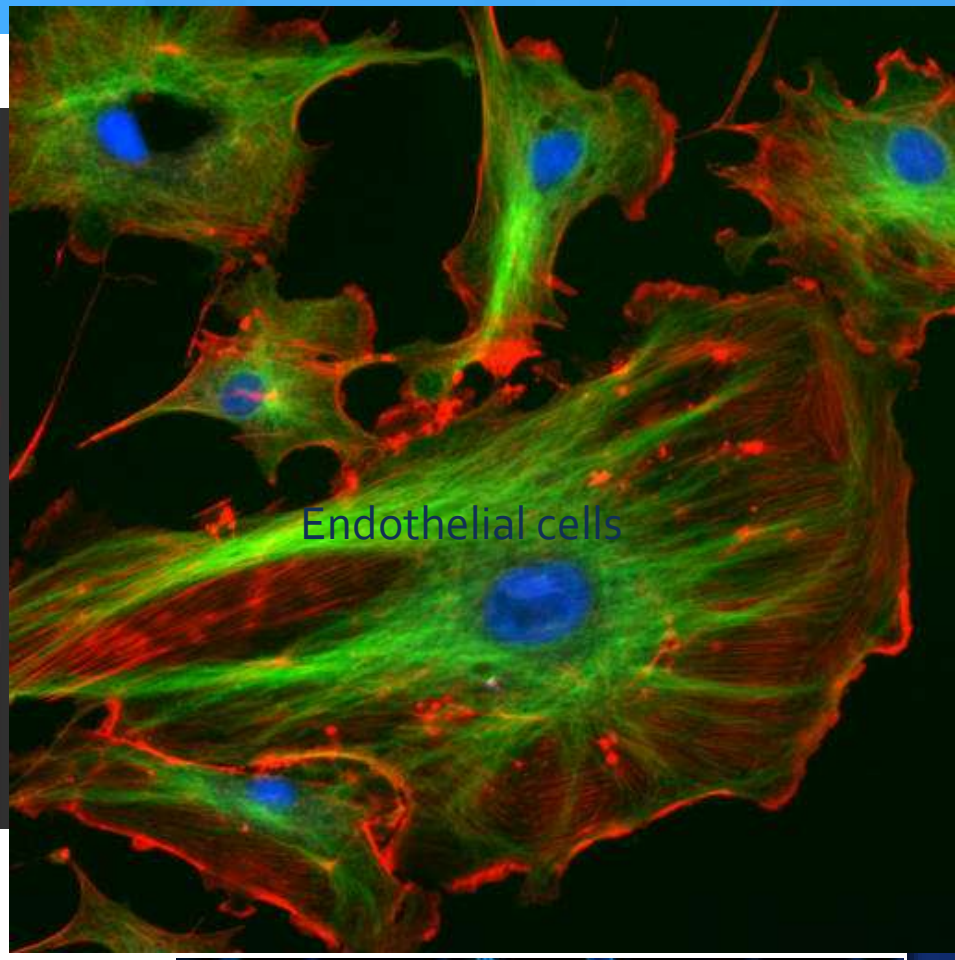
- Organisms
- Cells
- Body Systems
- Advances in Medicine

Organisms



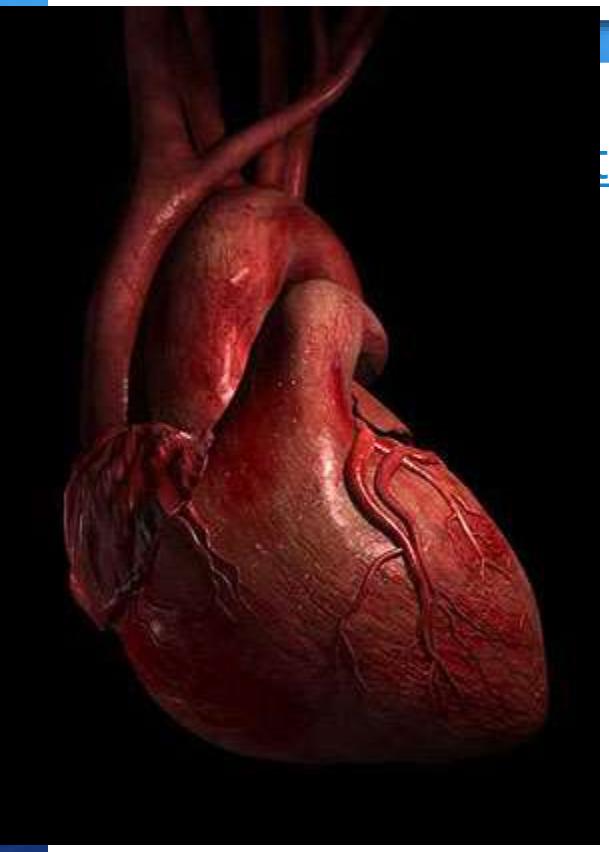
Cells




Endothelial cells


SCIENCEphotoGALLERY
sciencephotogallery.com

Body Systems



tp://www.youtube.com/watch?v=ZbgFKB7u4n8

Advances in Medicine

Blood and Guts

Galen: Gladiator Doctor

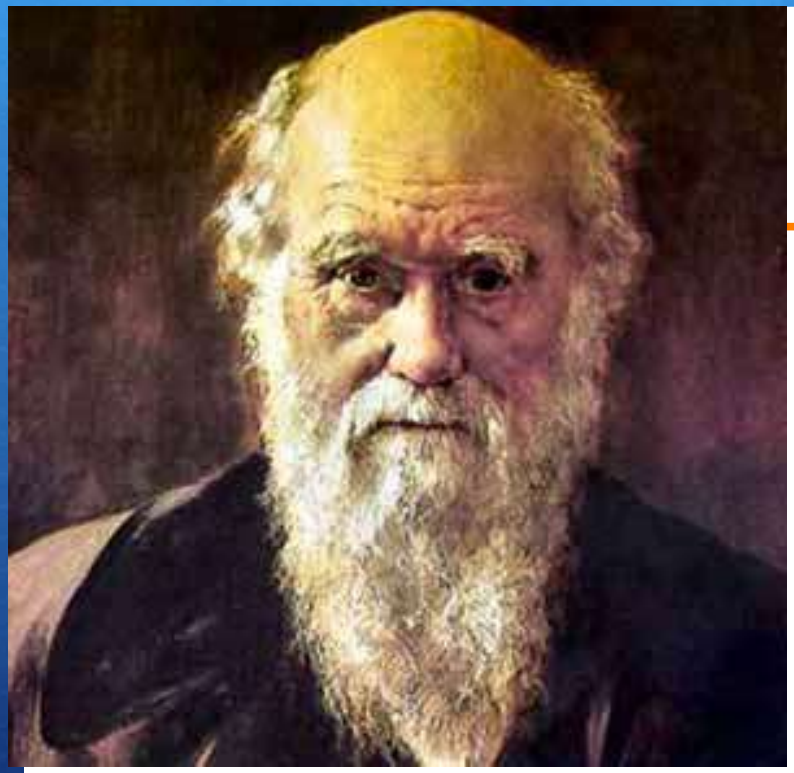
- Thought "Life Force" Flowed
- Liver is a Heater
- Accepted until the 16th century

Roman Medicine

- No anaesthetics!

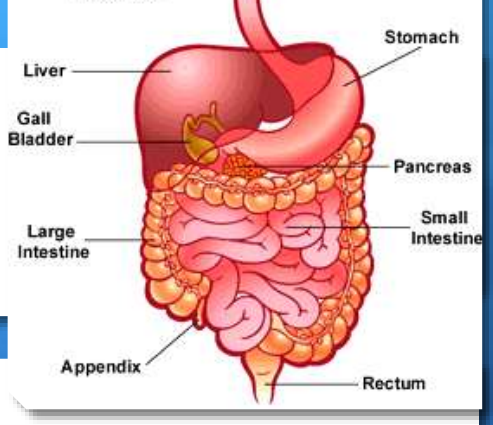
Roman Medicine: Bleeding

Charles Darwin wanted to be a doctor



- What did he end up doing?
- Why did he not succeed in medicine?

Body Parts are related to each other



- One discovery in early medicine was correct: Our body parts are related and dependant on one another in Body Systems:
- Draw the chart on the board, with a partner list at least 10 body parts, give their function, and other body parts they relate to
- All organisms also have some things in common (even paramecium and whales!!) Every organism needs these things in order to survive

Your Assignment: In Pairs

1. Complete the body parts chart (at least 10 parts)
    1. Share with another group!

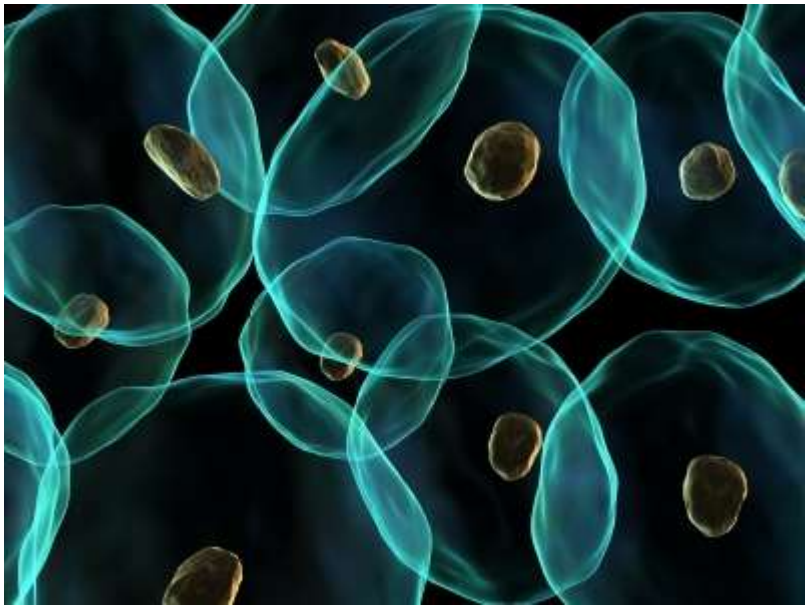
2. Come up with 4 or 5 things that all organisms need to survive

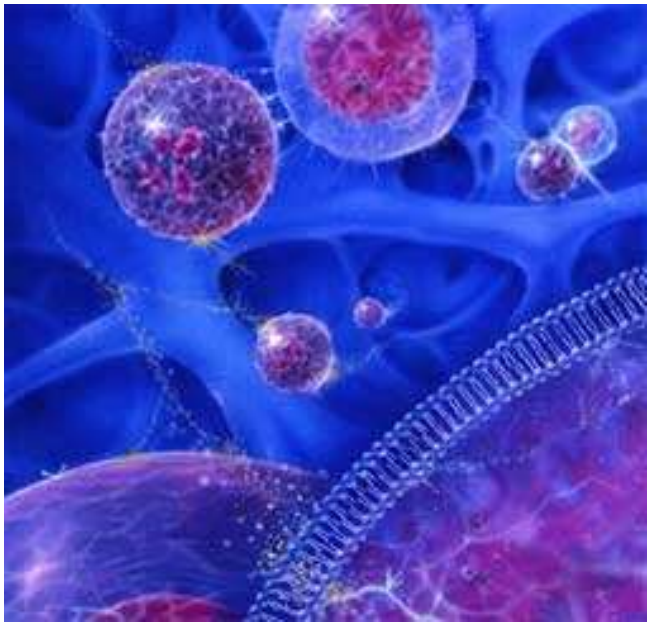
3. Complete sections 1.0 and 1.1 in your notes booklet

What Characteristics do all Living Things Have in Common??

All living things are:

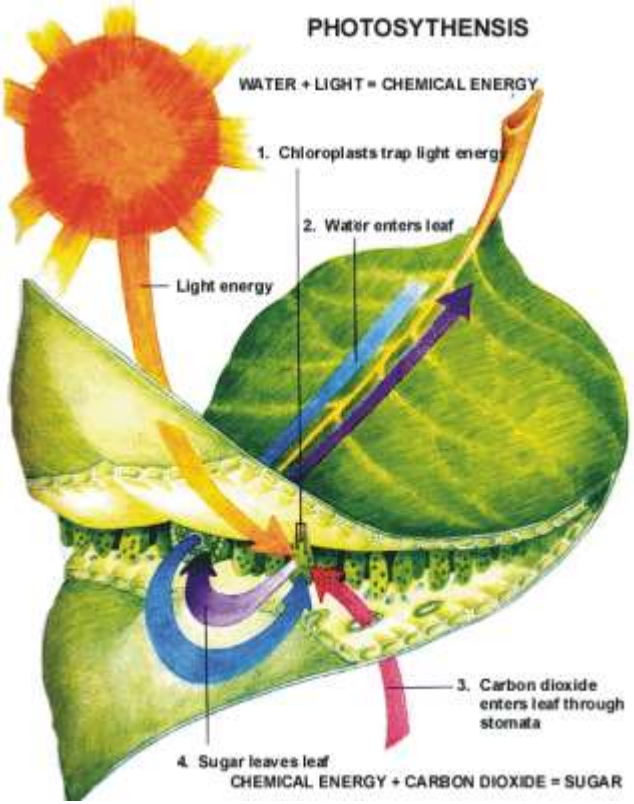
- 1. Made up of cells





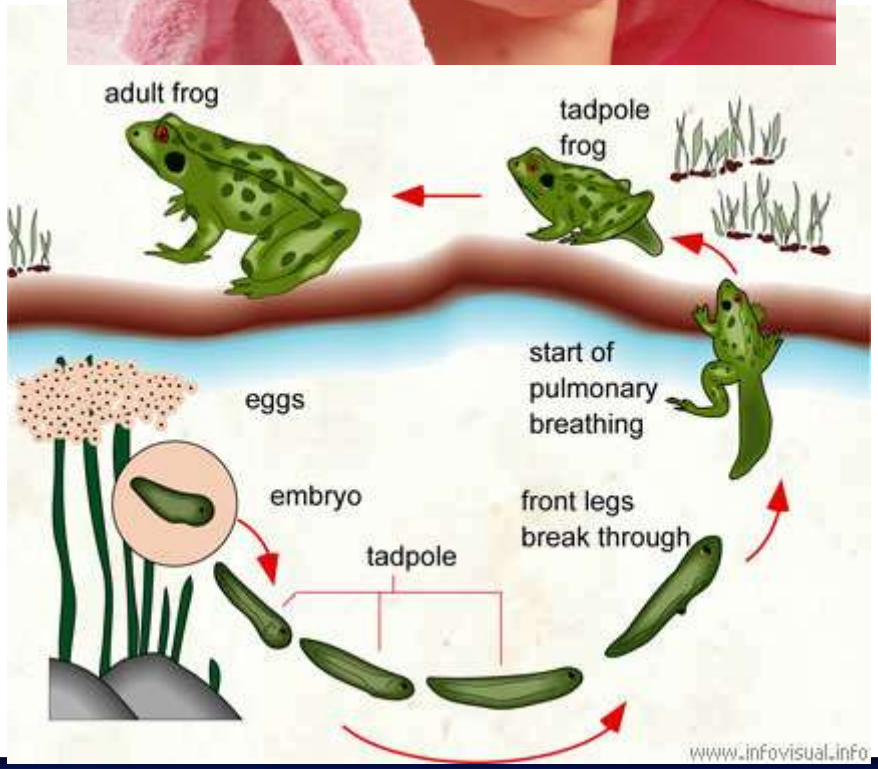
All living things

- **2. Need Energy**



All living things

+ 3. Grow and Develop



All living things

- **4. Respond to the environment (a stimulus triggers response). Can you think of other examples?**

http://www.youtube.com/watch?v=ktIGVtKdgwo&feature=fvst
http://www.youtube.com/watch?v=K_INI1OgKsY

Lesson 16 Venus_Fly_Trap.asf

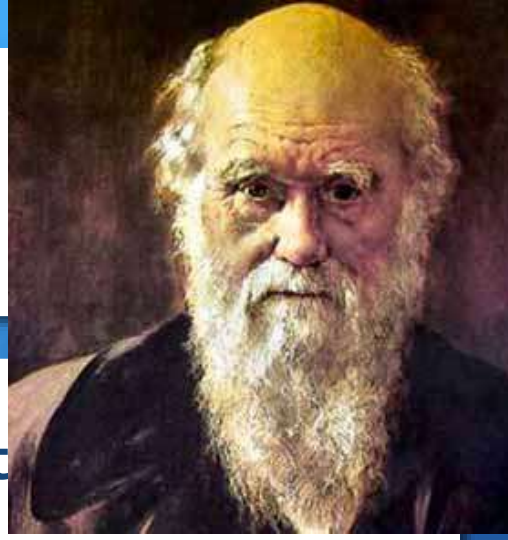
Lesson 16 Venus_Fly_Trap.asf

All living things

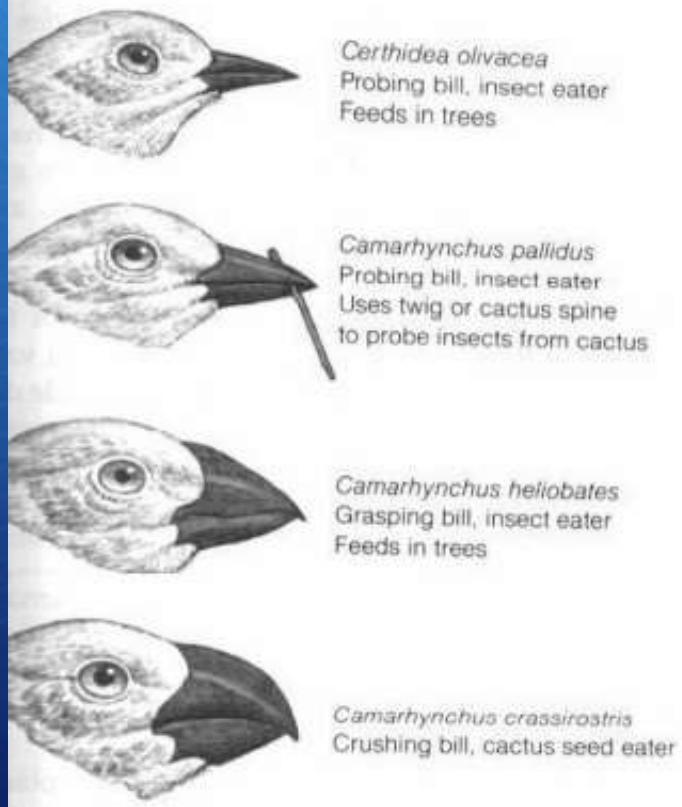
- **5. Reproduce**

http://www.youtube.com/watch?v=DY9DNWcqxl4

All Living Things



- **6. Have Adaptations for their environment**
  - **Other examples??**



Structures versus function

- **Structures: The physical parts of an organism that perform a specific task. Eg) Teeth**
- **Function: The purpose or the task completed by the organism Eg) Gaining energy (eating)**

The Eye:
What are it's structures?
What is it's function?

Structures versus Function

- **Please complete this chart:**

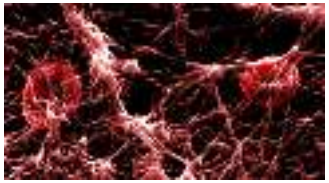
Animal	Structure	Function
Shark 	Teeth	
Venous Fly Trap 		Gain Energy
Polar Bear 		
Beetle 		Protection
Tree 	Leaves	
Butterfly 	Wings	
Your pick: Draw it:		

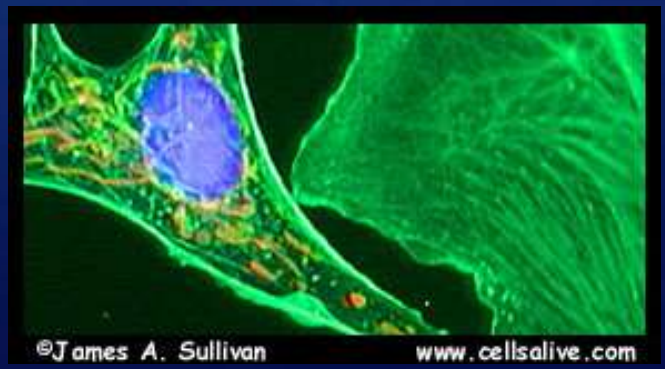
Your Assignment

1. Chart as a class
2. Notes: 1.0 – 1.3
3. Pick an Animal ☺ to research

What is a Cell?

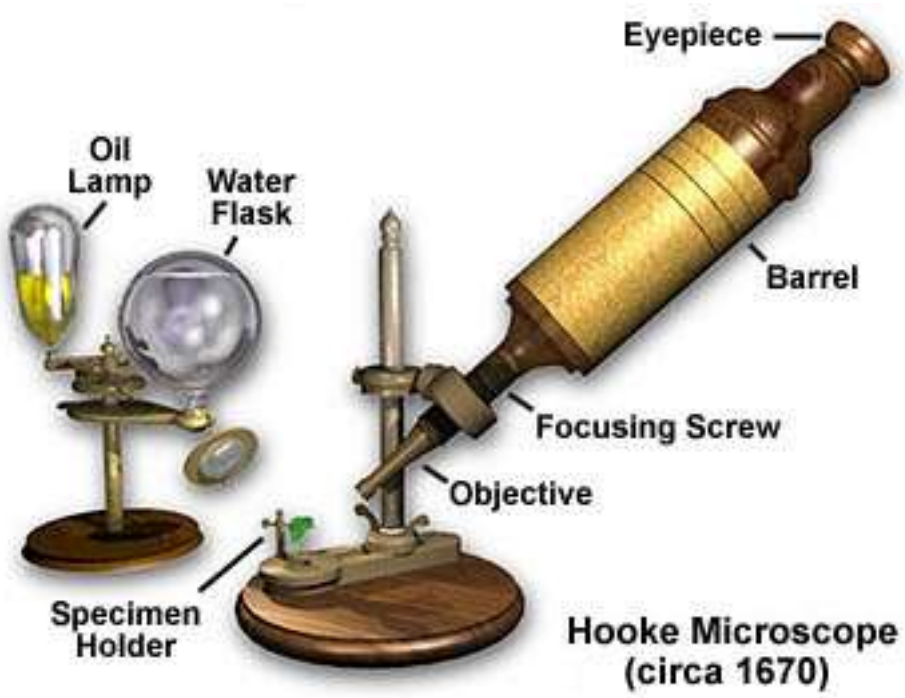
Thought Web





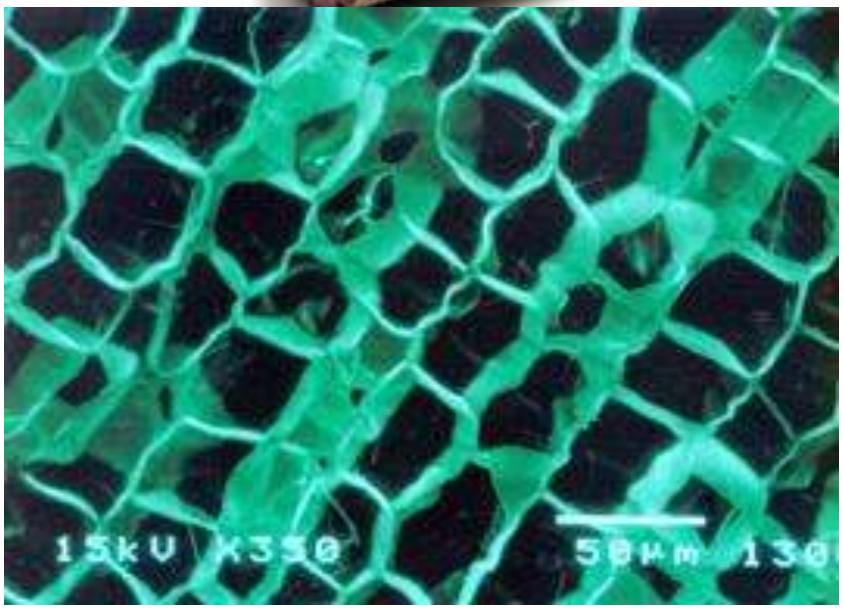
How Did We Find Out About The Cell?

- Early Microscopes
  - The first compound microscope was invented in 1595
  - Compound means two or more lenses
  - In 1665, Robert Hooke used a three lens microscope to study the structure of cork



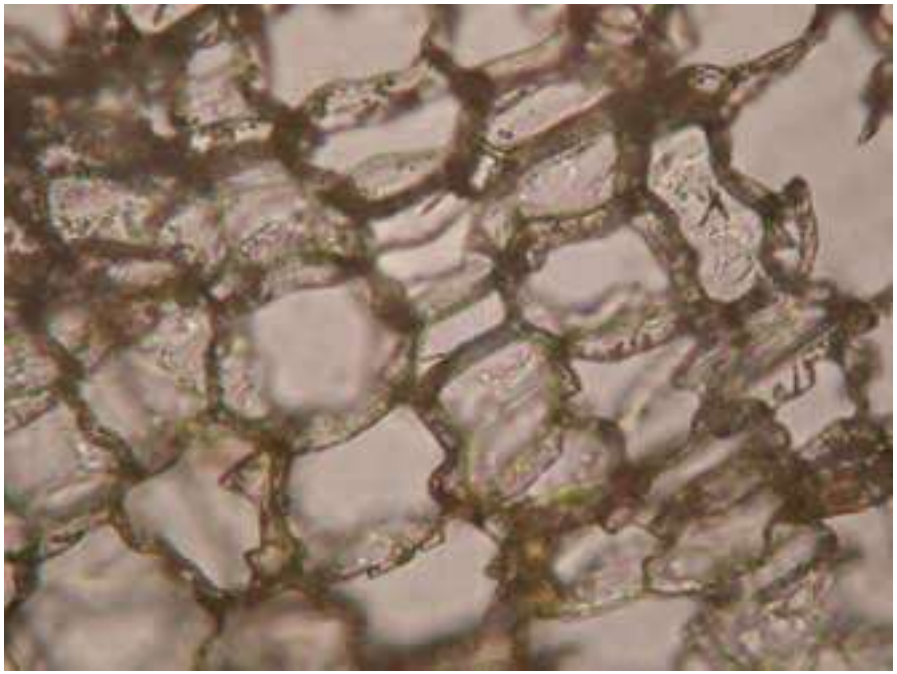
Why do you think he studied cork?

- He wondered why cork was:
  - So light
  - Could float on water
  - Firm, yet compressible



Hooke Examined Thin Slices of Cork

- He found:
  - Many empty chambers that he called **"cells."**
  - **These chambers were the remnants of living cells, the simplest functional unit of life**



By the Council of the ROYAL SOCIETY of *London* for Improving of Natural Knowledge.

Ordered, *That the Book written by* Robert Hooke, *M.A. Fellow of this Society, Entituled*, Micrographia, or some Physiological Descriptions of Minute Bodies, made by *Magnifying* Glasses, with Observations and Inquiries thereupon, *Be printed by* John Martyn, *and* James Allestry, *Printers to the said Society.*

Novem. 23. 1664.

BROUNCKER. *P.R.S.*

MICROGRAPHIA:

OR SOME

Physiological Descriptions

OF

MINUTE BODIES

MADE BY

MAGNIFYING GLASSES

WITH

OBSERVATIONS and INQUIRIES thereupon.

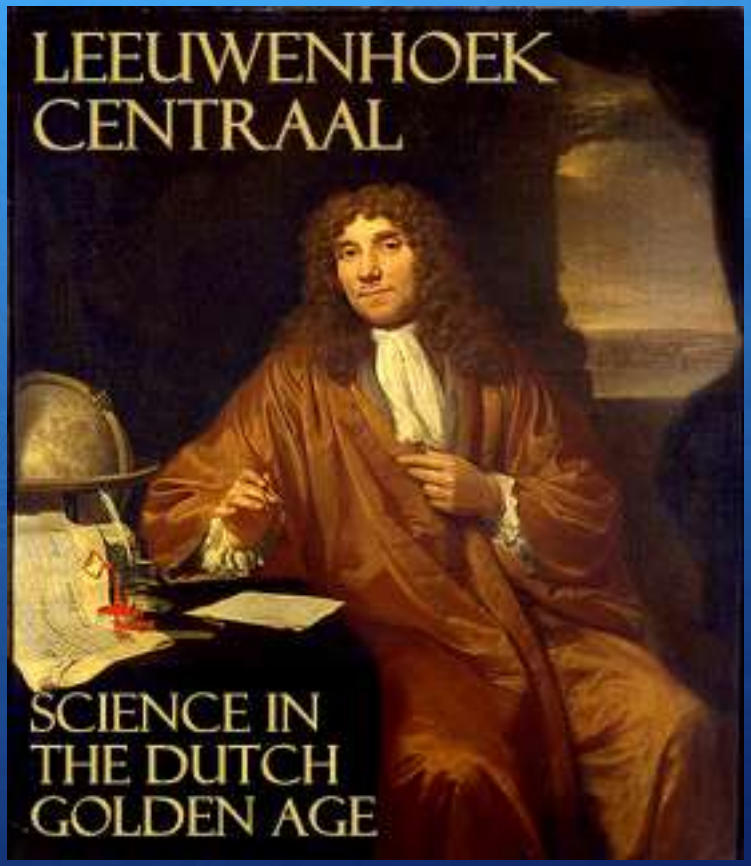
By R. HOOKE, Fellow of the ROYAL SOCIETY.

Non possis oculo quantum contendere Linceus,
Non tamen idcirco contemnas Lippus inungi. Horat. Ep. lib. 1.

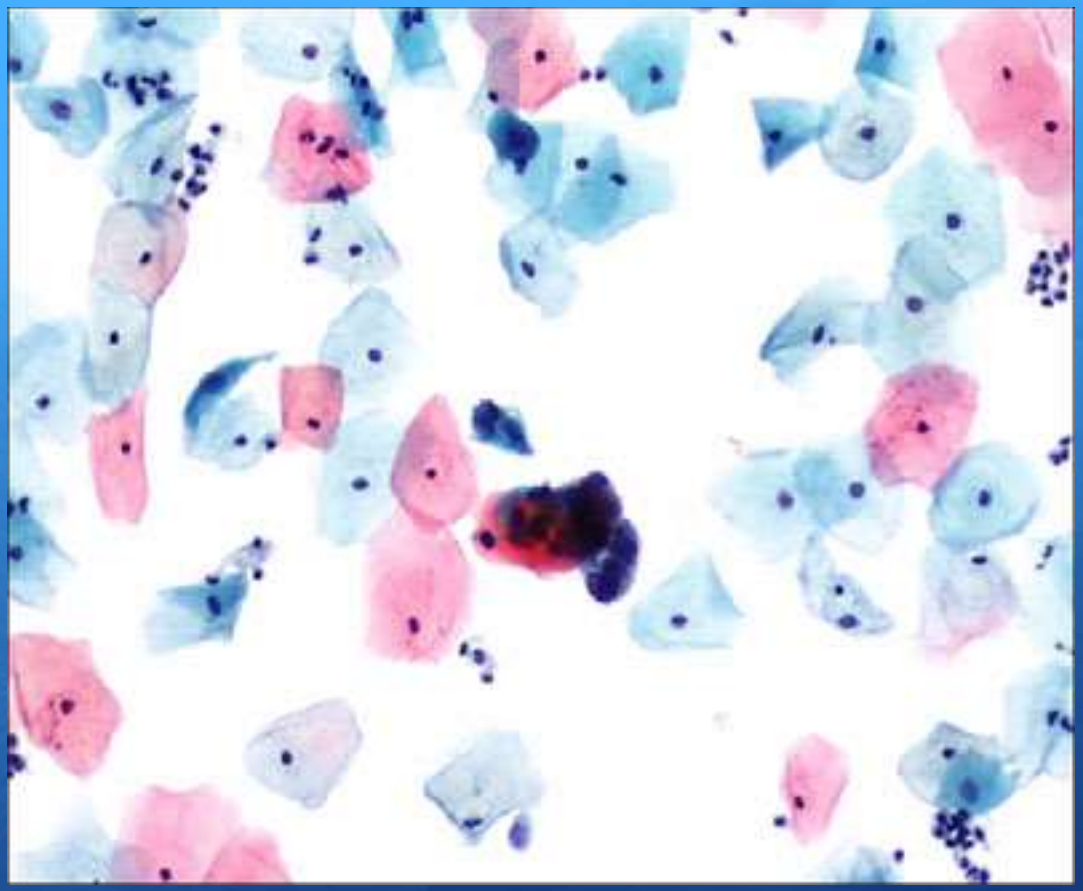
LONDON, Printed by *Jo. Martyn*, and *Ja. Allestry*, Printers to the ROYAL SOCIETY, and are to be sold at their Shop at the *Bell* in *S. Paul's* Church-yard. M DC LXV.

Antoni van Leeuwenhoek

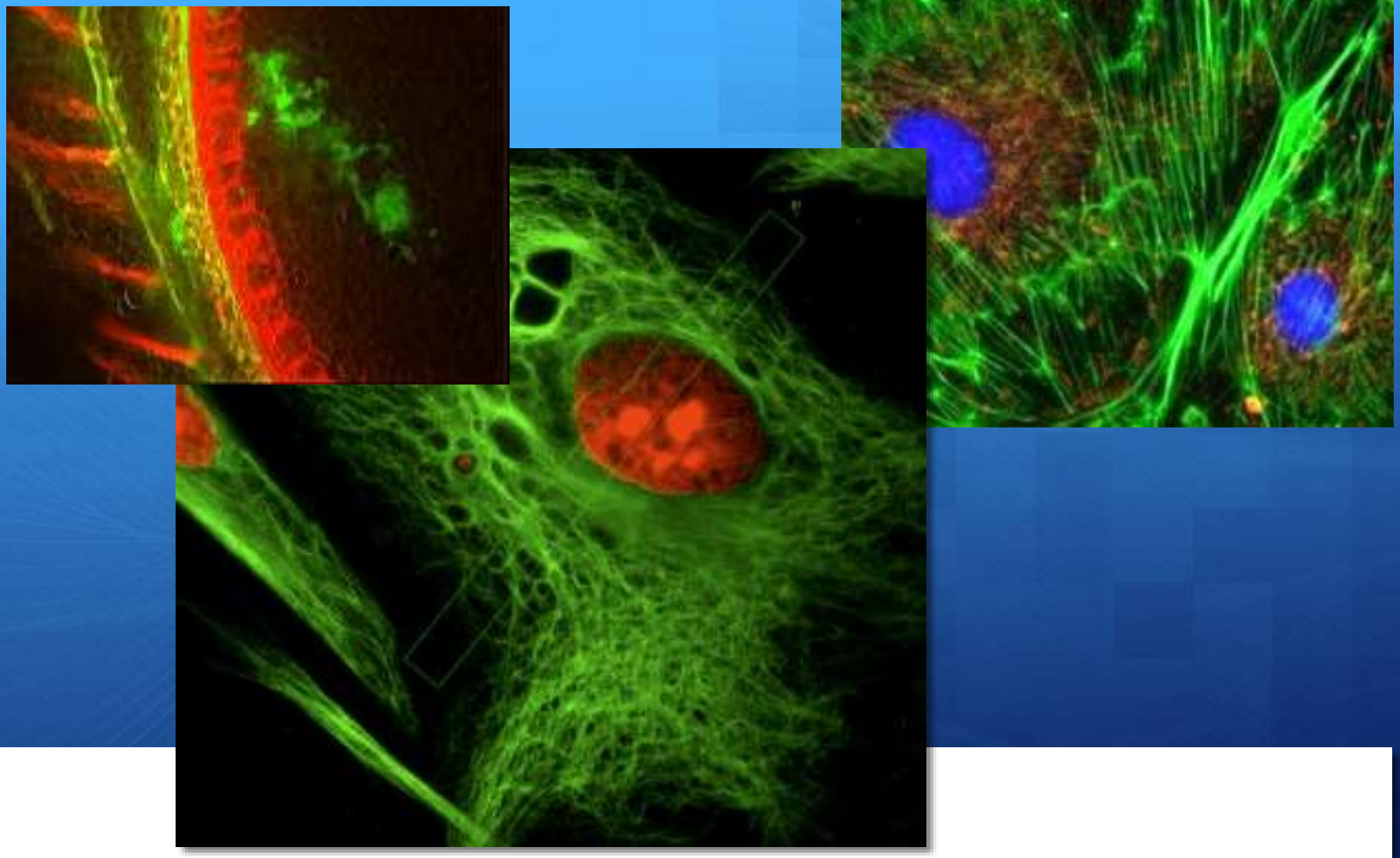
- Used a single lens microscope to see moving cells
- He saw what are now known as bacteria, sperm, and single celled protozoa
- These were the first observations of individual free living cells


LEEUWENHOEK
CENTRAAL
SCIENCE IN
THE DUTCH
GOLDEN AGE

Look for Hooke and van Leewenhoek (6 min).

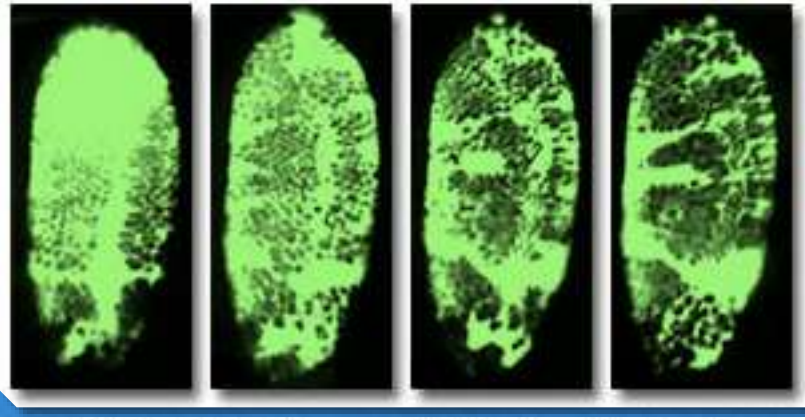


Contrast (Cell Staining)

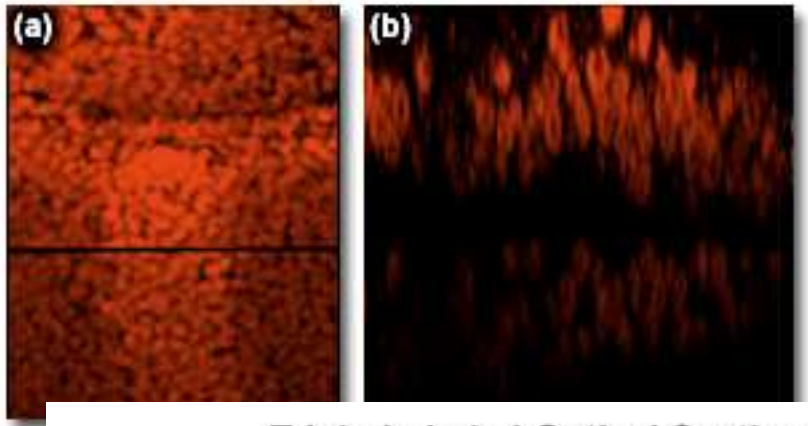


Fluorescence Microscopy

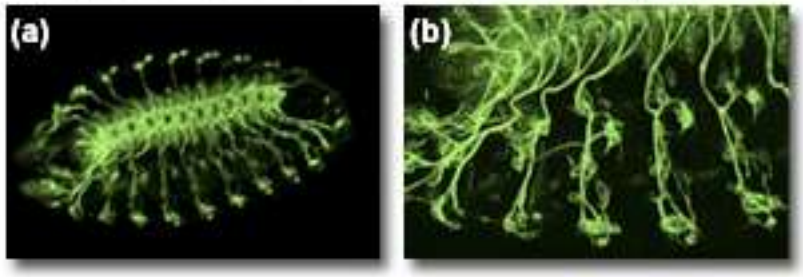
Time-Lapse Imaging



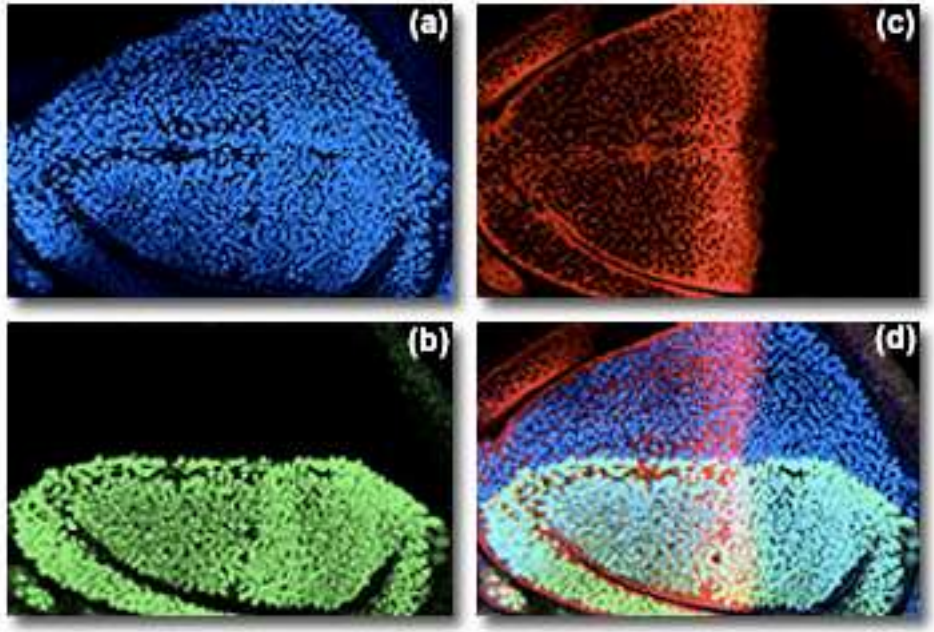
Imaging in the X-Z Plane



Optical Section and Z-Series Projection

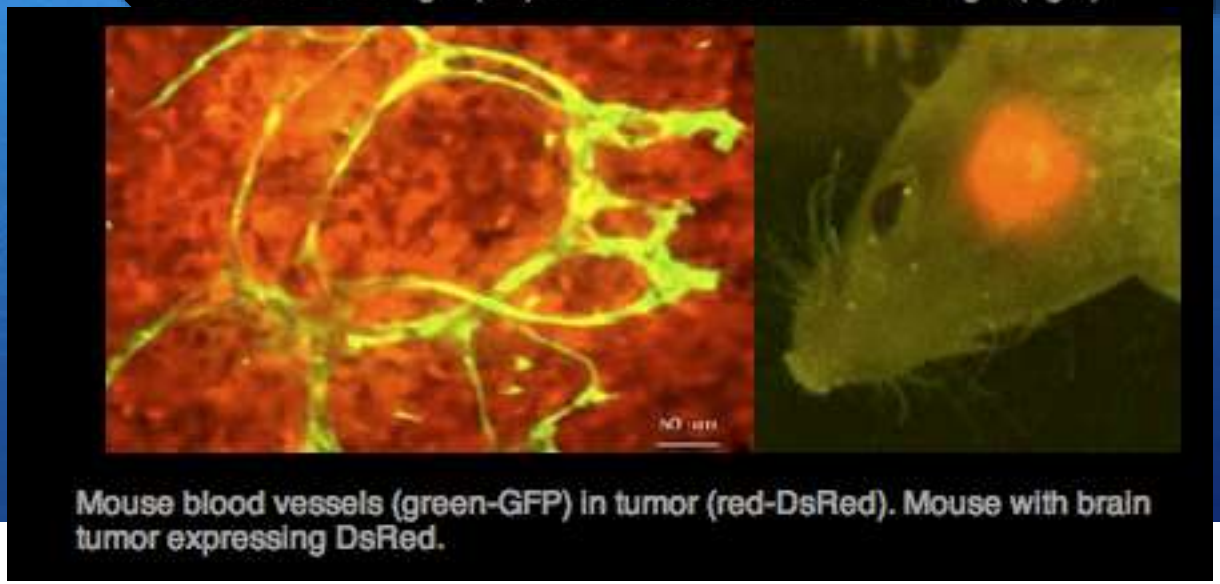


Triple-Labeled Optical Sections



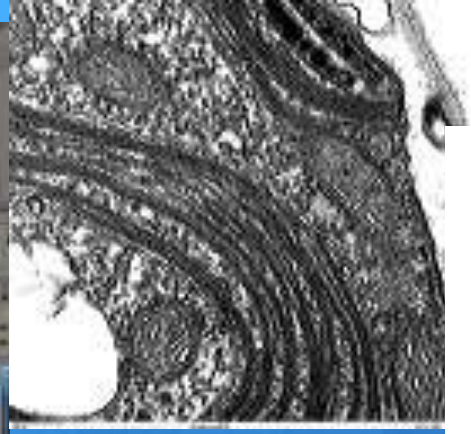
Confocal Microscope

Mouse under blue light (left) Same mouse under normal light (right)

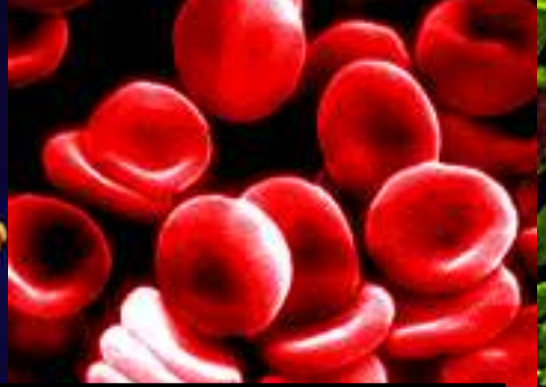


Mouse blood vessels (green-GFP) in tumor (red-DsRed). Mouse with brain tumor expressing DsRed.

Green Flourescence Propein (GFP



Transmission Electron Microscope (TEM)



Scanning Electron Microscope (SEM)

organs work together to make **organ systems**

Label the parts of the microscope and identify their function (see pgs. 100-101)

Microscope

Parts	Function
1 _____	_____
2 _____	_____
3 _____	_____
4 _____	_____
5 _____	_____
6 _____	_____
7 _____	_____
8 _____	_____
9 _____	_____
10 _____	_____
11 _____	_____

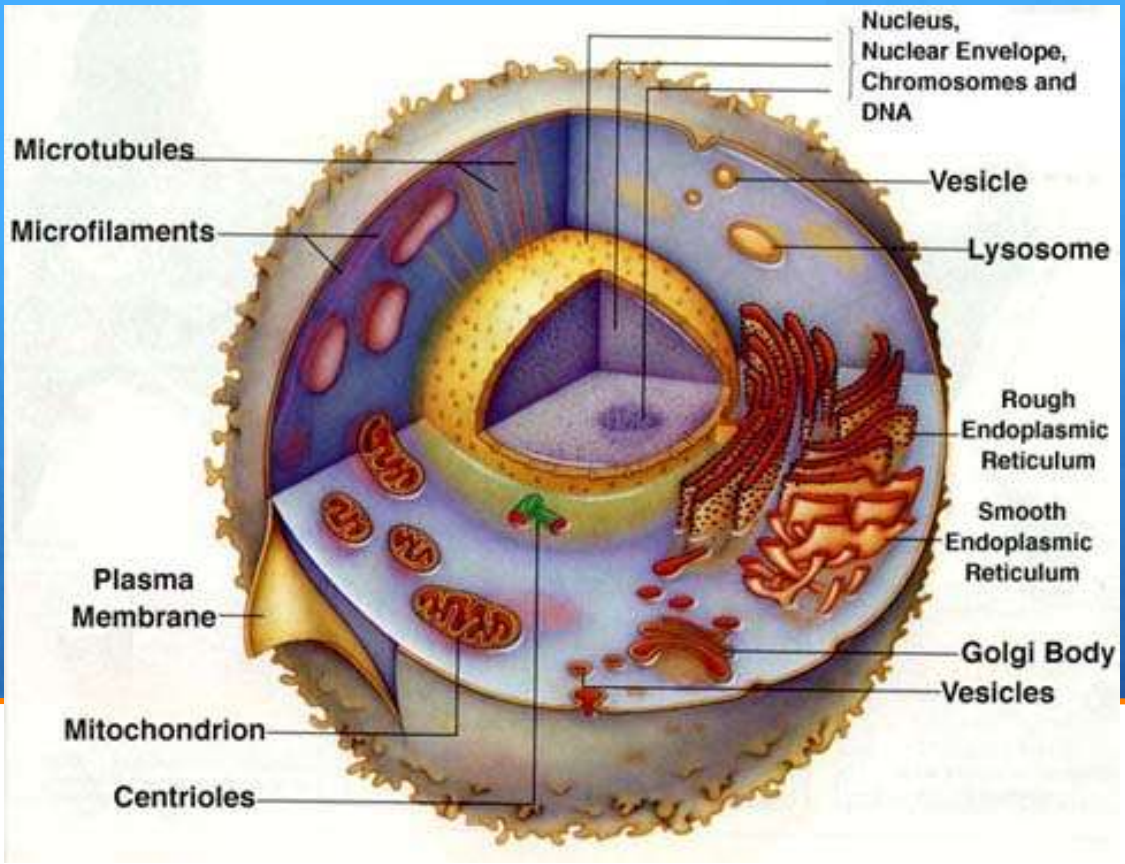
Your Assignment

1. Microscope Parts
2. Notes: Up to 2.1

Structure	Plant Cell	Animal Cell	Function
Nucleus			
Mitochondria			
Cell Membrane			
Vacuoles			
Cytoplasm			
Cell Wall			
Chloroplast			

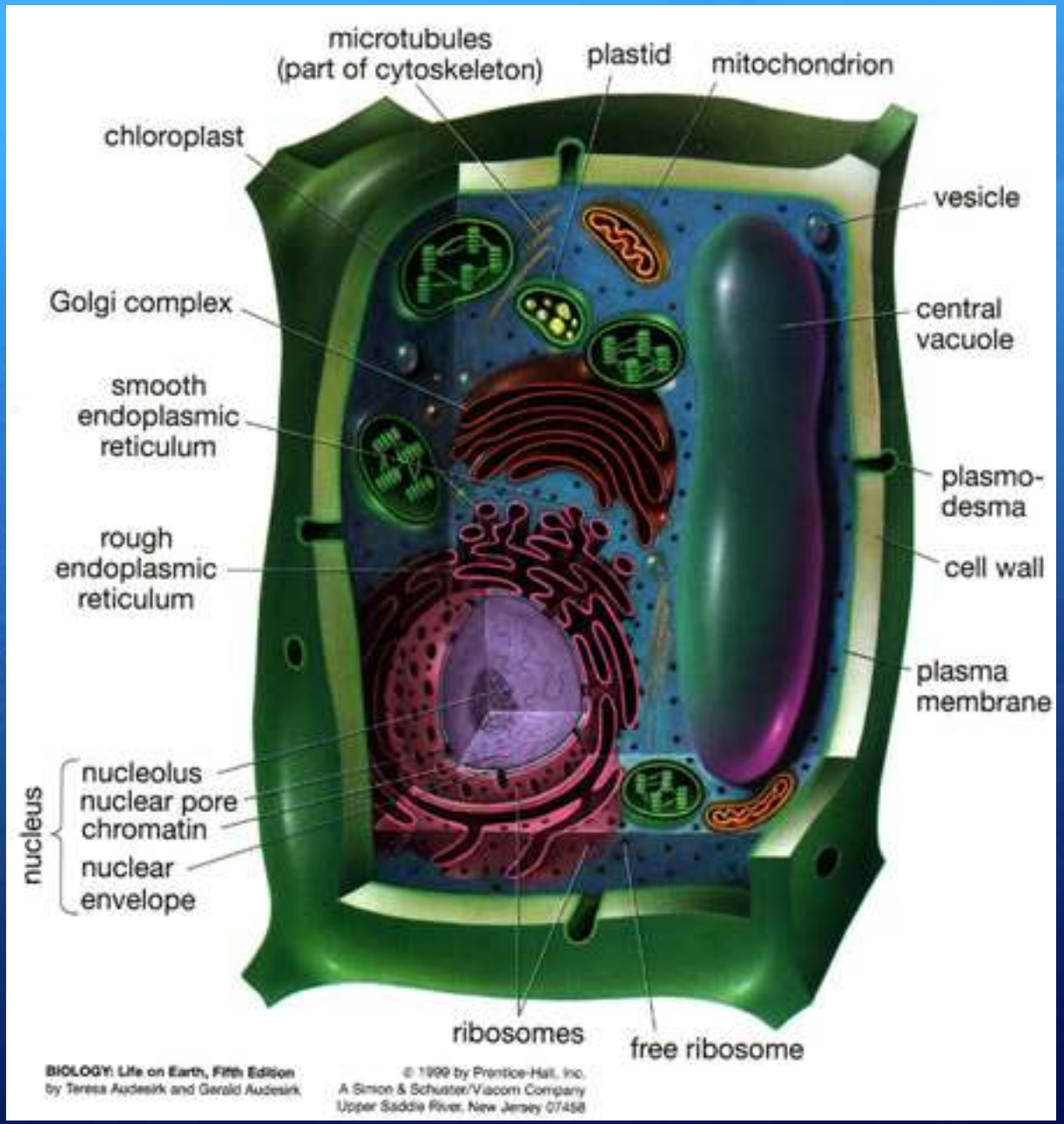
Monday January 14th

Complete the microscope Handout using page 100 in your science textbook.



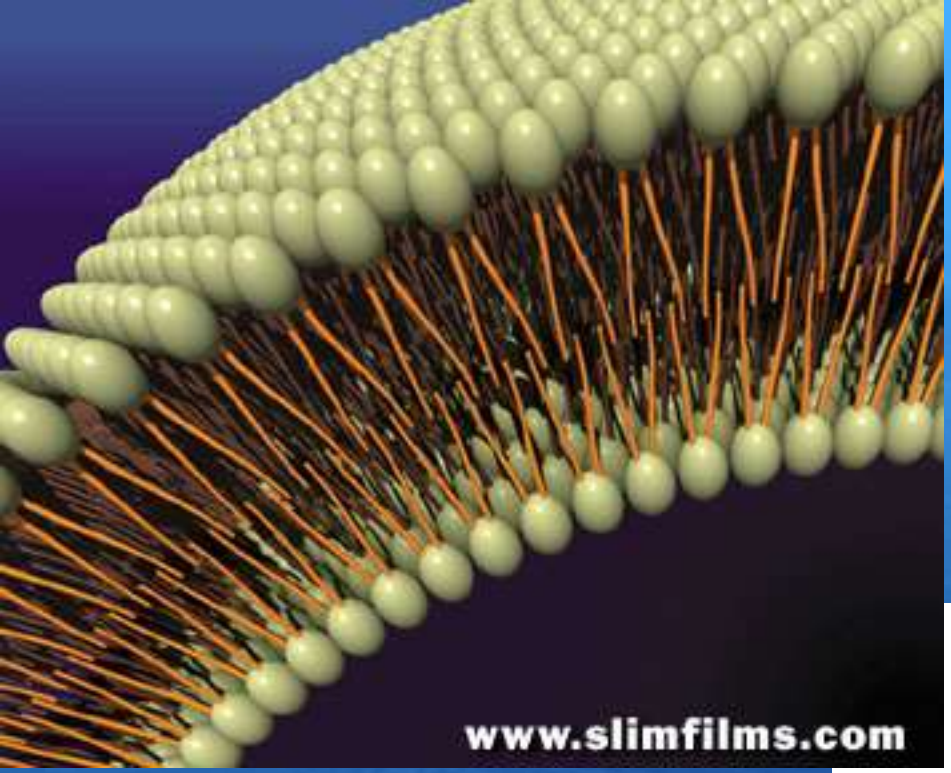
Section 2: The Cell as an Open System

Today's Class: Cell Organelles


microtubules
(part of cytoskeleton)
plastid
mitochondrion
chloroplast
vesicle
Golgi complex
central
vacuole
smooth
endoplasmic
reticulum
plasmo-
desma
rough
endoplasmic
reticulum
cell wall
plasma
membrane
nucleus
nucleolus
nuclear pore
chromatin
nuclear
envelope
ribosomes
free ribosome
BIOLOGY: Life on Earth, Fifth Edition
by Teresa Audesirk and Gerald Audesirk
© 1999 by Prentice-Hall, Inc.
A Simon & Schuster/Viacom Company
Upper Saddle River, New Jersey 07458

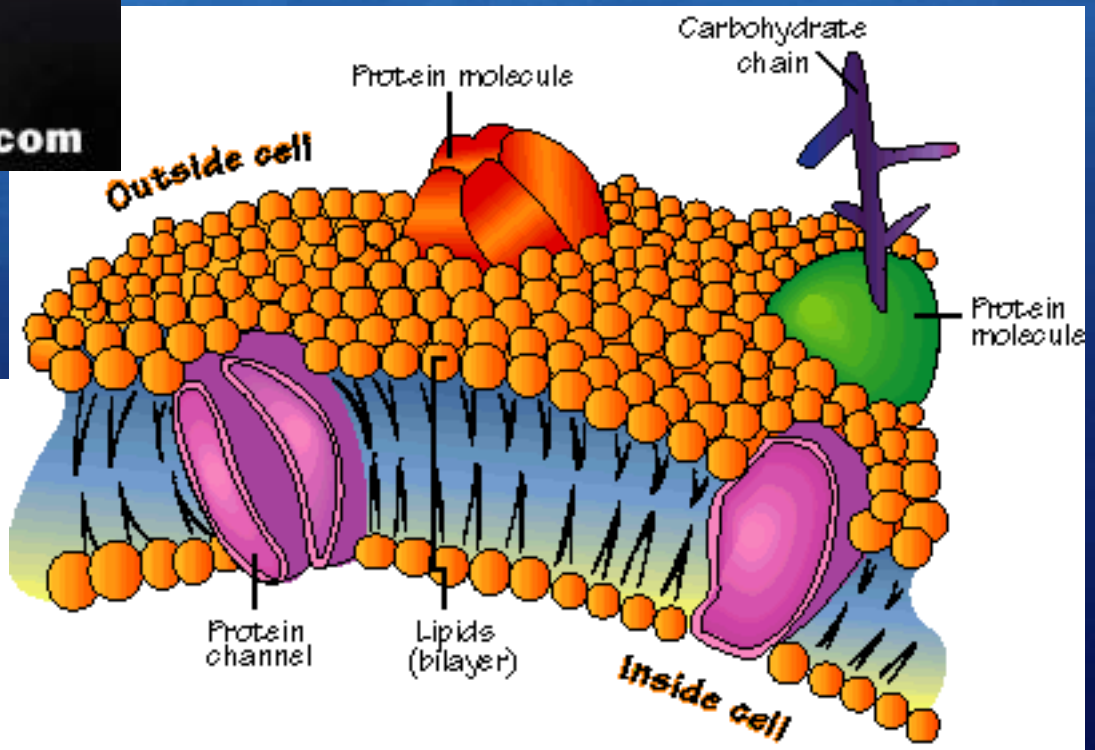
Parts of a cell video

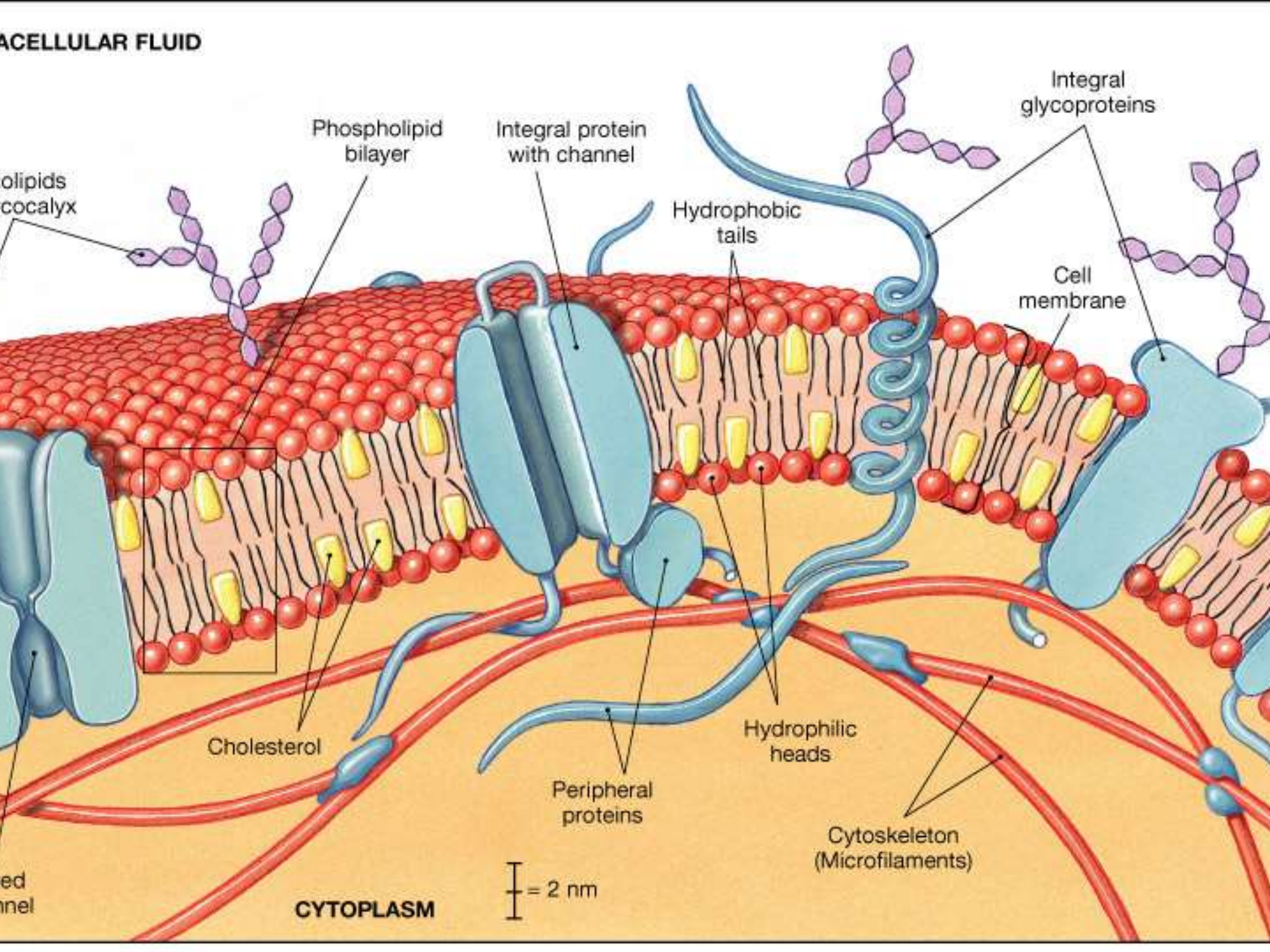
Cell Organelles



Cell Membranes

Cell membranes are made of a Phospholipid By-Layer



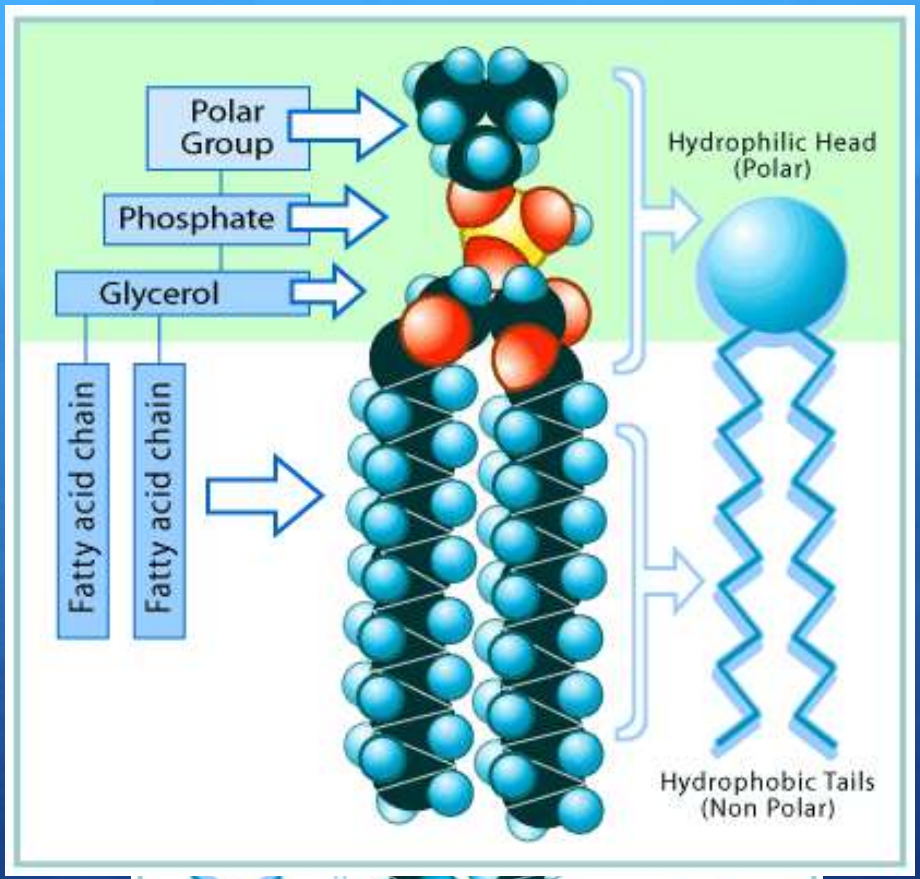

ACELLULAR FLUID
olipids
ocalyx
Phospholipid bilayer
Integral protein with channel
Integral glycoproteins
Hydrophobic tails
Cell membrane
Cholesterol
Peripheral proteins
Hydrophilic heads
Cytoskeleton (Microfilaments)
ed
nnel
= 2 nm
CYTOPLASM

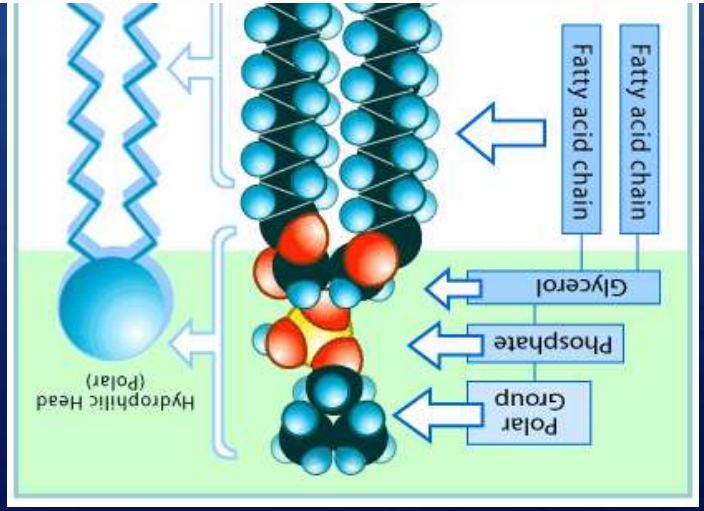
Hydrophilic Head Hydrophobic Tail

Phospholipid By- Layers:

Phospho: Phosphate group that is POLAR makes the Hydrophilic head

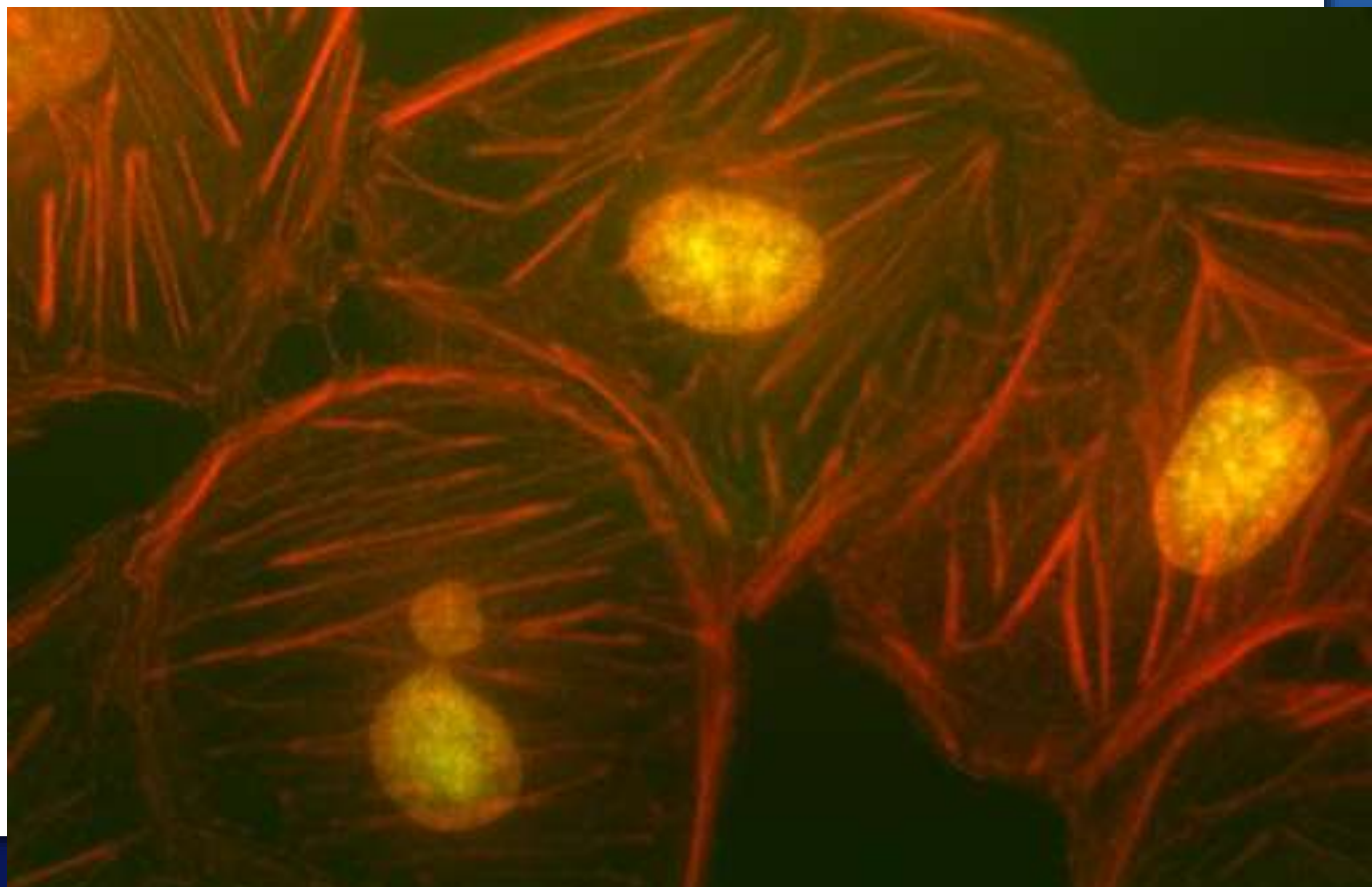
Lipid: Fattys acids make the hydrophobic tail





Nucleus "The brain of the cell"

- Contains DNA, contained by nuclear envelope, allows transport just like the cell membrane.



Cytoplasm (cellular fluid)

- Fills cell, Contains nutrients for cell processes, all organelles are suspended in cytoplasm.

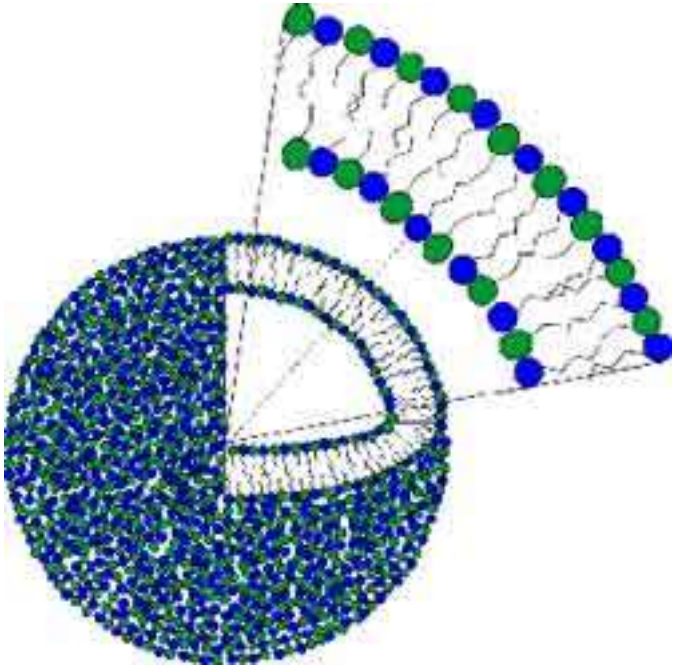
- Cytoplasmic streaming:
- http://www.youtube.com/watch?v=8edk6nGMwMs&feature=fvw

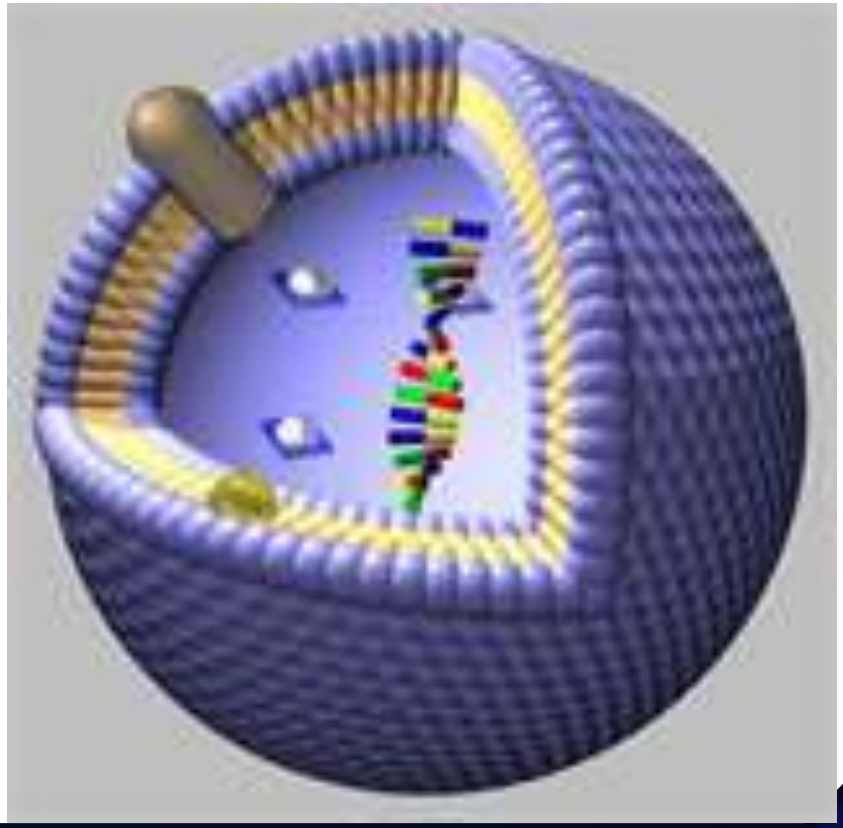
Endoplasmic Reticulum (the highway)

- Smooth ER produces fats and oils
- Rough ER have ribosomes attached for protein synthesis

Vacuoles and Vesicles (storage)

- Membrane bound storage structures. Materials can enter a vesicle to me moved to a different part of the cell. Lysosomes included





Lysosome

- Contains strong chemicals that can digest molecules

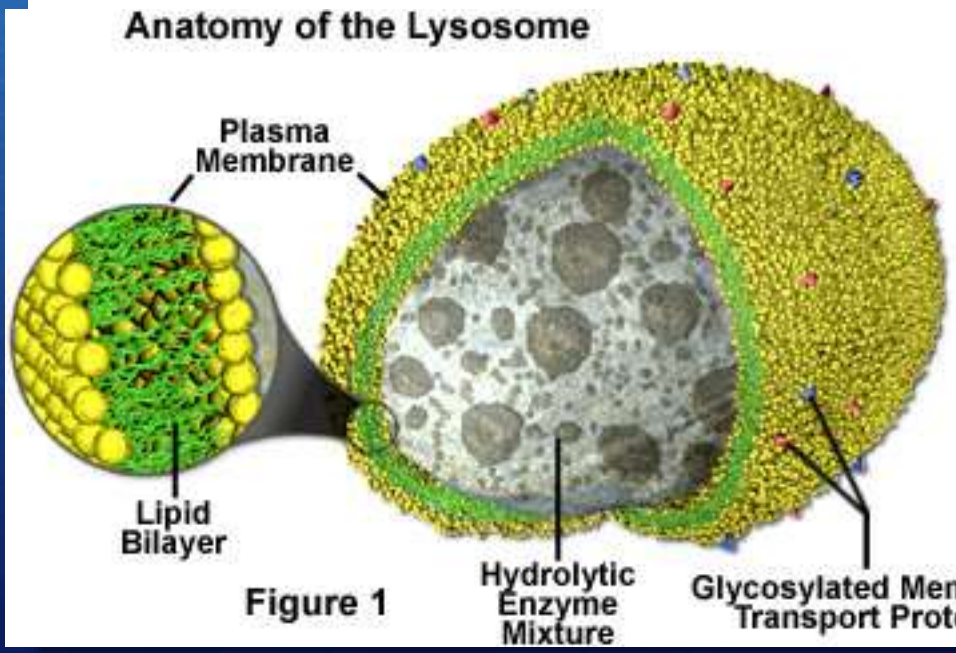
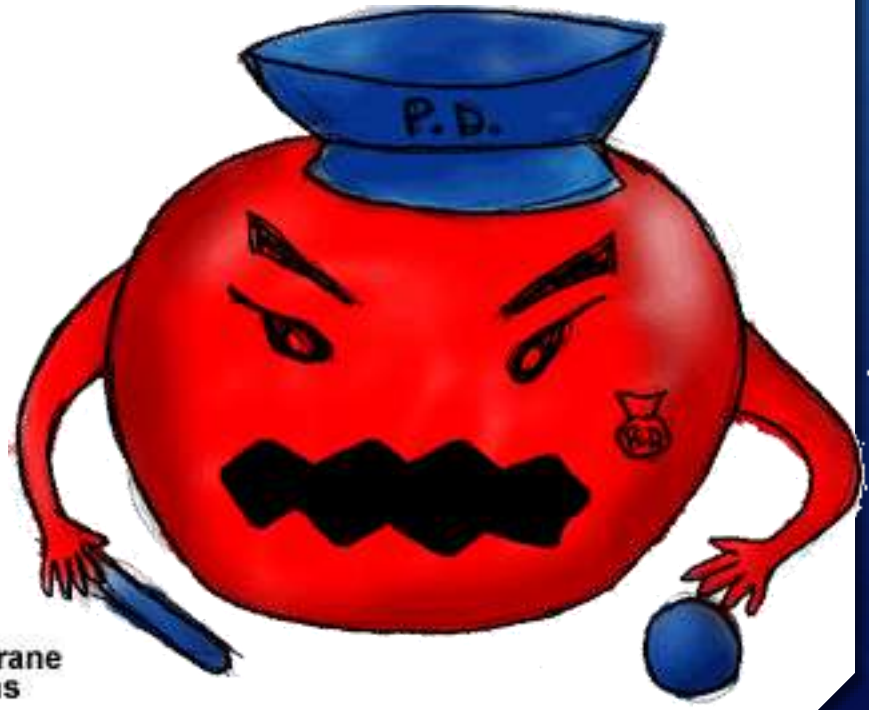
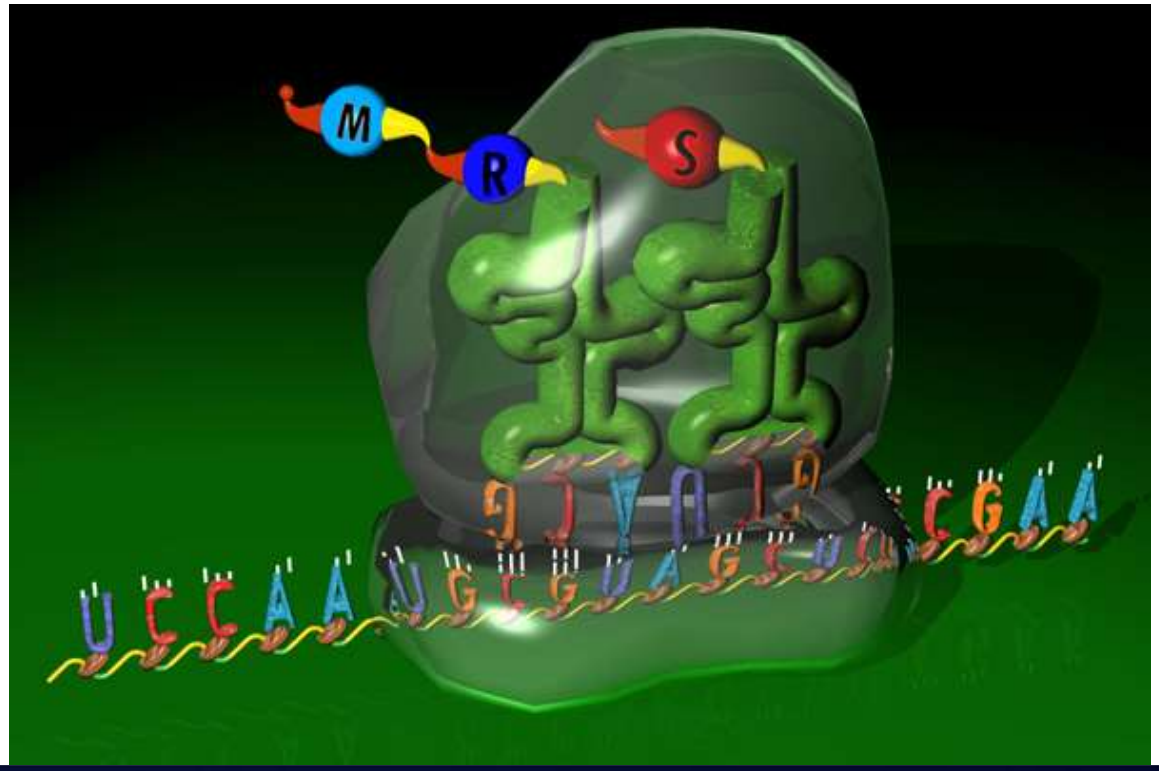


Figure 1



Ribosomes (protein builders)

- Attached to rough ER or floating in cytoplasm
- Responsible for protein synthesis



Golgi Apparatus (bag boy… or girl)

- Packages substances (nutrients, etc.) for transport in the cell

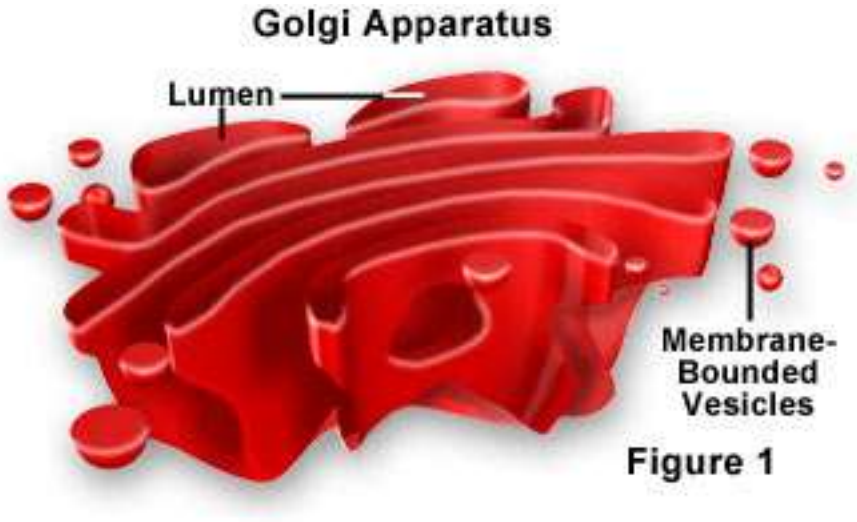
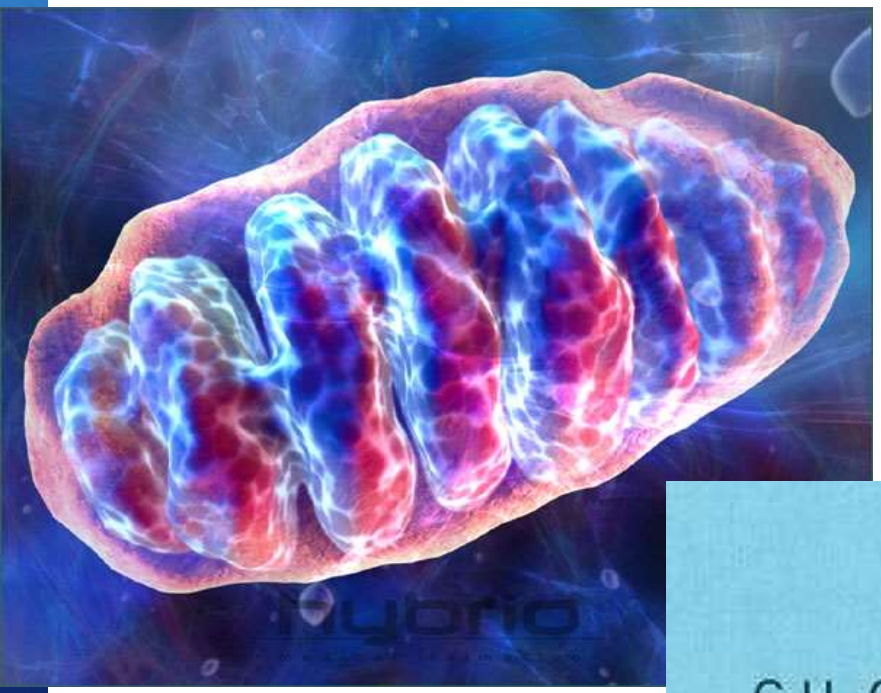


Figure 1

Mitochondria (The Powerplant) (Start)

- Converts chemical energy in sugars to ATP (Energy that cells can use) through Cellular Respiration

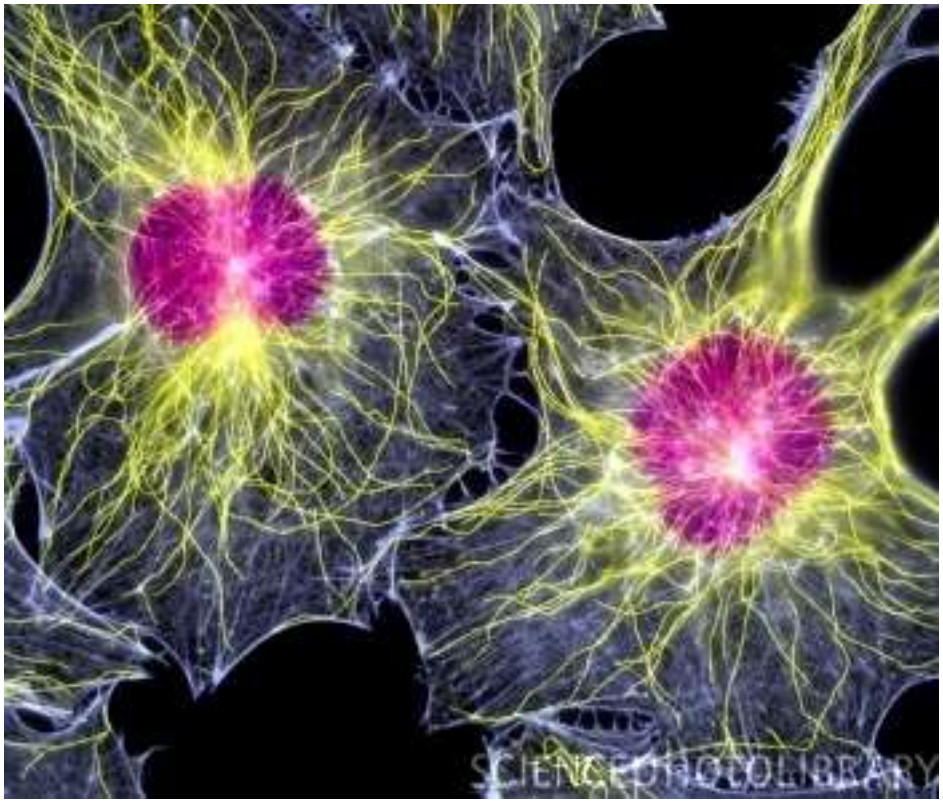


$$C_6H_{12}O_6 + 6O_2 \xrightarrow{36\ ADP + 36P_i \rightarrow 36\ ATP} 6CO_2 + 6H_2O$$

Glucose + Oxygen → Carbon dioxide + Water

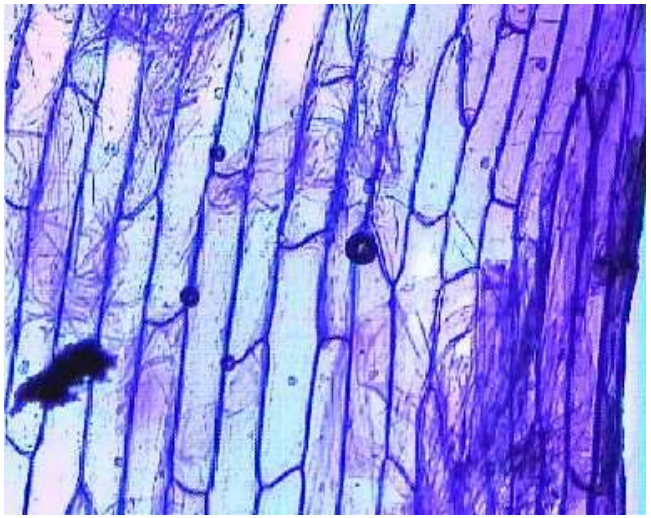
Cytoskeleton (The Frame)

- Made up of microtubules and the protein actin.
- Supports the structure of the cell, like the frame supports a house

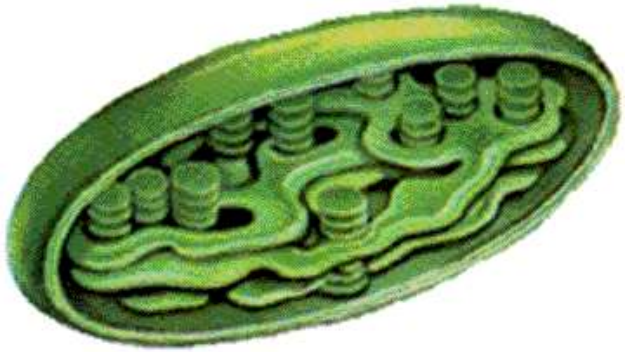


Plant Cell specific organelles

- Cell Wall. Rigid frame keeps cell in a consistent shape.



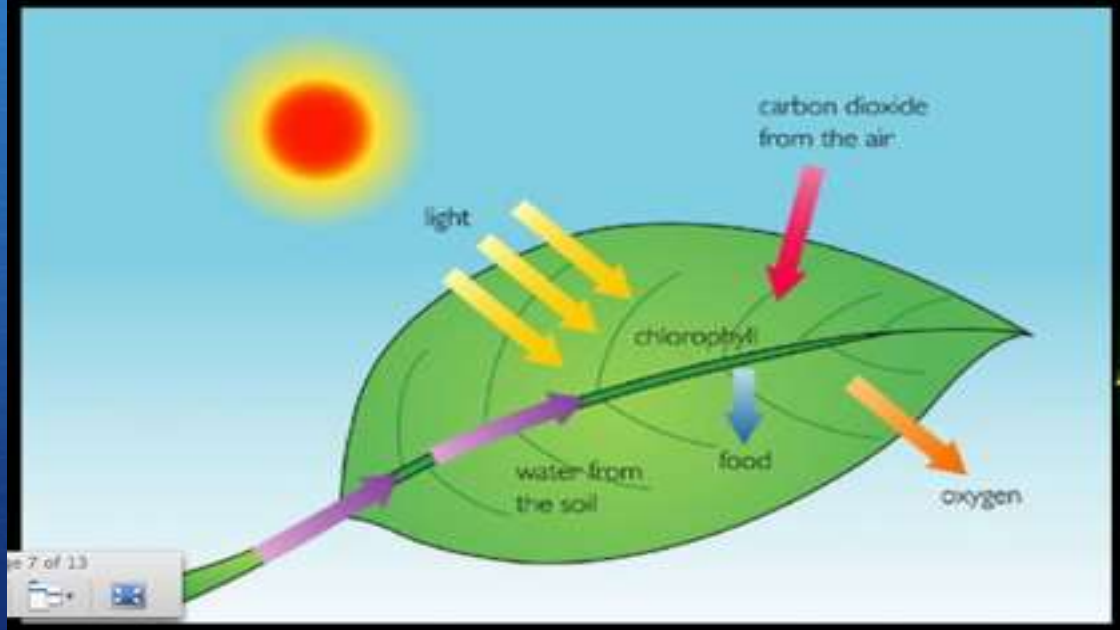
- Chloroplasts: green, where photosynthesis takes place



$$6\,CO_{2(g)} + 12\,H_2O_{(l)} + \text{light} \rightarrow C_6H_{12}O_{6(aq)} + 6\,O_{2(g)} + 6\,H_2O_{(l)}$$

Photosynthesis is a chemical reaction that plants use to make food.

$$6\ CO_{2(g)} + 12\ H_2O_{(l)} + \text{light} \rightarrow C_6H_{12}O_{6(aq)} + 6\ O_{2(g)} + 6\ H_2O_{(l)}$$



Carbon Dioxide + Water + light -----> glucose + oxygen + water

Your Assignment

- Cell Poster:
- Get together in groups of 2-3
- complete either a plant or animal cell, include labels with one sentence functions for organelles
- Label all structures to the right:

- Cell membrane
- Nucleus
- Golgi Apparatus
- Rough ER (with ribosomes)
- Mitochondria
- Lysosome
- Plant? Cell wall, chloroplast.

Awesome interactive cell model

http://learn.genetics.utah.edu/content/cells/insideacell/

Making Playdough

Cell model project – cells and systems

Please Keep it clean! (I'm not your mom)

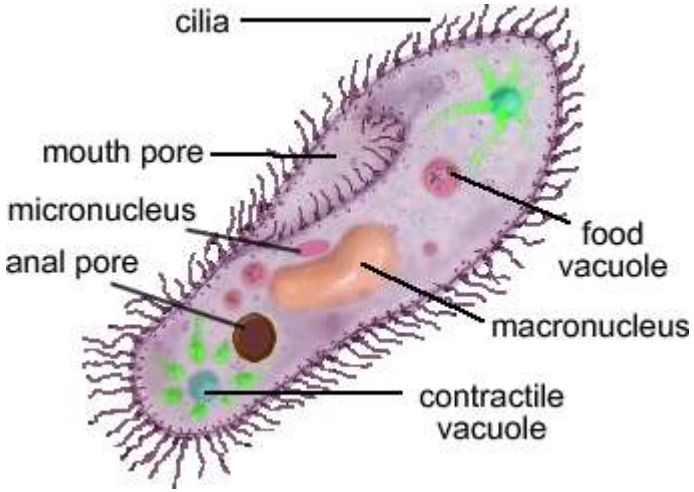
- **1. GATHER MATERIALS:**
  - **100 ML BEAKER, TWO 400 ML BEAKERS, MIXING CONTAINER FOOD COLOURING**
  - **ONE 400ML BEAKER IS TO REMAIN DRY, THE OTHER WILL BE USED FOR WATER**
- **2. MIX IN PLASTIC CONTAINER:**
  - **1000ML FLOUR (2X BRIMMING FULL + 200ML IN BIG BEAKER)**
  - **250ML SALT**
  - **30ML OIL**
- **3. MIX FOOD COLOURING IN 300ML WATER**
  - **GRADUALLY ADD COLOURED WATER TO FLOUR/SALT/OIL MIXTURE**
  - **KNEED AS YOU ADD WATER; ADD MORE WATER AS NECESSARY**
  - **PLAYDOUGH SHOULD BE FIRM, NOT SLOPPY**

STATION MUST BE SPOTLESS WHEN FINISHED

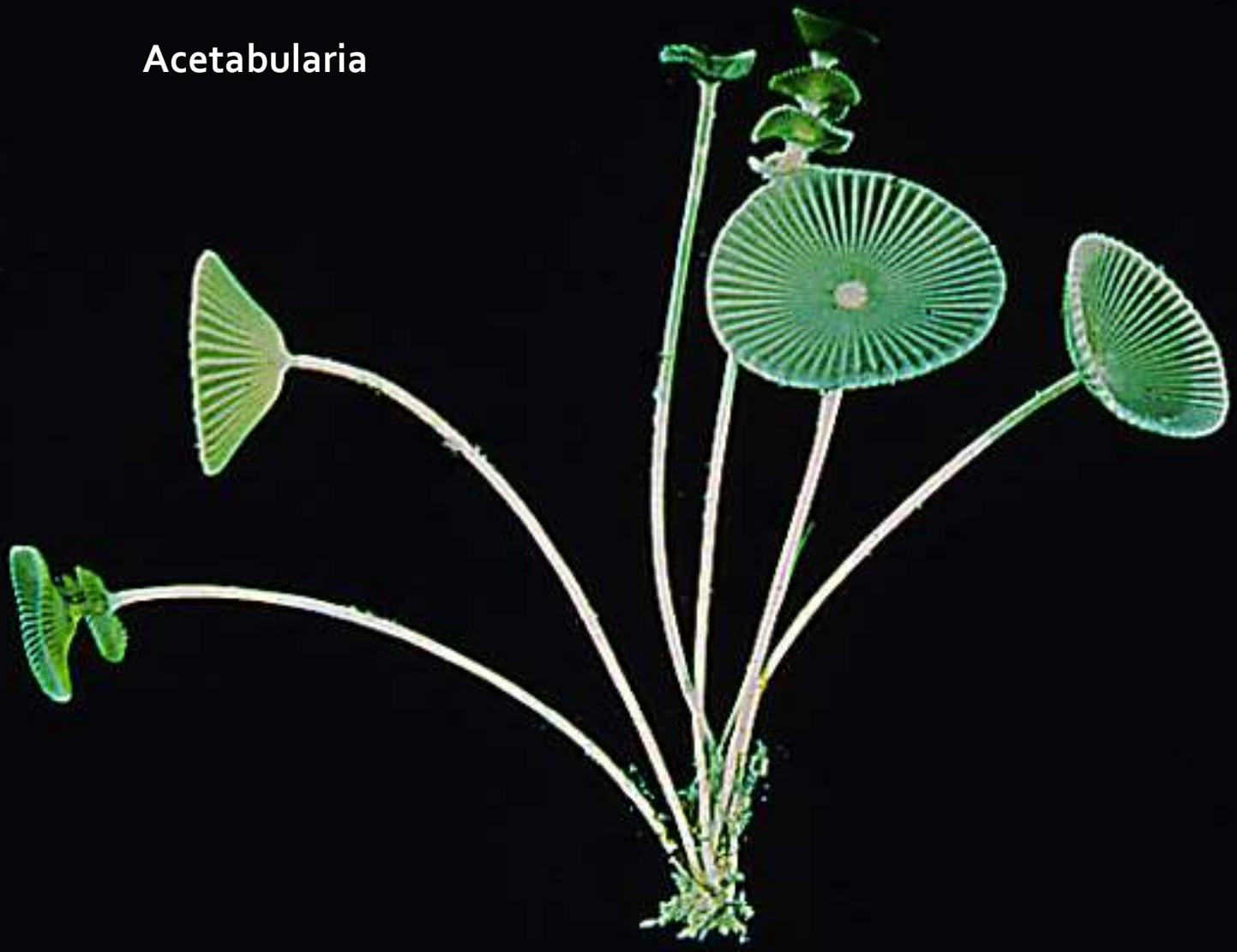
Single Celled Versus Multi Celled Organisms

Single (Uni) Celled

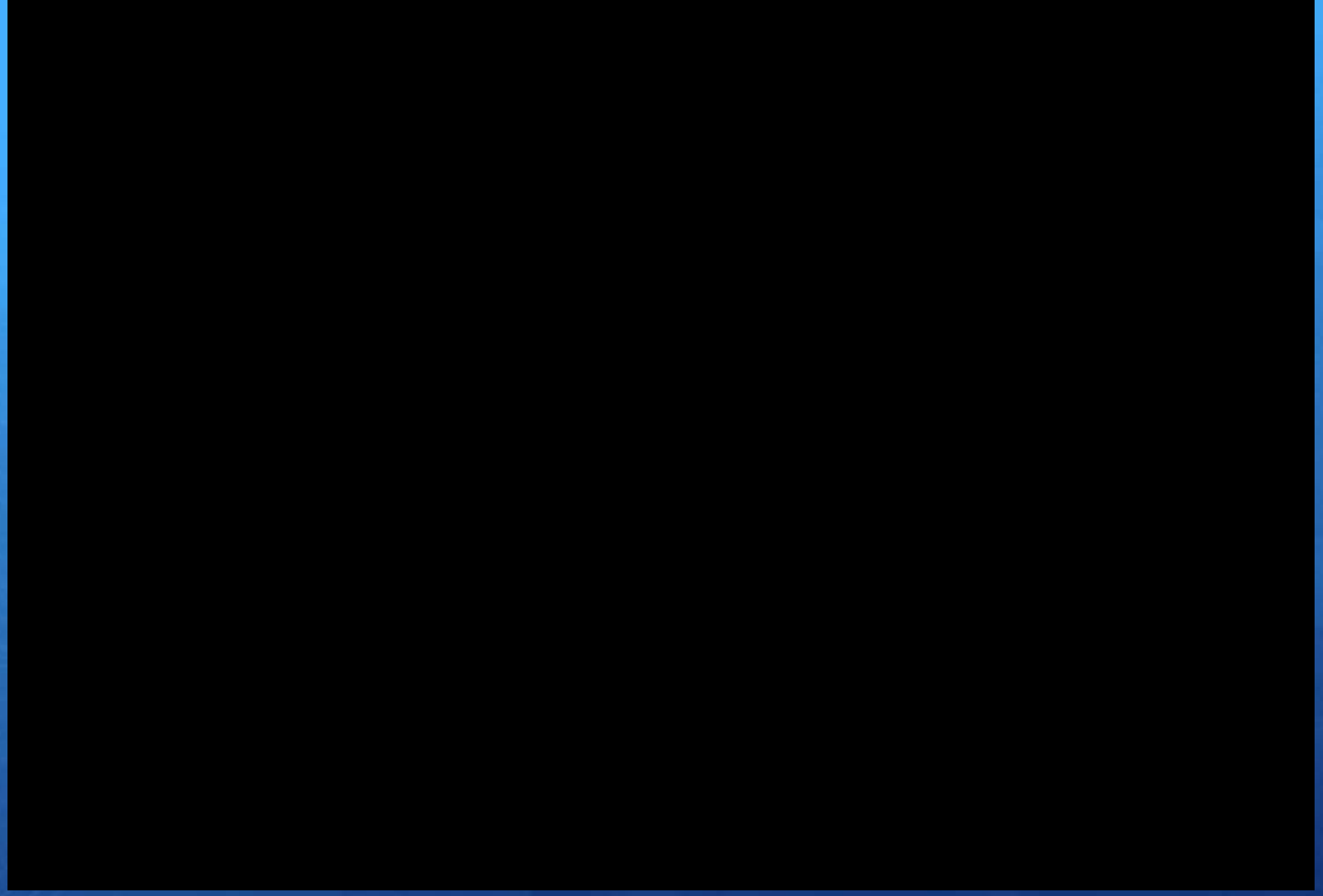
+ Amoeba
+ Diatoms (toothpaste)
+ Paramecium
+ Acetabularia



Acetabularia



"Stimulus, response! Stimulus, response! Don't you ever *think*?"

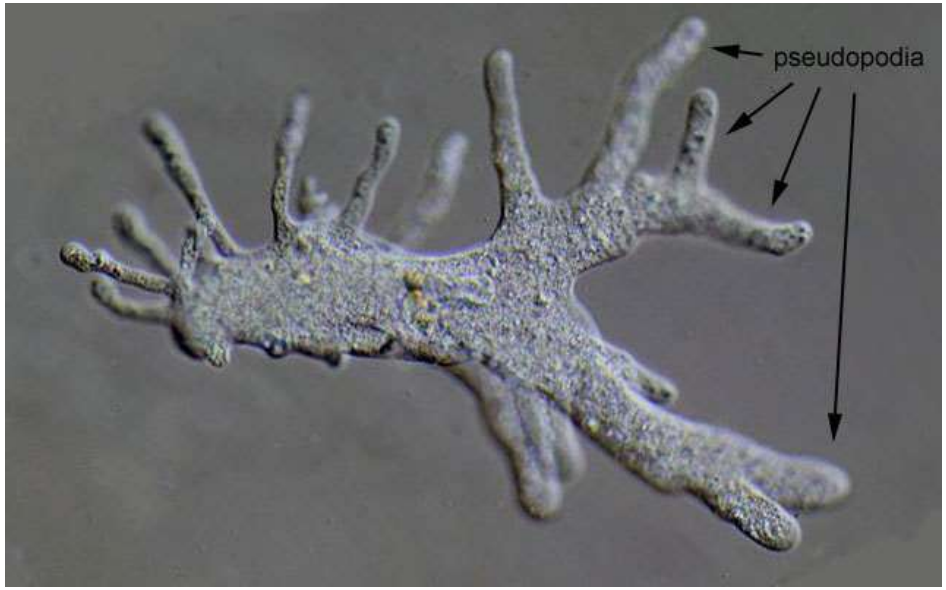


Amoeba and Paramecium

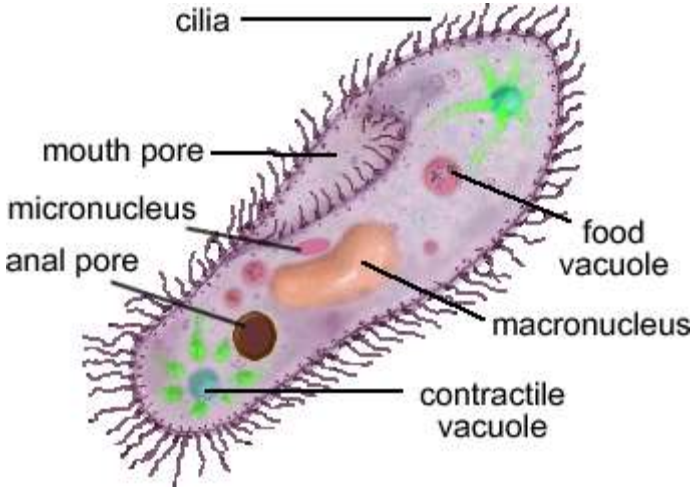
Single Celled protozoa. The amazing thing about uni-cellular organisms is that they can carry out all life functions inside a single cell! What life functions?

Amoeba and Paramecium

- Amoeba use Pesudopods (false feet) to engulf and digest food. Called "phagocytosis"

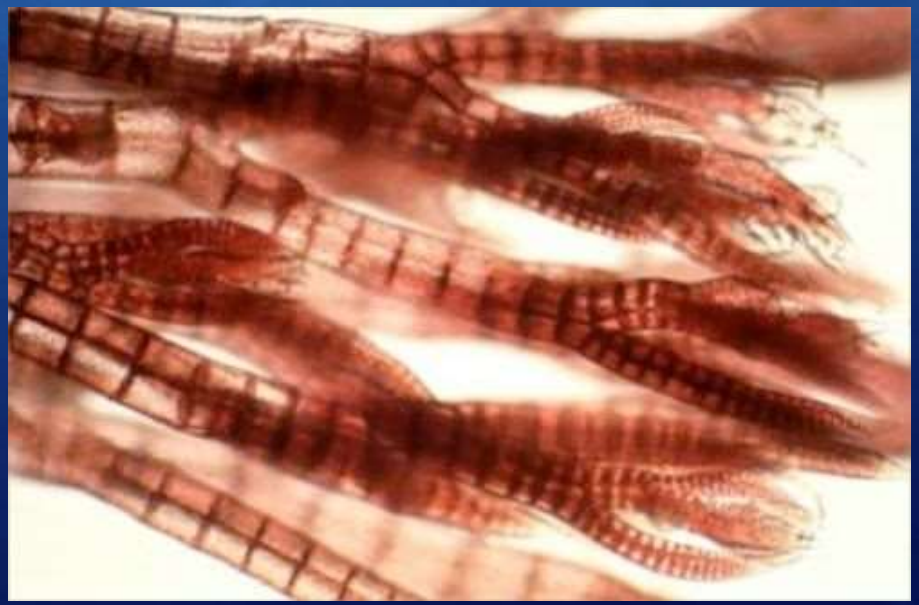


- Paramecium use fast beating cilia to move and sweep food into their oral grooves (mouths)



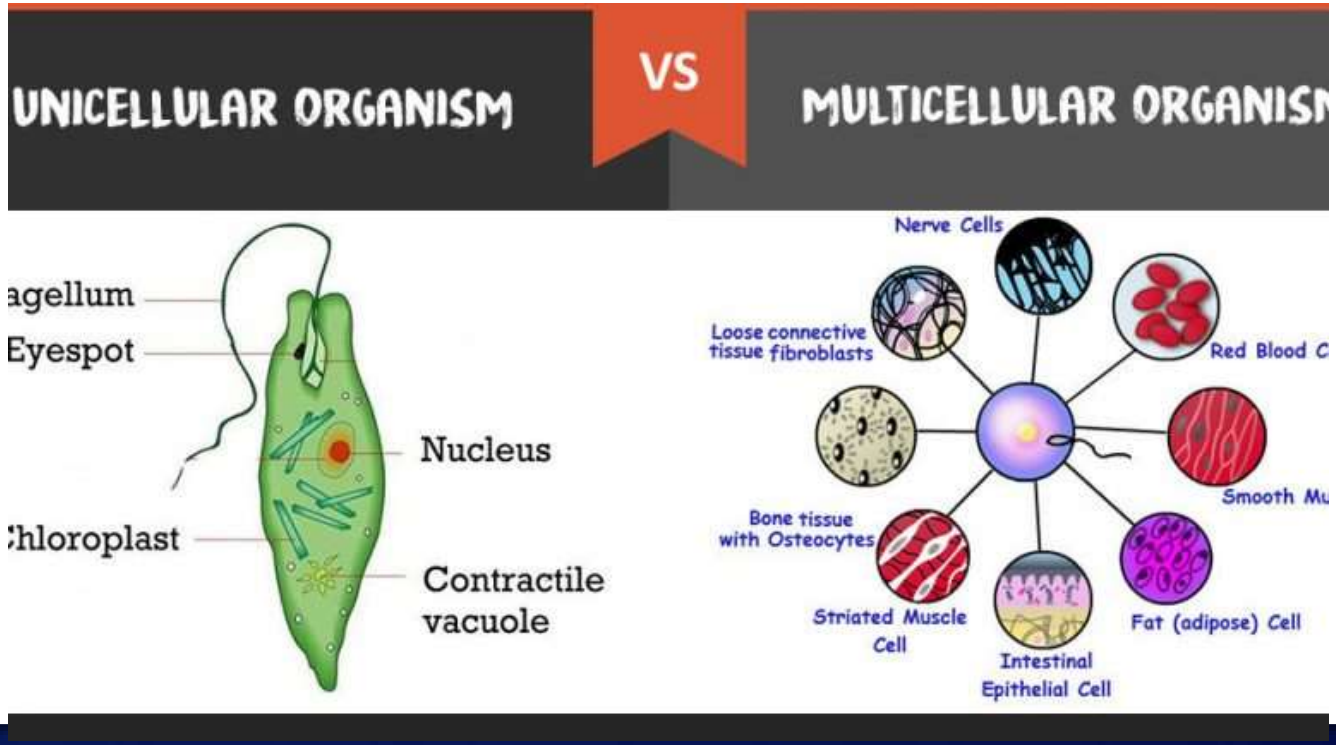
The Solution: Become Multi-celled

Do all cells in a multi-celled organism have to carry out all life functions?



Unicellular vs Multicellular

Unicellular organisms must carry out all the same life functions as more complex multicellular organisms



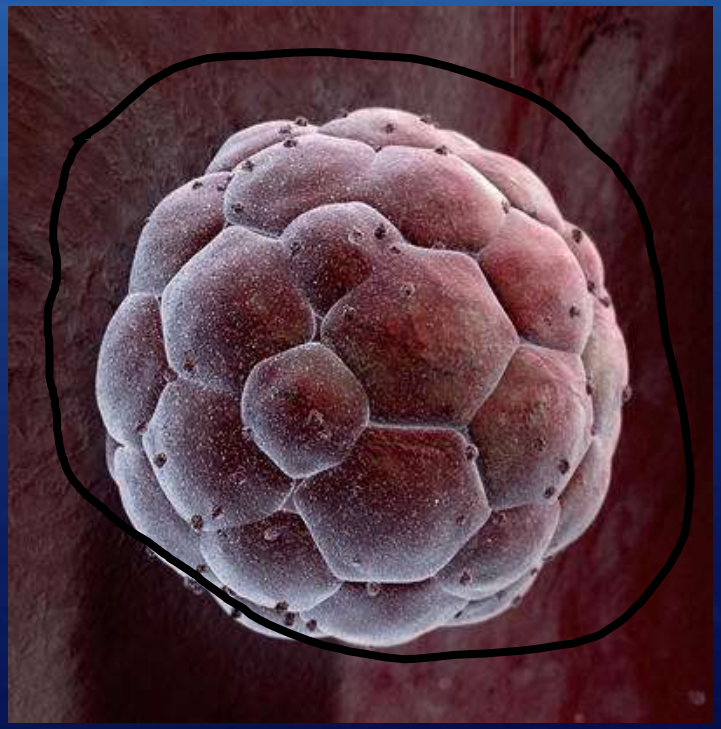
The problem with Uni-Cellular organisms: How big is too big?

If all live processes are carried out by a single cell, why might size become a problem?

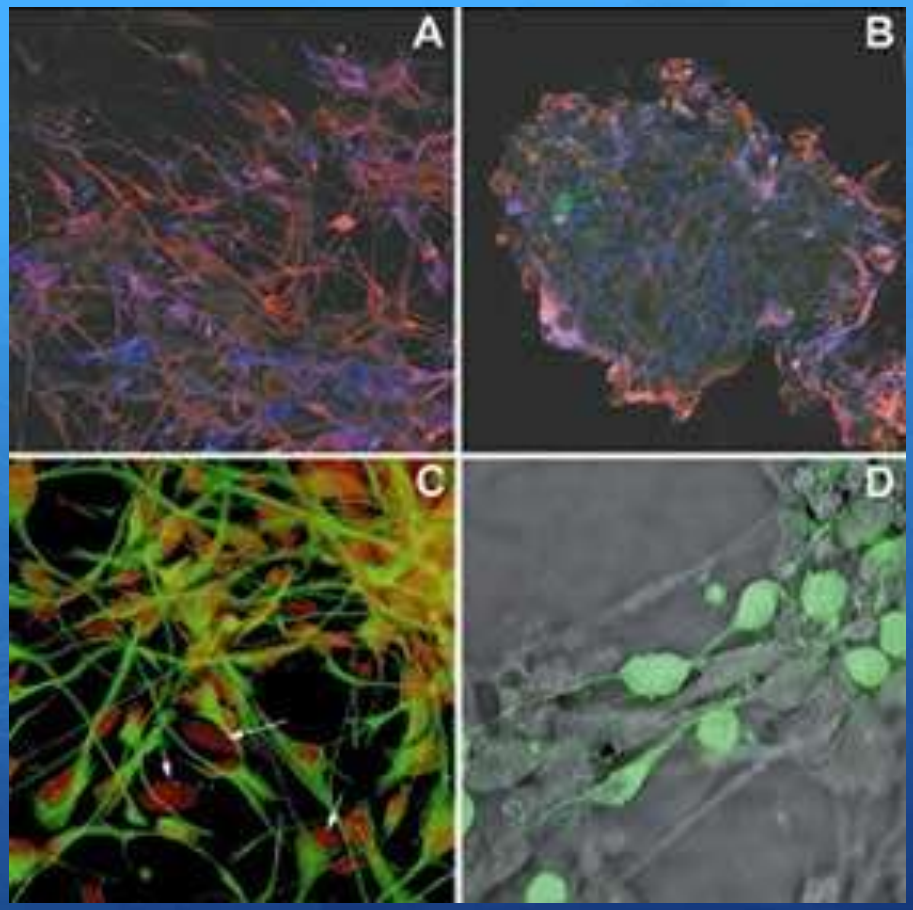
Human Blastocyst

This is how we all start

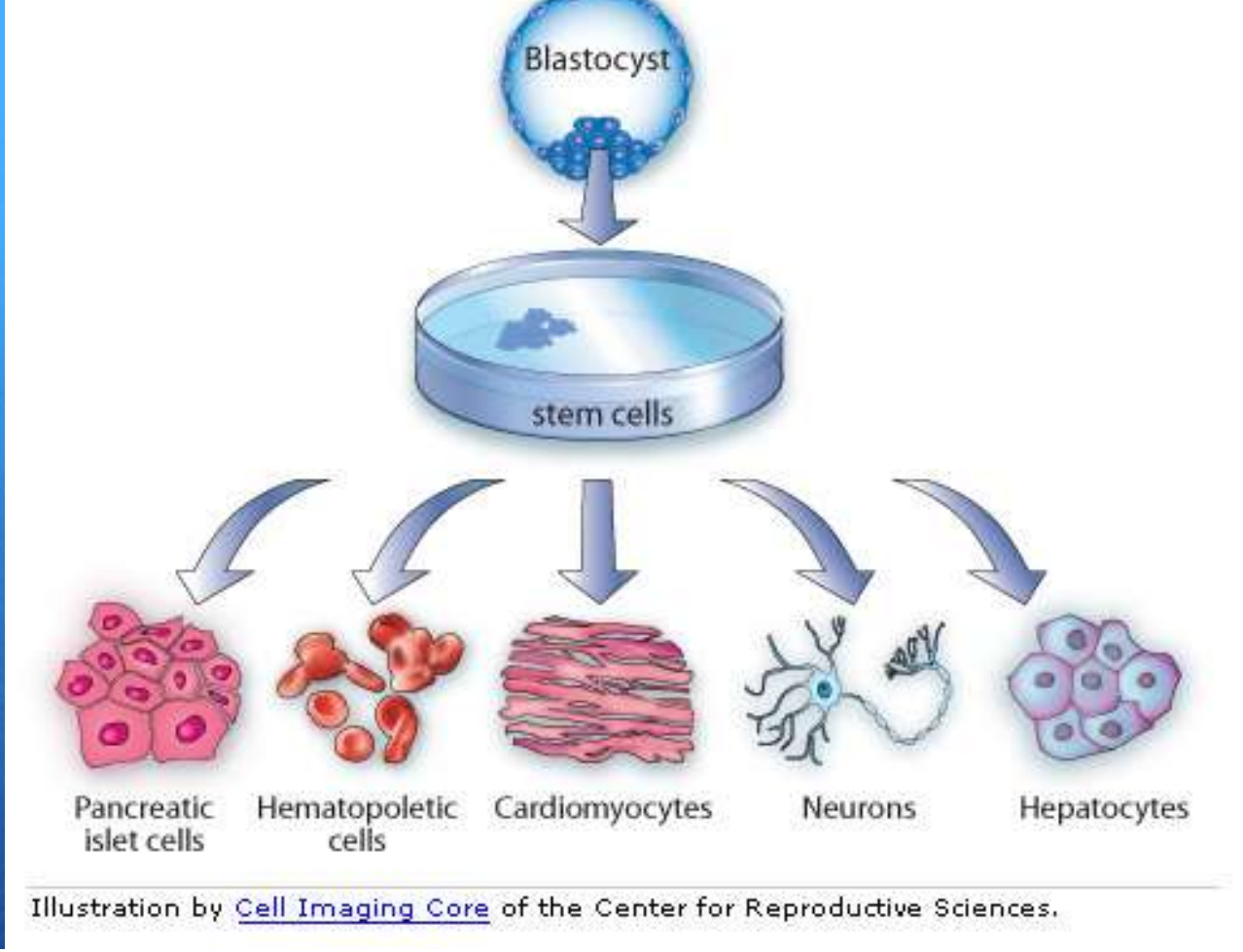
The cells that make up the blastocyst are STEM CELLS. They can differentiate into ANY type of cell in the body



Cell Differentiation: Remember GFP??



Stem Cells



Multi-cellular organisms have specialized cells

Cells that only have one specific function are more efficient, but can not survive on their own.

Your Assignment

1. C/R p 114
2. Finish notes up to 2.4

Skip 3 and 5

Notes

2.0 → 2.4

↓

finish earlier

How Substances Move Into and Out of Cells

-Tea Demo

-Food Colouring Demo

-Cold Air Demo

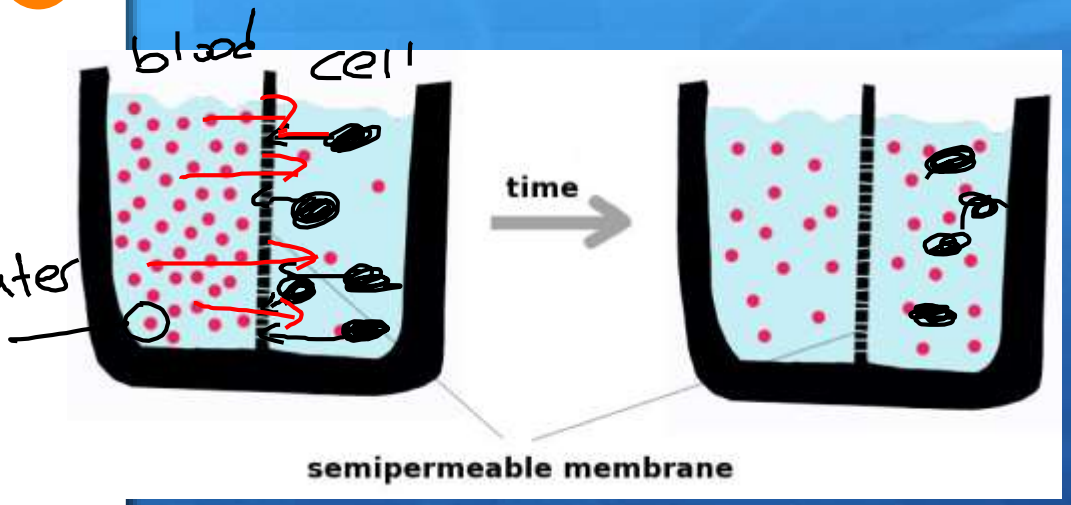
-Magic Test Tube Demo

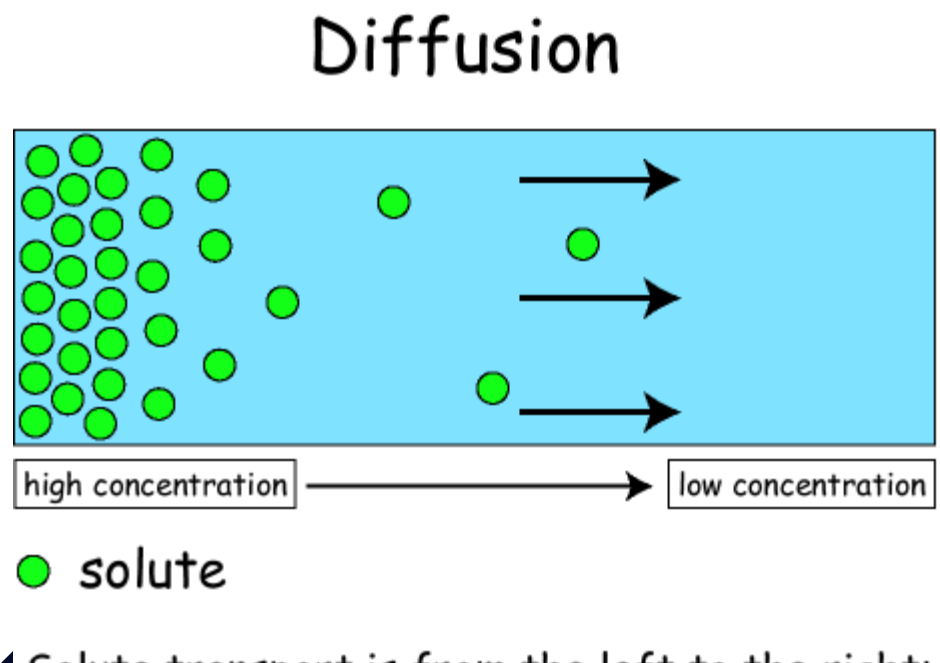
-What causes this movement?

How Substances move in and out of cells (copy)

All cells in our body must be able to take in food, water, and gasses. They must also remove waste.

Diffusion is the movement of particles from an area of high concentration to an area of low concentration

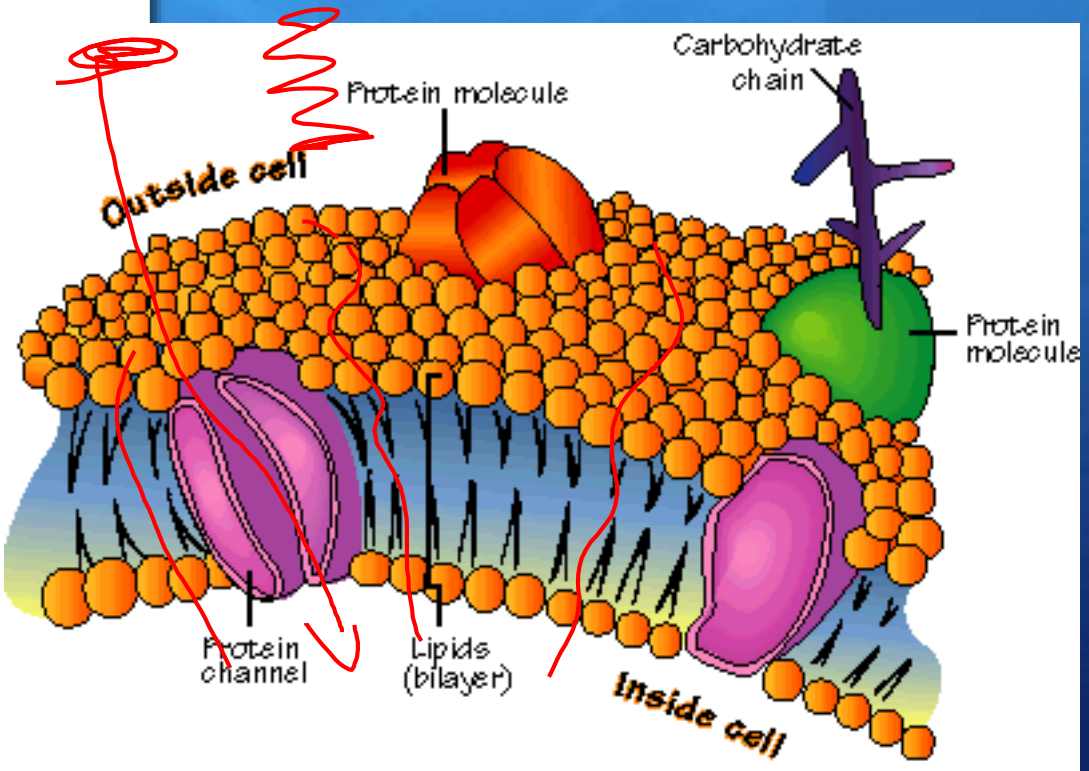


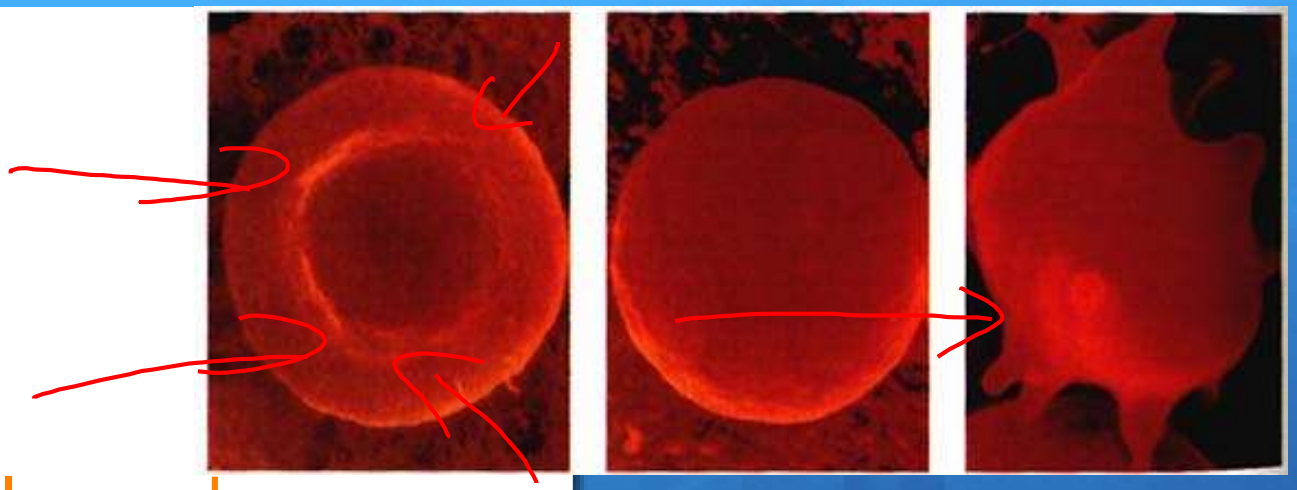


Selectively Permeable Membrane

Cell membranes are selectively permeable:

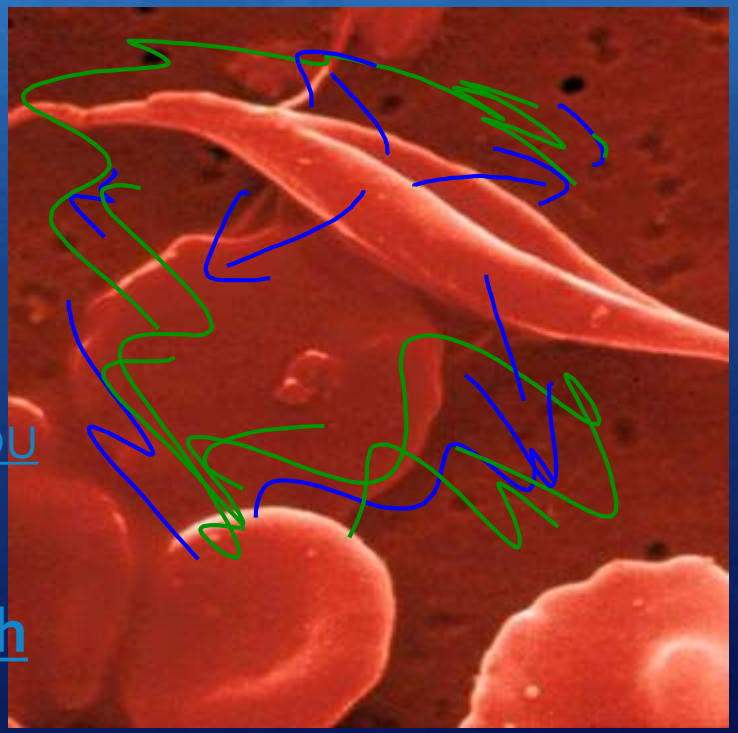
They have openings to allow nutrients in and waste out, but prevent large particles from entering the cell





The cell membrane and osmosis

The diffusion of water through a selectively permeable membrane.



https://www.youtube.com/watch?v=7-QJ-uUpxoM

https://www.youtube.com/watch?v=7rX1jNDUsXU

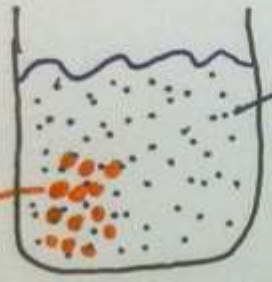
https://www.youtube.com/watch?v=A8cI6FkcG4c

Pg 115 / 116

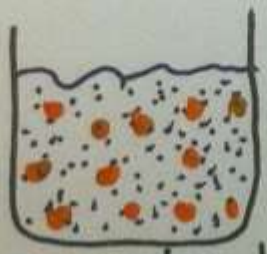
Draw these two diagrams on paper

Diffusion

Start:

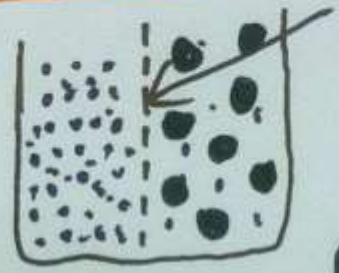


Finish:



The Salt particles have diffused from an area of ~~low~~ high concentration to an area of ~~high~~ low concentration to acheive a balance (equibrium)

Osmosis



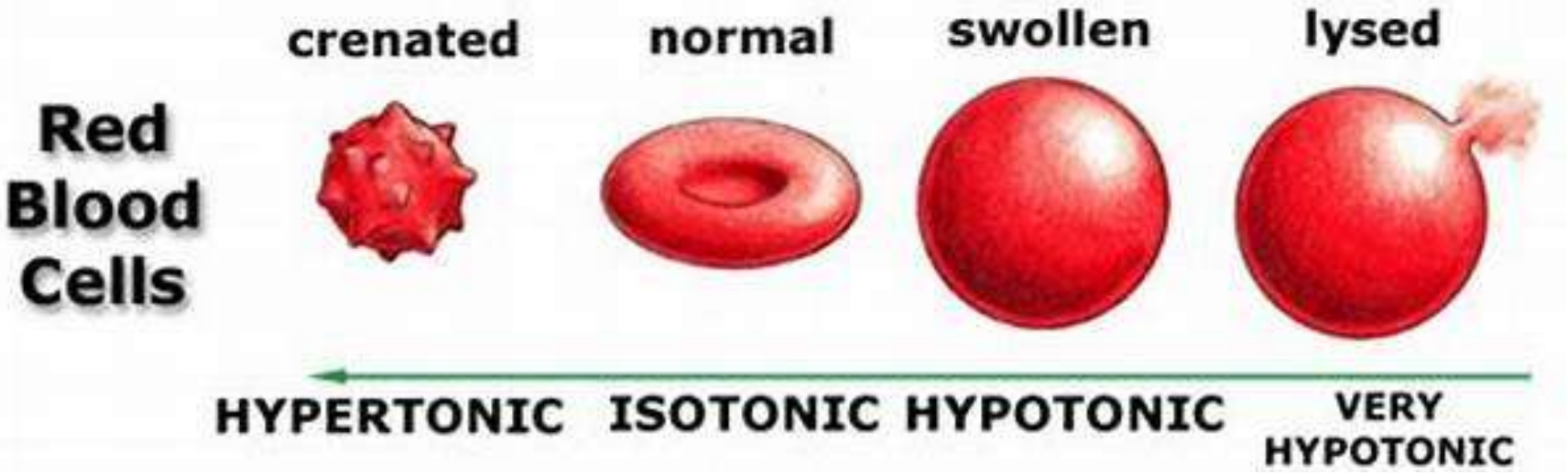
Selectively Permiable membrane

• = water particles

● = Solute particles too large to Pass through the membrane

Water particles diffuse across the semi permiable membrane to acheive a balance (equibrium)

OSMOSIS IN RED BLOOD CELLS



Your Assignment

C/R p 119 # 1, 2, 3, 5

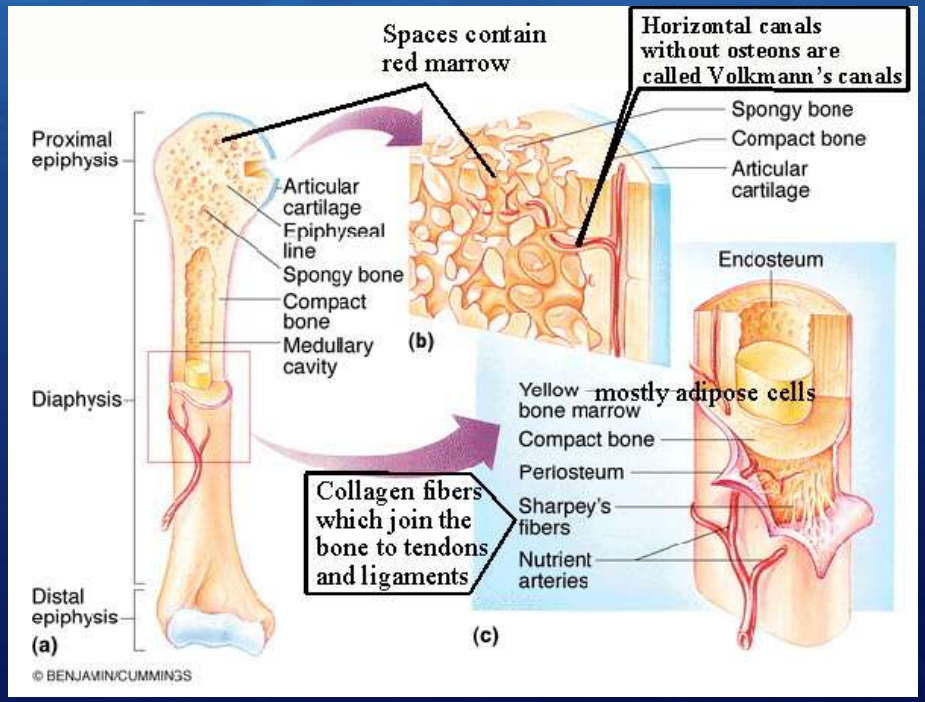
Notes Catch Up

Tissues and Organs

Similar Cells in your Body form tissue. Together, tissues form organs

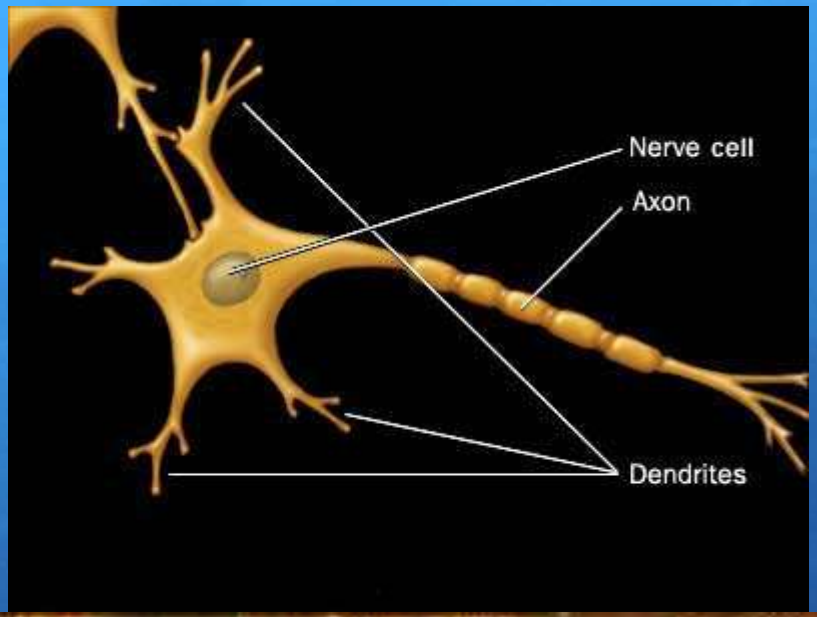
To form tissue, cells must grow and divide

Your body replaces 50 million skin cells every day… (where do they go?)



Specialized Cells

Cells in a multicellular organisms specialize…. **This means each type of cell has a specific function, and the organism could not survive without each type of cell working together.**



What do red blood cells specialize in?

What do white blood cells specialize in

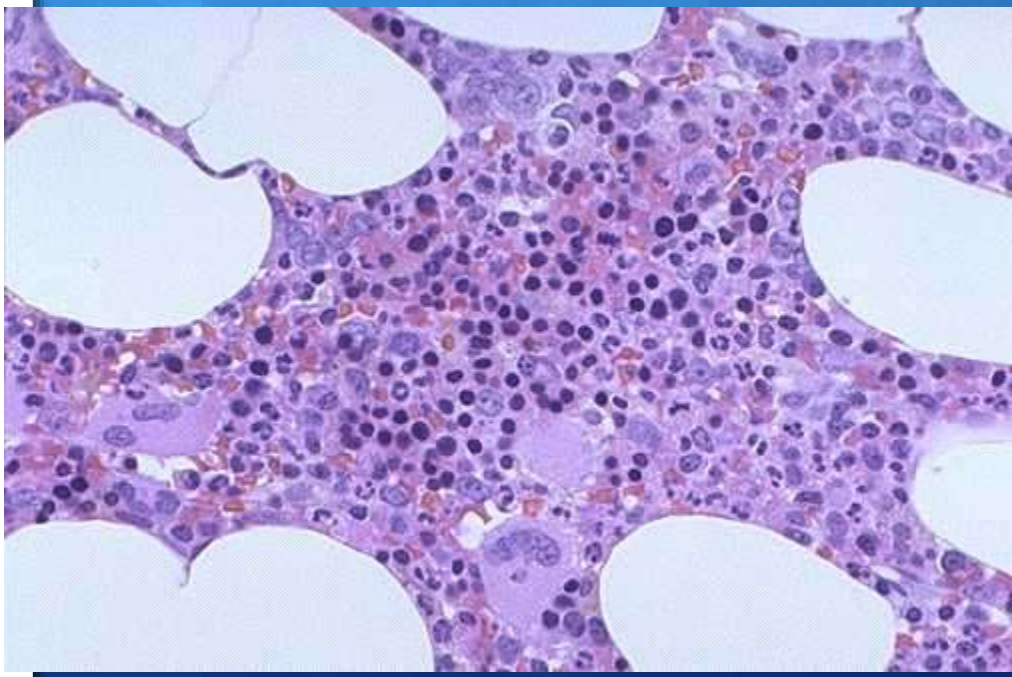
What do bone cells need to be?

Why are nerve cells built the way they are?

Bone Marrow

Bone Marrow is a specialized type of tissue?

What function does bone marrow perform?



Bone Marrow Produces

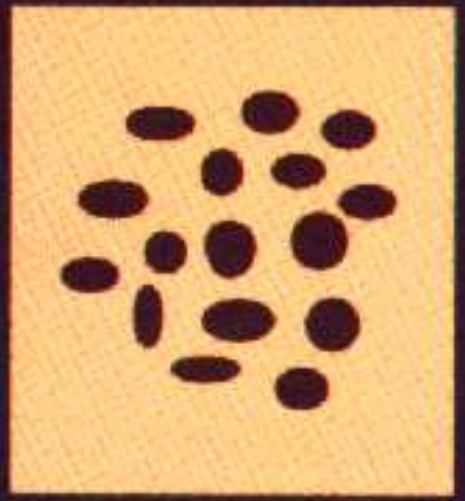
White Blood Cells

Fight Infection

Red Blood Cells

Carry Oxygen

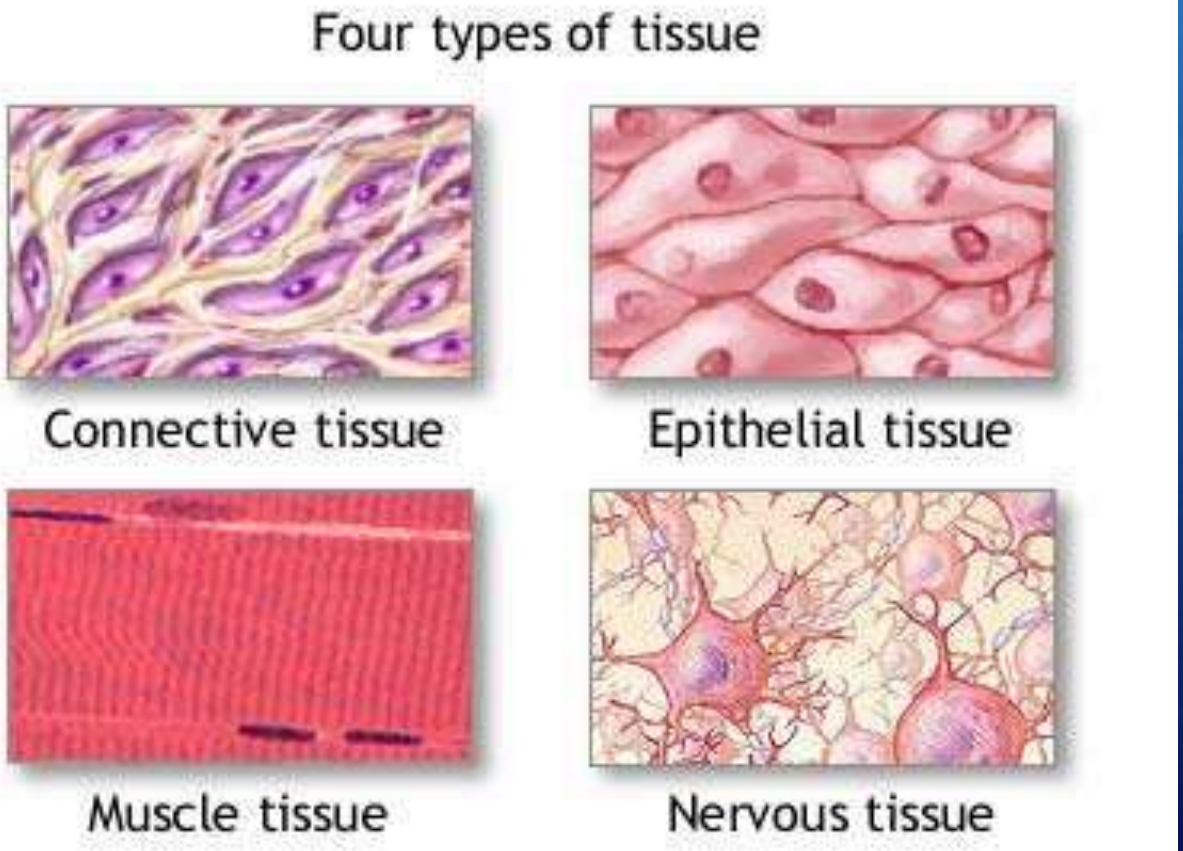
Platelets



Control Clotting

Similar Cells Form Tissue

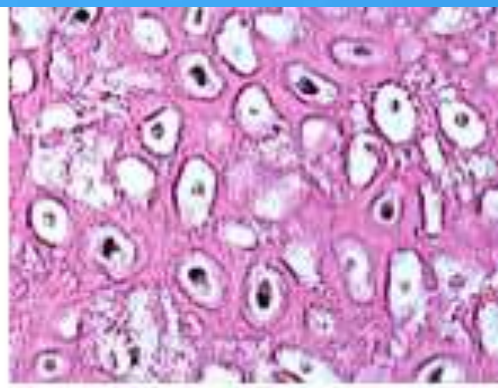
Four main types of tissue make up almost all of your organs



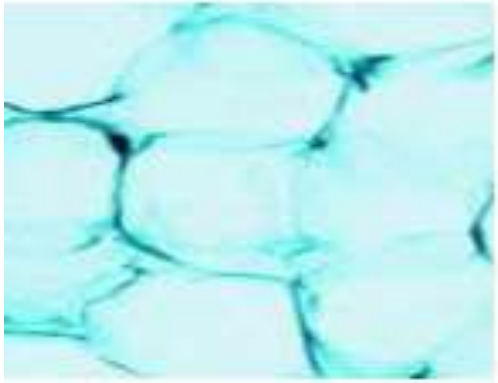
These tissues all fit into one of the categories

Histological images of various tissues in the body

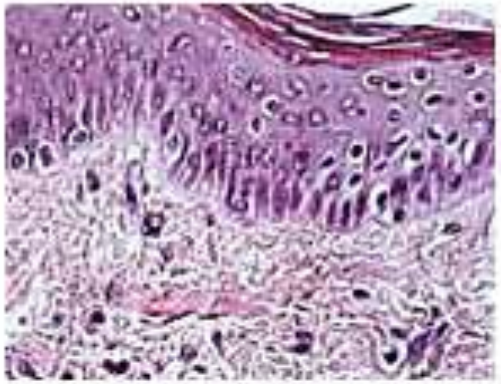
Bone



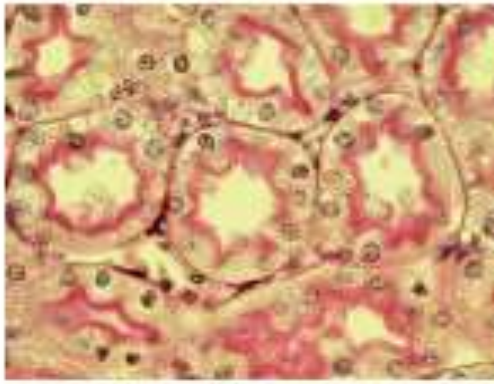
Cartilage



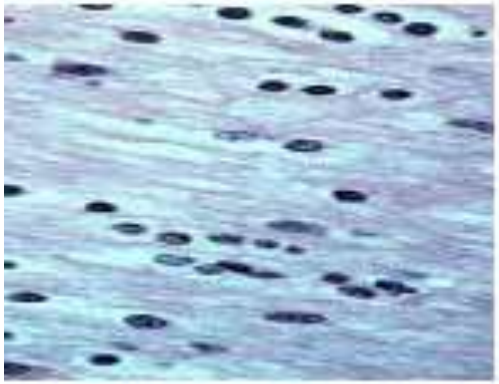
Adipose Tissue



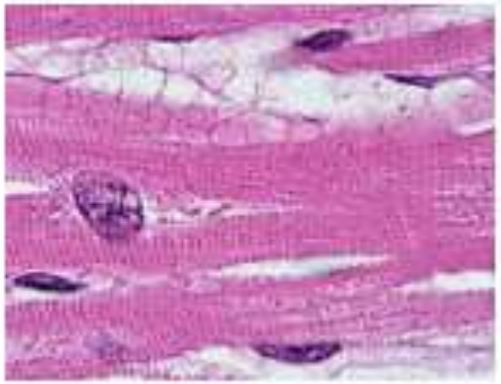
Skin



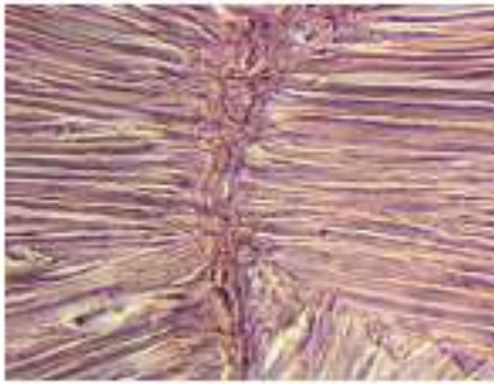
Intestinal Villi



Neural Tissue



Cardiac Muscle



Skeletal Muscle

Plants also have Tissue

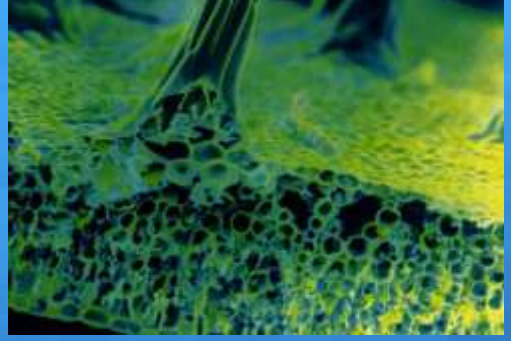
Plants have 3 tissue types:

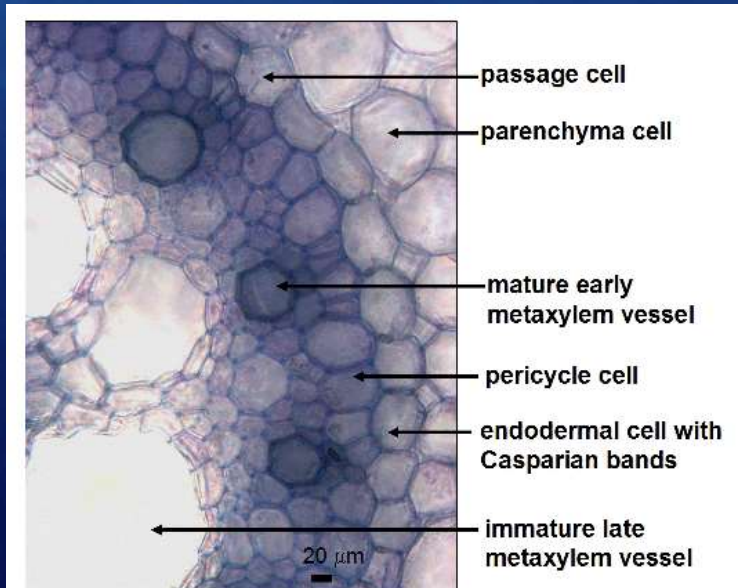
-Photosynthetic / storage

-Protective

-Transport (phloem transports food, xylem transports water)

-Each of these types of tissues exist in the leaves, the stems, and the roots





Your Assignment

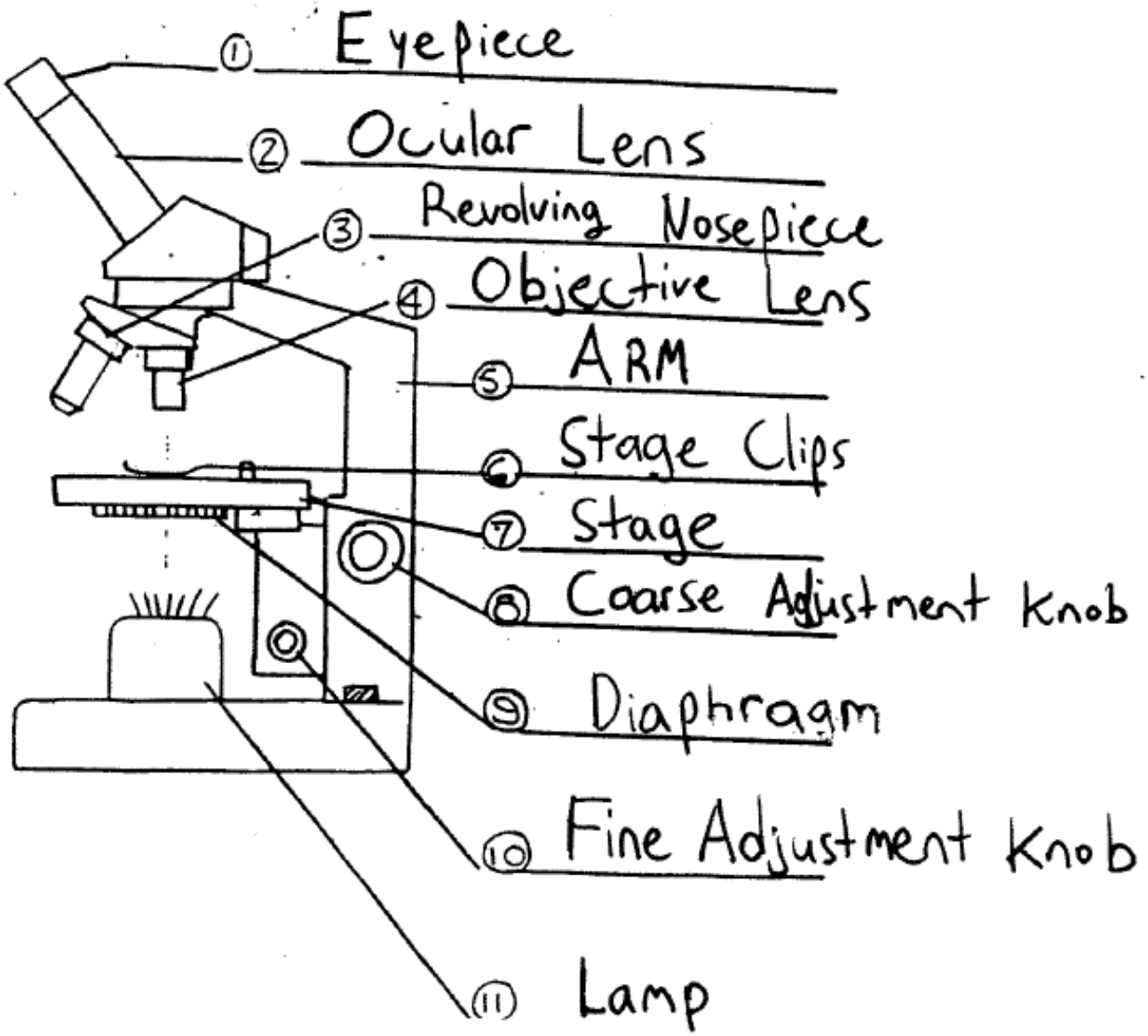
-**Tissues of Humans and Plants handout**

-**Finish notes up to 3.0**

Section 1 / 2 Review

Parts of the Microscope

e of connective tissue which creates red blood cells



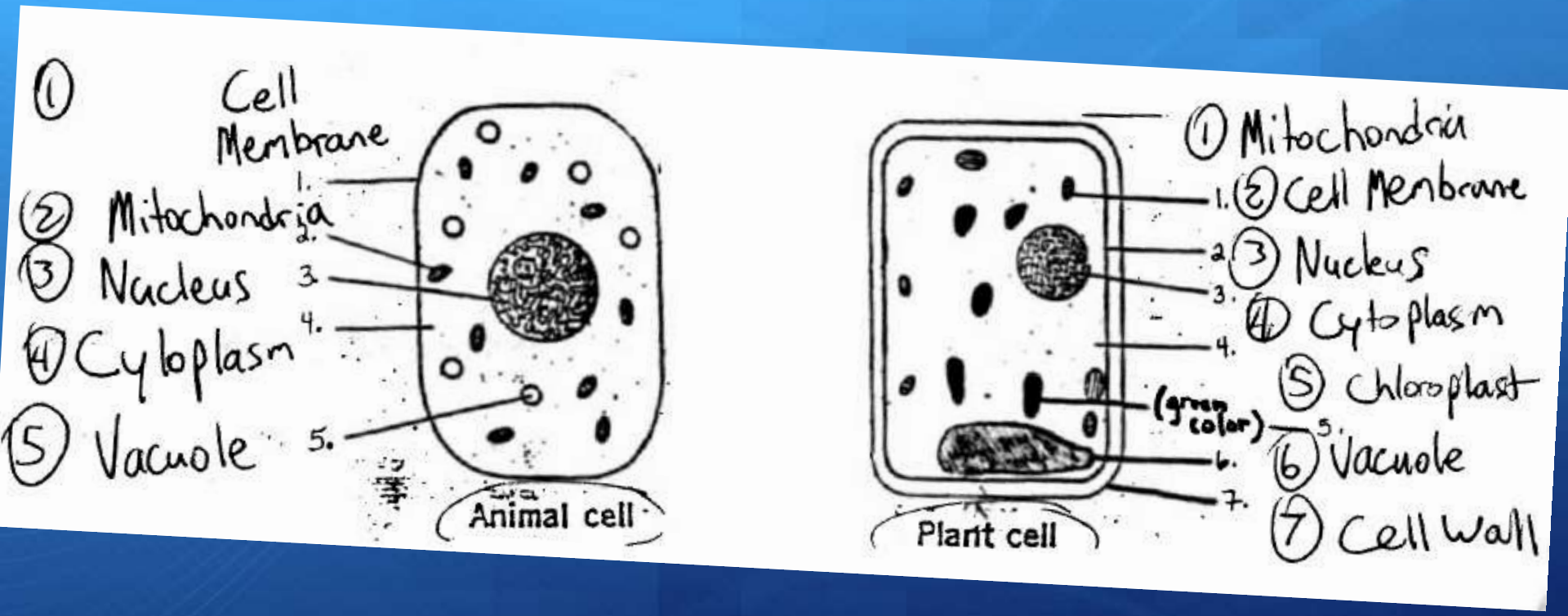
Cells - The Basic Unit of Life

Define and describe the following terms:

1. **capillaries** tiny blood vessels, only one cell thick that connect Arteries to veins
2. **tissues** A group of similar cells working together to perform a similar function
3. **organelles** Structures in cells that perform specific functions

Using a ruler, create and complete the following chart:

Cell Structure	Description	Function
a) cell membrane	thin fluid-like membrane	Controllable Gateway
b) cell wall	Thicker/Solid	Frame For Plant Cell
c) cytoplasm	Fluid in Cell	Contains Nutrients
d) nucleus	Sphere, w Membrane	Brain/Command Center
e) vacuoles	Small spheres	Storage Rooms
f) mitochondria	Kidney Shaped	Power Plant, Make E.
g) chloraplasts	Green Blobs	Make Sugar For Plants.


① Cell Membrane
② Mitochondria
③ Nucleus
④ Cytoplasm
⑤ Vacuole
1.
2.
3
4.
5.
Animal cell
① Mitochondria
1. ② Cell Membrane
2
3. ③ Nucleus
④ Cytoplasm
4.
⑤ Chloroplast
(green color)
5.
⑥ Vacuole
6.
7.
⑦ Cell Wall
Plant cell

Single Celled or Multicelled Organisms

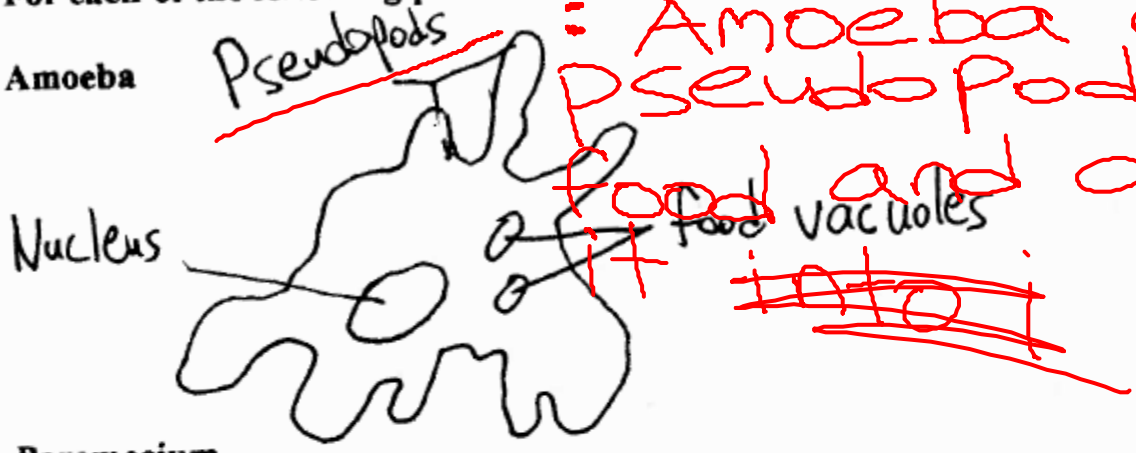
Cells are the individual, living units that make up all living organisms. Organisms that are made of two or more cells are Multicellular. Multicellular organisms rely on many Specialized cells to perform the functions required for life. Examples of multicellular organisms are humans, Trees, and Frogs.

If an organism is made of only one cell it is called Uni-Cellular. An example of a unicellular organism is the Amoeba. A unicellular organism can perform all of the functions of a multicellular organism. Unicellular organisms eat, move, react, get rid of waste, and reproduce.

Common Unicellular Organisms

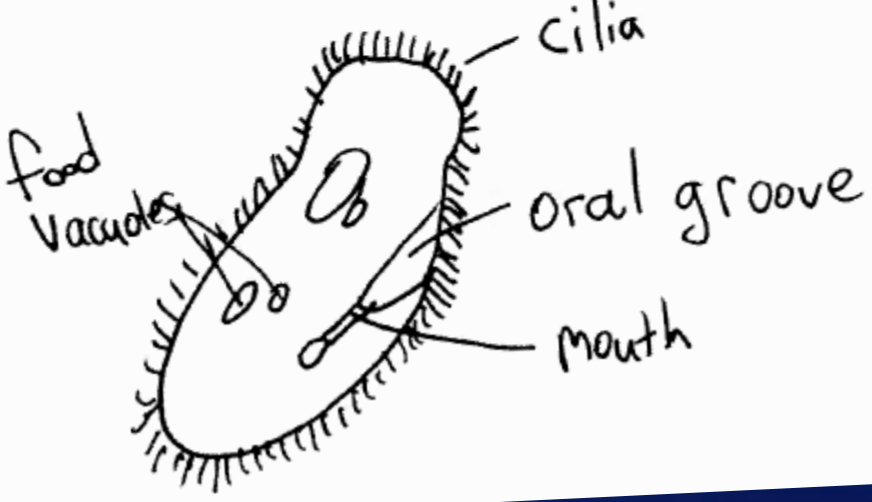
For each of the following provide a labelled diagram and a written description:

Amoeba



= Amoeba extends pseudopods around food and absorbs it into

Paramecium



Diffusion and Osmosis

The movement of particles from an area where there is more of them to an area where there are fewer of them is called diffusion. **Molecules move from areas of high concentration to areas of** low **concentration. Diffusion can occur in a** liquid **or a gas.**

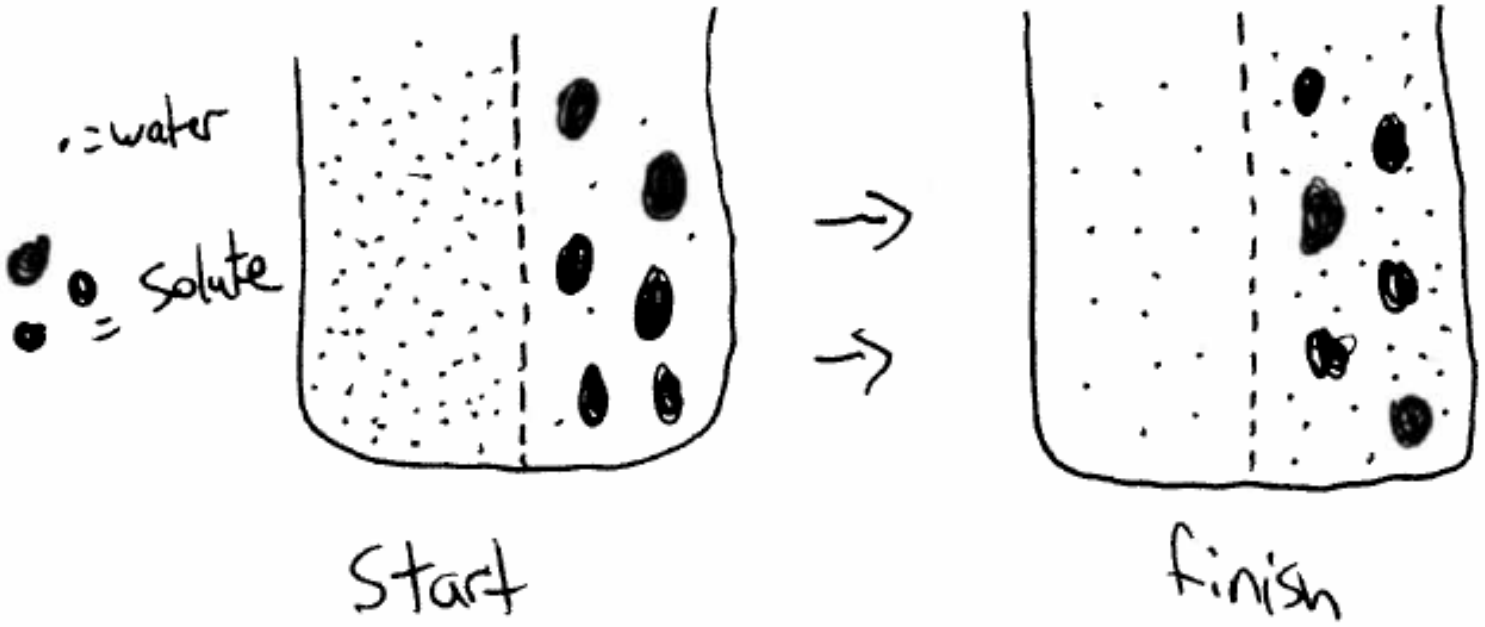
Diagram of diffusion:

Selectively permeable membranes only allow some particles to move across.

Plant roots do not allow dirt and large particles to enter the plant.

Osmosis is the diffusion of water through a selectively permiable membrane. In osmosis the particles move from an area of high concentration to low concentration.

Diagram of osmosis:



2.5 Specialized Cells

A. Reproduction:

All cells produce by Cell division **. The cell division results in** two identical copies **of each organism. Your body replaces** 50 000 000 **skin cells each day.**

B: Multicellular Organisms Have Specialized Cells

Each specialized cell has a different function **. Your** red blood **cells carry oxygen to all cells of your body. Red blood cells have a thin,** pliable **disk shape that allows them to travel through very small blood vessels. Red blood cells are made in the** Marrow **of your bones. To reproduce the red blood cell does not divide, it** is replaced by new red blood cells in the marrow. **.**

B. Tissue

Define/explain each of the following terms and provide an example for each:

1. **Connective tissue** Supports and Connects diff. parts of the body ex) Blood
2. **Epithelial tissue** ~~Skin~~ Skin / organ covers
3. **Nervous tissue** Brain, Spinal Cord, nerves
4. **Muscle tissue** Allows you to move - muscles, heart.

C. Tissues in Plants

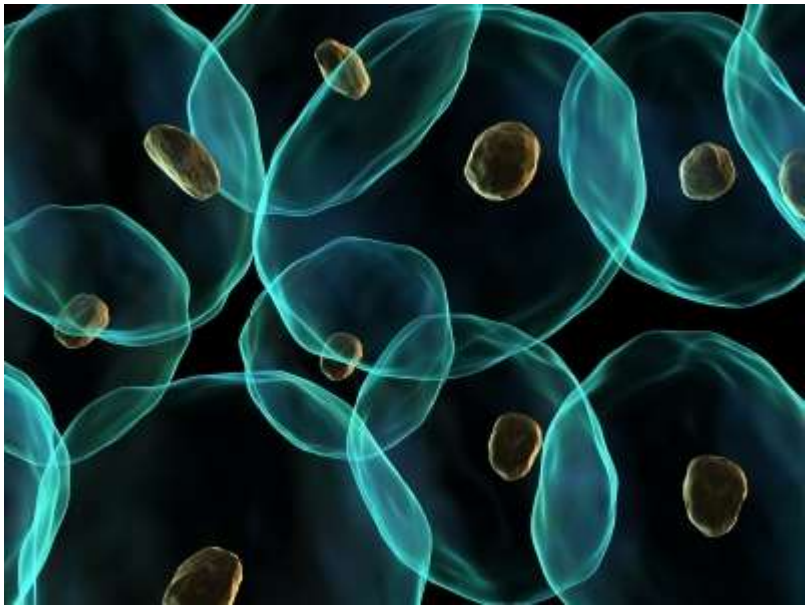
Draw, using a pencil and ruler, the following chart. Complete the chart.

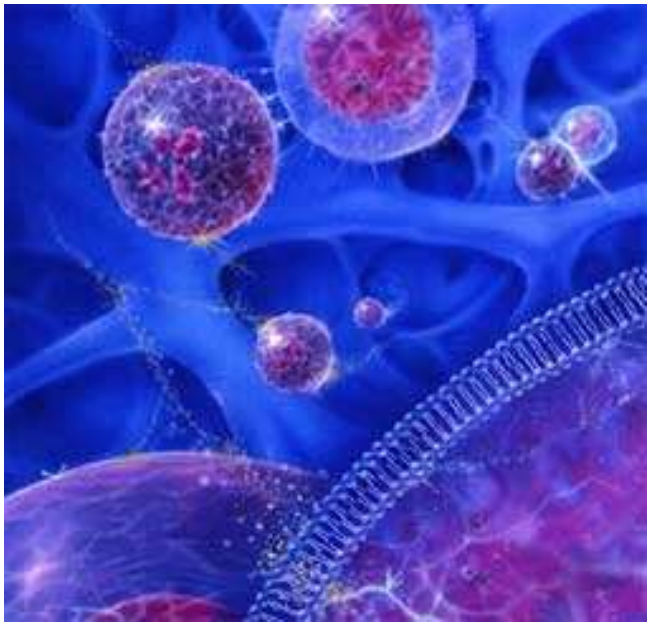
Role of Specialized Tissues in Plants

Tissue Type	Stem Cells	Root Cells
Protective Tissue	Waterproof Layer to protect plant	Absorb H_2O from soil
Transport Tissue	Phloem: food Xylem: water	Phloem, Xylem in Circle
Storage Tissue	Support plant, store food	Store food

All living things are:

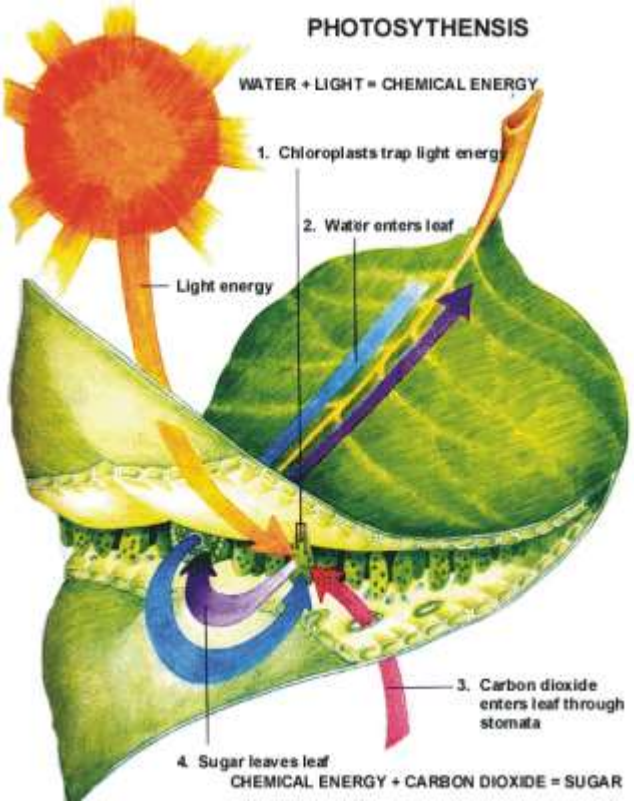
- 1. Made up of cells





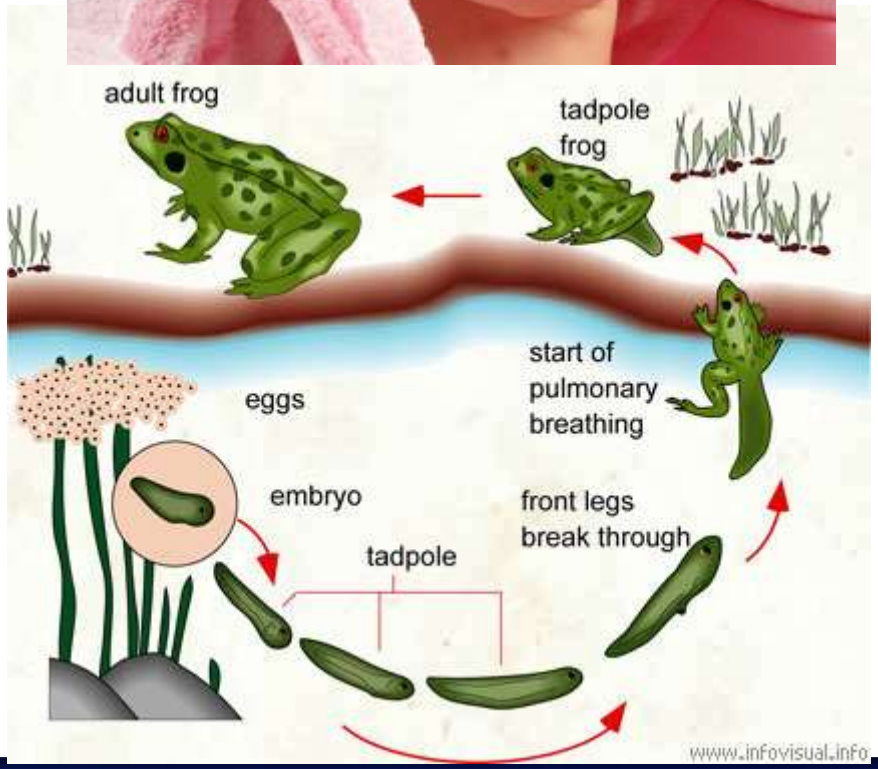
All living things

- **2. Need Energy**



All living things

+ **3. Grow and Develope**



All living things

- **4. Respond to the environment (a stimulus triggers response). Can you think of other examples?**

http://www.youtube.com/watch?v=ktIGVtKdgwo&feature=fvst
http://www.youtube.com/watch?v=K_INI1OgKsY

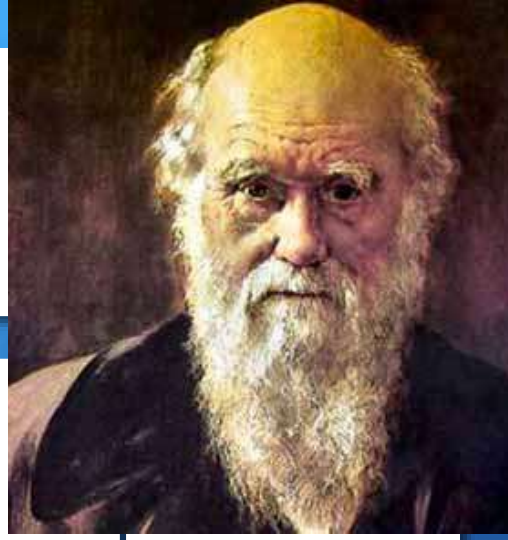
Lesson 16 Venus_Fly_Trap.asf

All living things

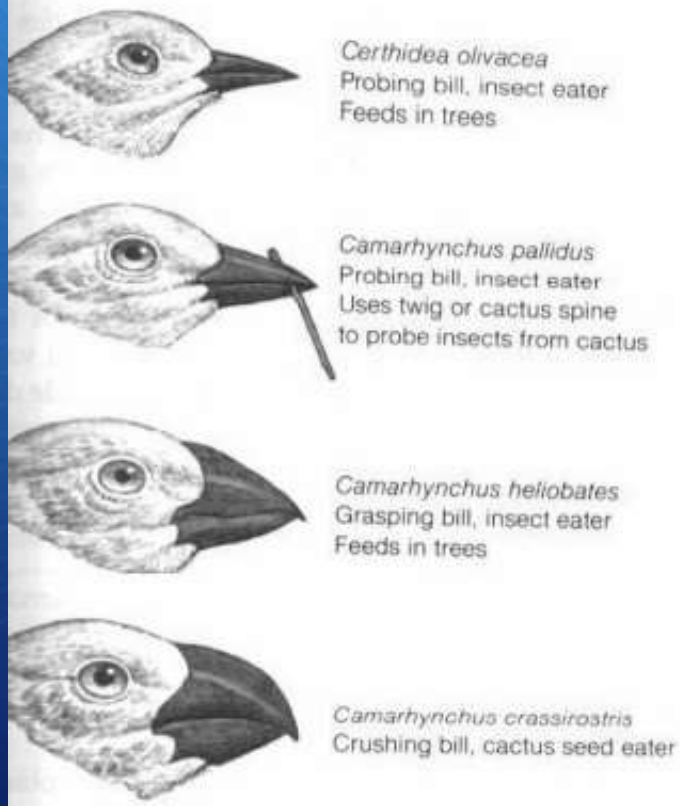
- **5. Reproduce**

http://www.youtube.com/watch?v=DY9DNWcqxl4

All Living Things



+ 6. Have Adaptations for their environment



- **Why are Darwin's finches a good example of structure versus function?**

- **Because the have different structures to perform a similar function**

Cactus Adaptation: Spines

- Where have humans copied this?

Insect Adaptations: Spiracles…. Why?

-> Breath

Structures versus function

- **Structures: The physical parts of an organism that perform a specific task. Eg) Teeth**
- **Function: The purpose or the task completed by the organism Eg) Gaining energy (eating)**

The Eye:
What are it's structures?
What is it's function?

Metabolism

- Energy is the ability to make things move or change and is needed by all organisms. The sum of all the different processes that happen in an organism is called **Metabolism.**

- **Metabolism is how we make energy**

Structural vs Behaviour Adaptations

- **Structural: What it looks like**
- **Behavioural: What it acts like**
  - **Classify the following as behavioural or structural adaptations:**
    - **Snowshoe hare grows white fur**
    - **Cactus has spines**
    - **Birds fly south**
    - **Giraffes have long necks**
    - **Mice only come out to feed at night**

How life is built

- Cells form Tissues
- Tissues form organs
- Organs from systems

- That's it! Study hard, and good luck on the test!

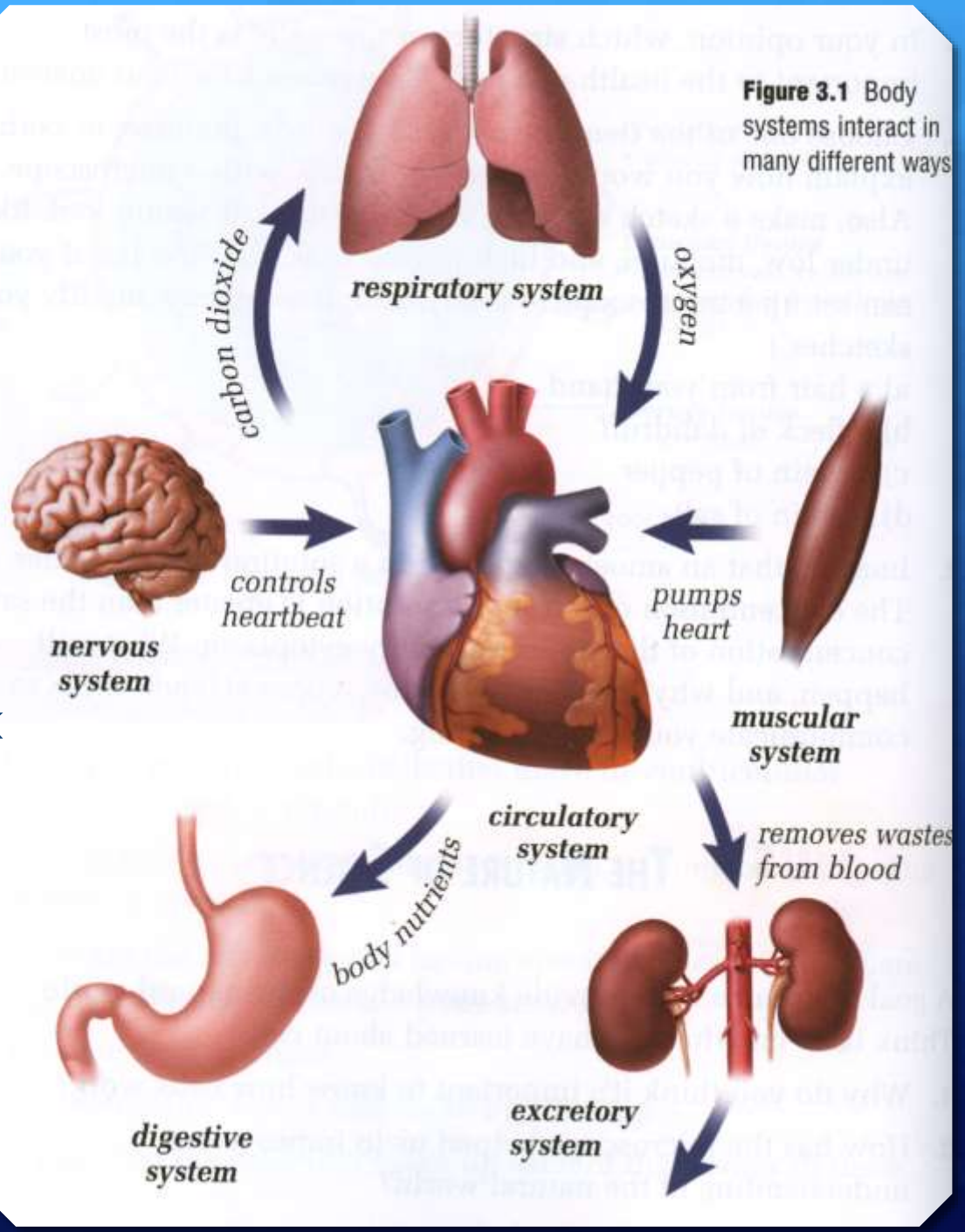
Section 3: Tissues and systems of the human body

What are the systems in our body?

What organs make up those systems?

How do the systems work together?

Which organs do you recognize?

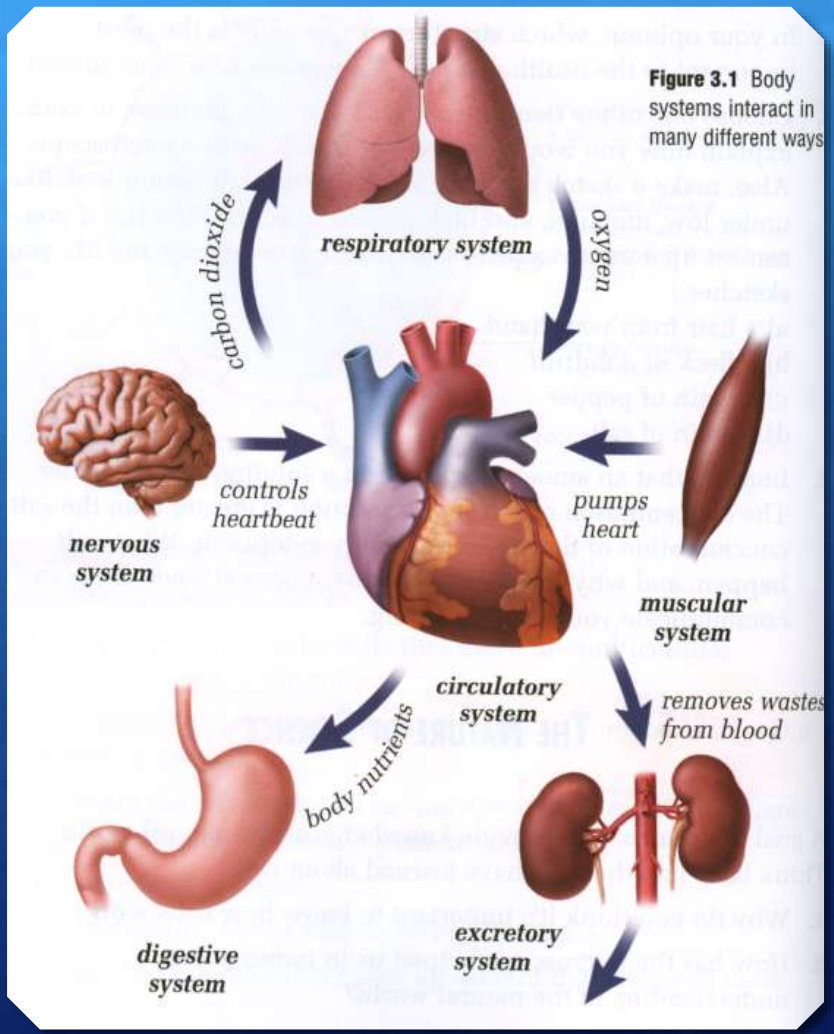


Working together

Our systems must: (Copy into Notes please)

React: respond to changes inside and outside.

Interact: Work together as a single unit to carry out life functions.



Breaking_Down_Digestion.flv

Introduction_to_the_Digestive_System.flv

The Digestive System

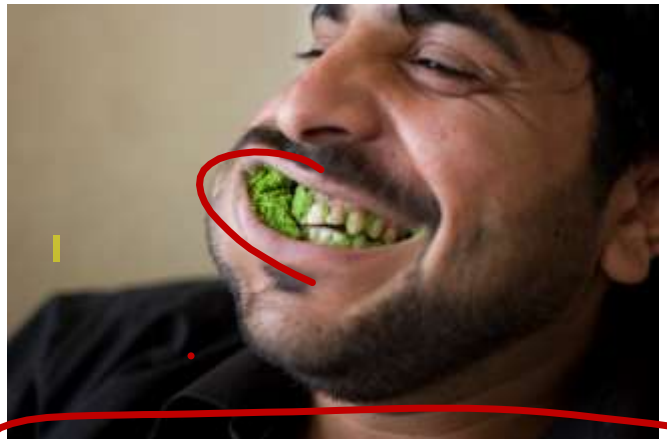
What does the digestive system do?

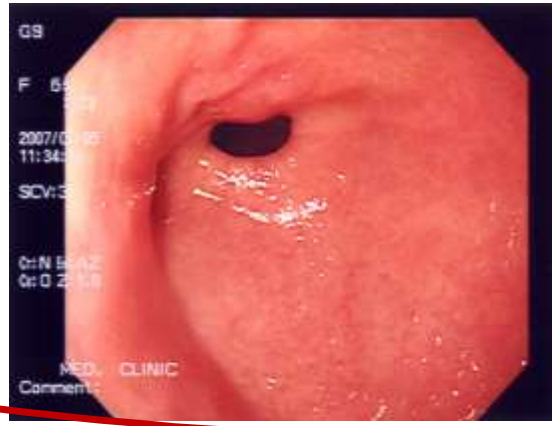
What Organs are Involved?

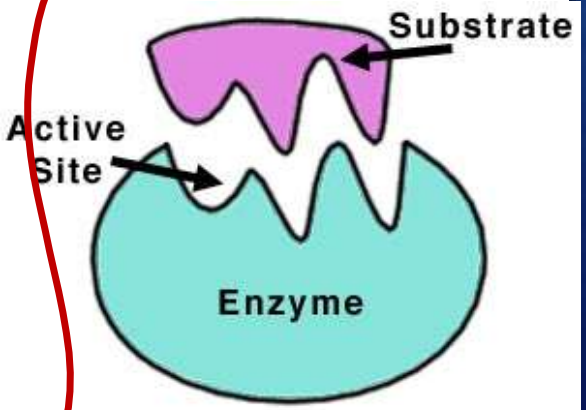
3.1 The Digestive System

starches + oils

- Living organisms need energy from carbohydrates (sugars), lipids (fats), and proteins to survive. It's all about absorbing nutrients!
- Types of Digestion: Physically rip food apart
  - Turn to page 127 and define Mechanical digestion, Chemical Digestion, and Enzymes (Use the glossary for enzymes)







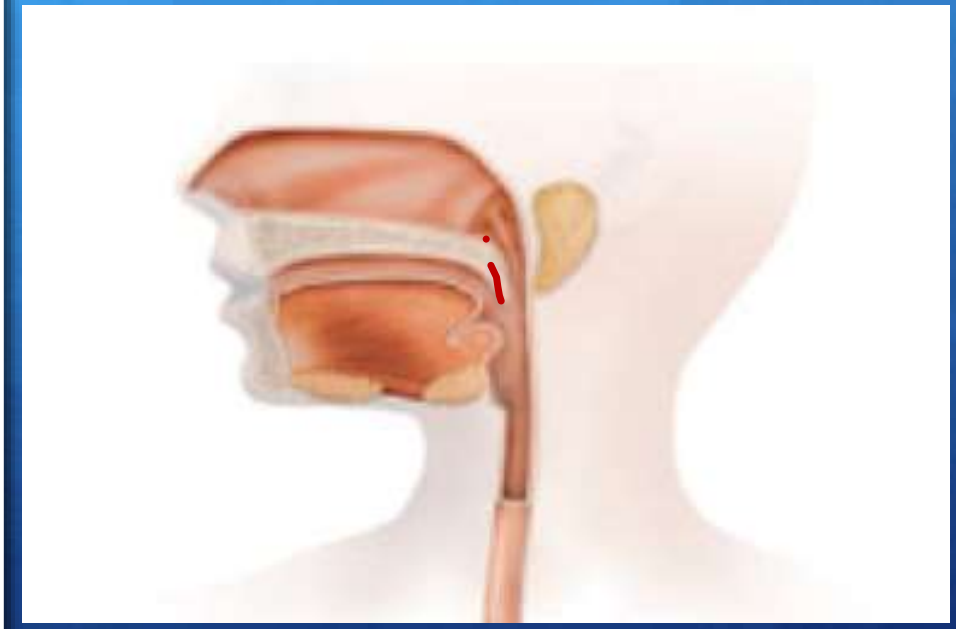
→ Using acids + enzymes

Food's Path

- The mouth and Esophagus:
  - The digestive system is a long tube. It starts at the mouth and ends at the rectum

Copy: Mouth and Esophagus

- Mouth: Teeth mechanically break down food by grinding it an mixing it with saliva.
- Saliva moistens food and has an enzyme that breaks down starch (like potatoes) into simple sugars.
- Food moves down the esophagus and into the stomach



The Esophagus

-Joins the mouth to the stomach

- Peristalsis: The muscles in the esophagus contract (squeeze) to push food into the stomach (copy)

- Like a tube of toothpaste!

Through_the_Esophagus_The_Function_of_Peristalsis.flv

Your Assignment

- Label "The Human Digestive System" using pages 128 and 130.
- If you finish, continue filling in the 3.1 notes.
- Please work quietly :)

The Digestive System Continued

The Stomach:

As food enters the stomach, muscles in it's walls churn food back and forth.

(Copy): Gastric Juice is made of mucus, hydrochloric acid, water, and enzymes. It helps digest proteins.

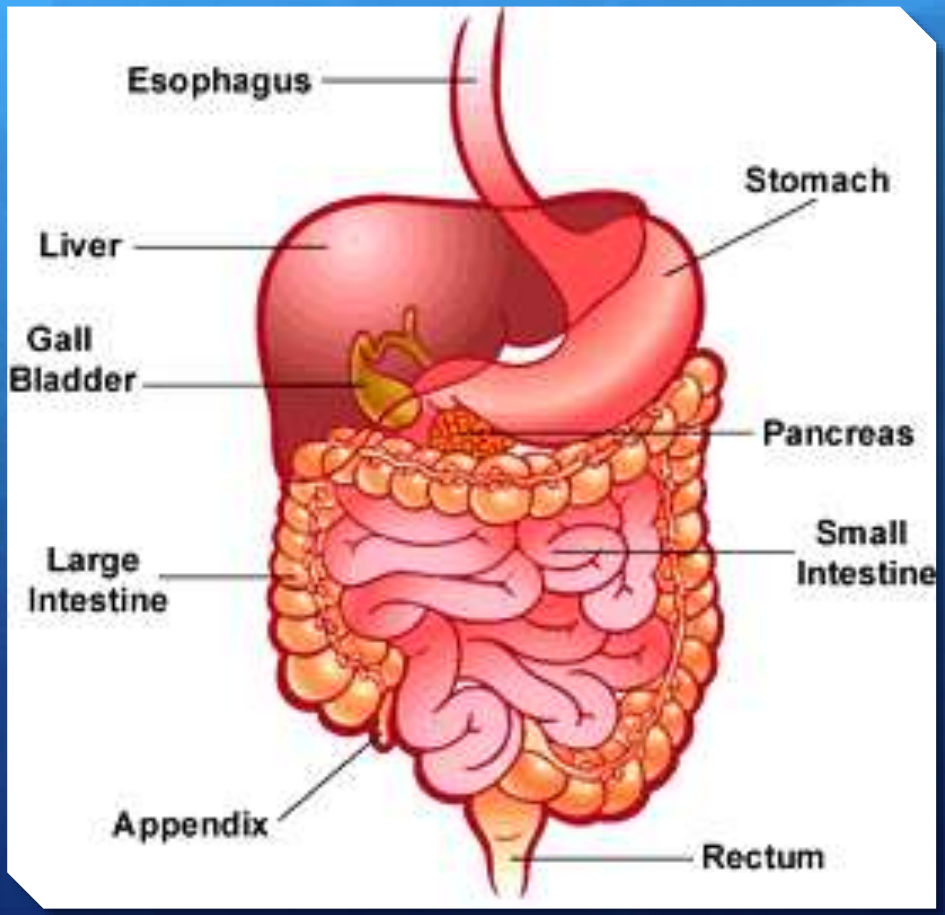
inside my stomach ?-Jump4

The Digestive System Continued

Small Intestine, Pancreas, Liver, Gall Bladder (copy)

Chemical digestion: The pancreas sends digestive enzymes into the small intestine to break down carbohydrates and protein.

The Liver produces bile which is stored in the Gall Bladder. The bile then travels to the *S.I.* where it digests lipids (fats)

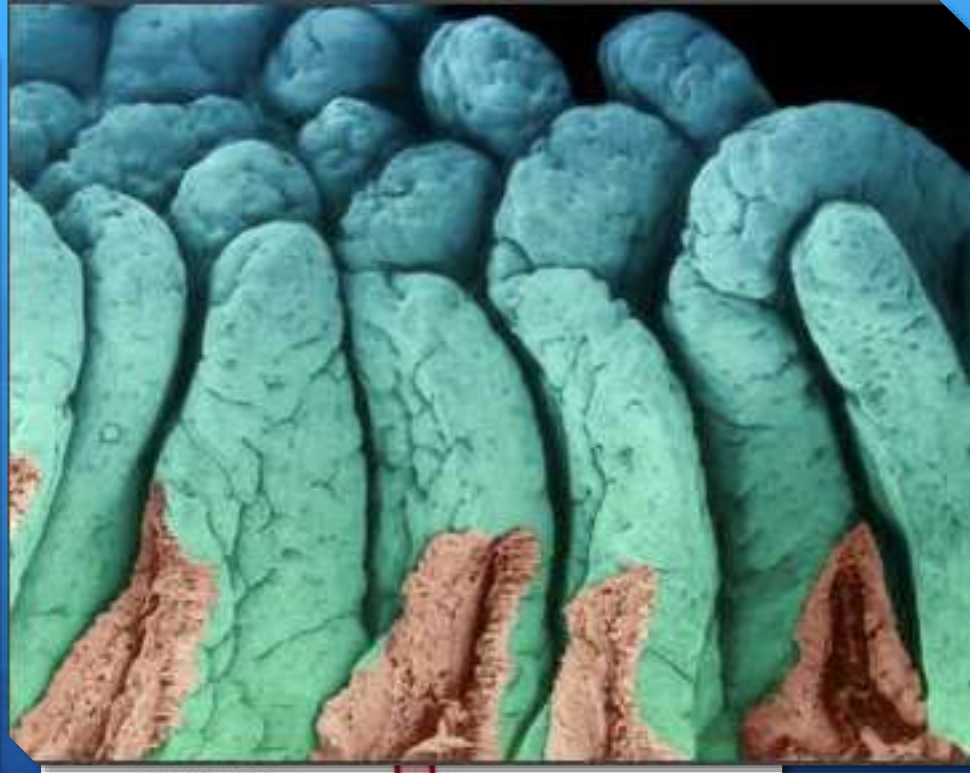


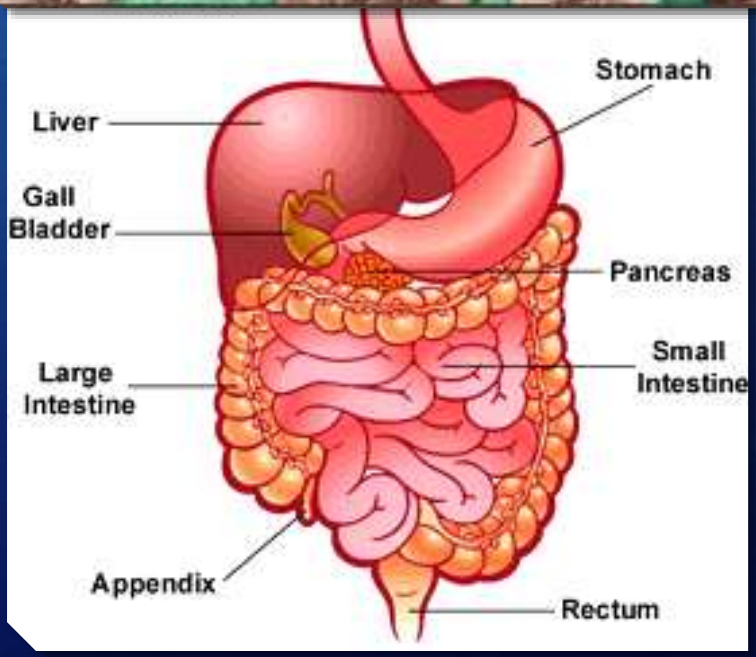
The Digestive System Continued

Villi: (Copy)

-Small finger-like projections that the small intestine folds into to increase surface area.

If one persons small intestine were completely unfolded, it would cover the classroom floor!

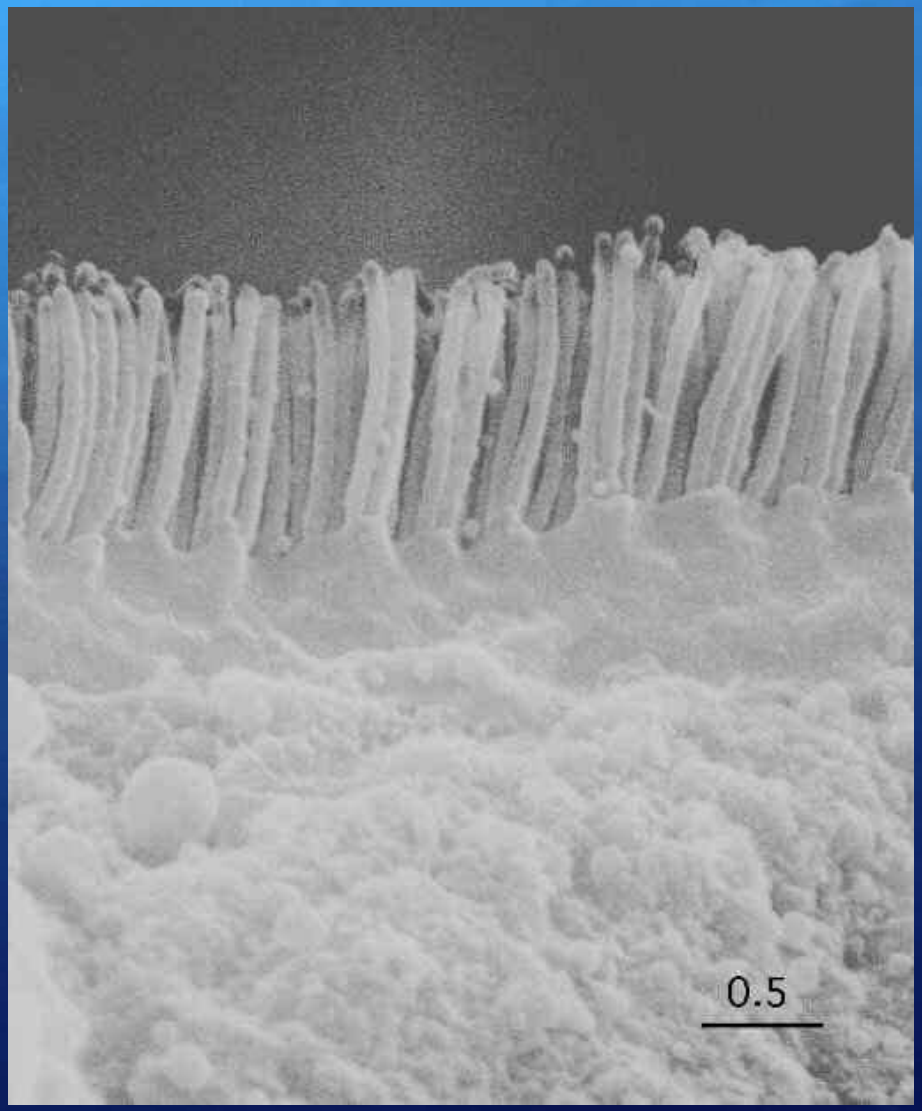




The Digestive System Continued

Copy under microvilli

Villi are covered with tissue that absorbs nutrients. It also folds to form even smaller fingerlike projections (microvilli).



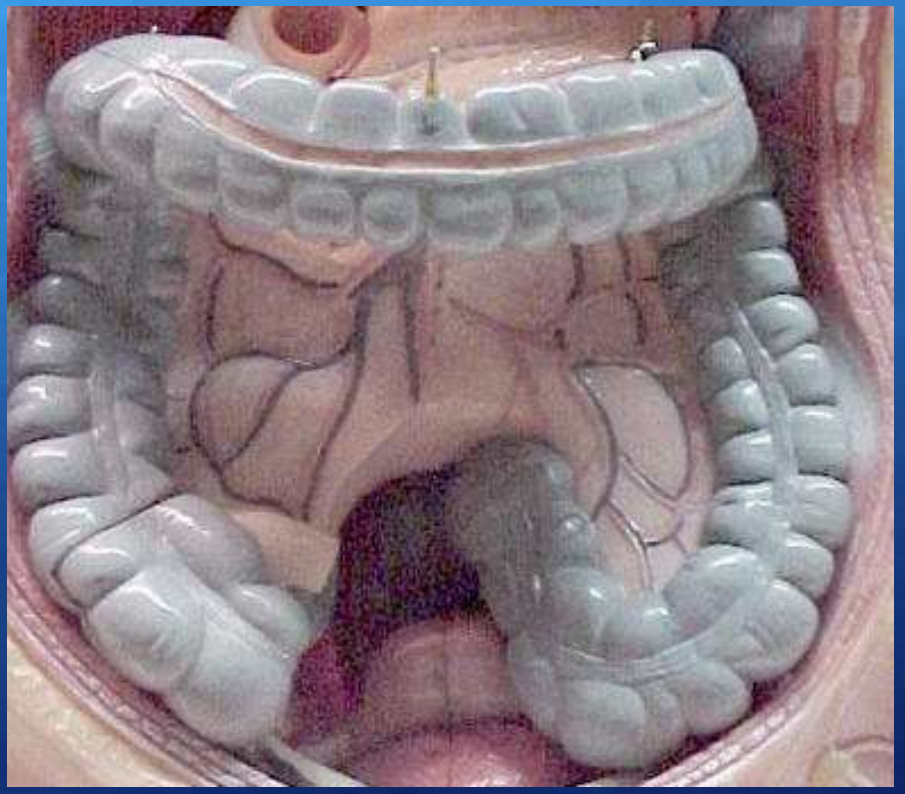
The Digestive System Continued

The Large Intestine (copy)

1.5 m long

Digestion is now complete. The *L.I.* absorbs water, vitamins and minerals.

The remaining food forms feces which is collected in the rectum.



Your Assignment

- Check and Reflect: p 131
  - # 1, 2, 3, 4, 6. (for homework)

Please work quietly, we will mark it at the end of class.

https://www.youtube.com/watch?v=b20VRR9C37Q

Name

Digestive System Quiz (12 marks)

Digestive Quiz

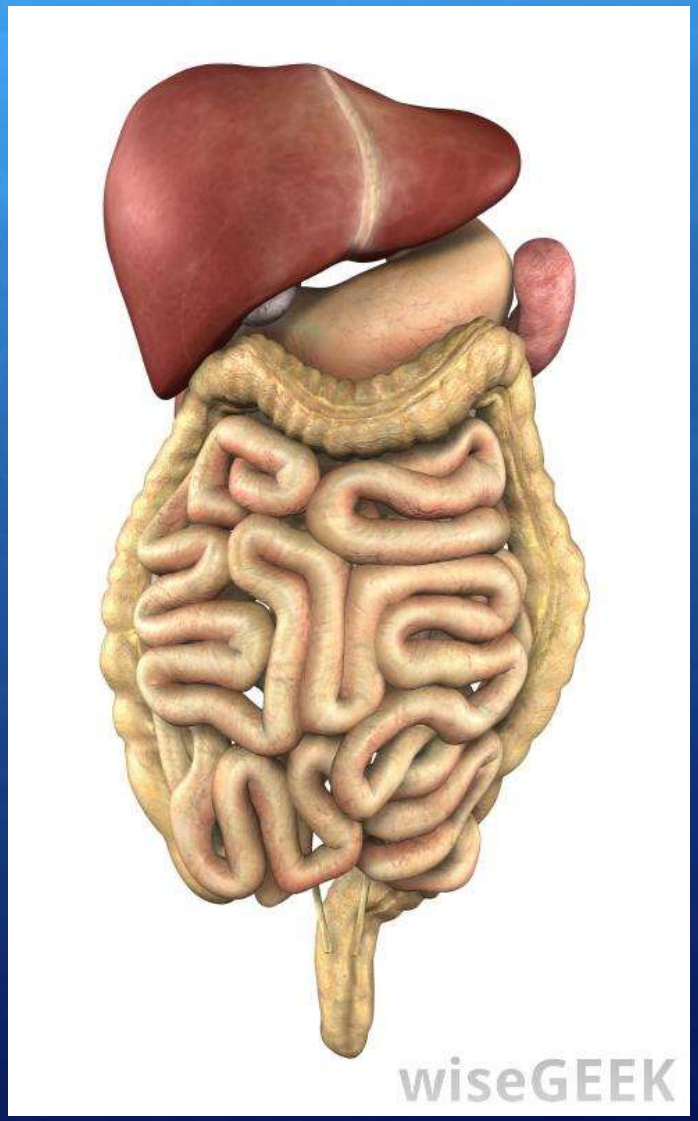
1. The digestive process starts in the

a. Stomach

b. Esophagus

c. Mouth

d. Kitchen



Digestive Quiz

2. List the four things found in your stomach's Gastric Juices (4 marks)

Digestive Quiz

3. Example(s) of Mechanical Digestion is / are

a. Teeth Physically Ripping food apart

b. Enzymes in saliva breaking down starches

c. Stomach churning and squeezing food

d. a and c

Digestive Quiz

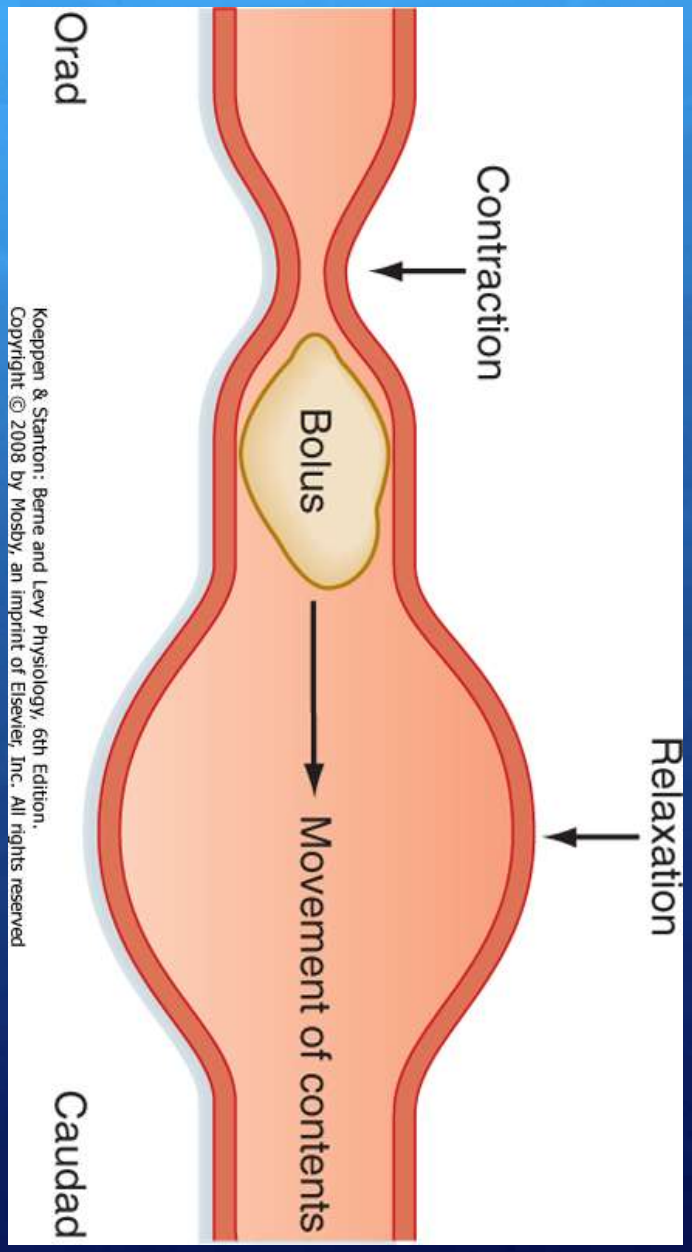
4. Food is squeezed down the esophagus via

a. Gravity

b. Defecation

c. Chewing

d. Peristalsis



Digestive Quiz

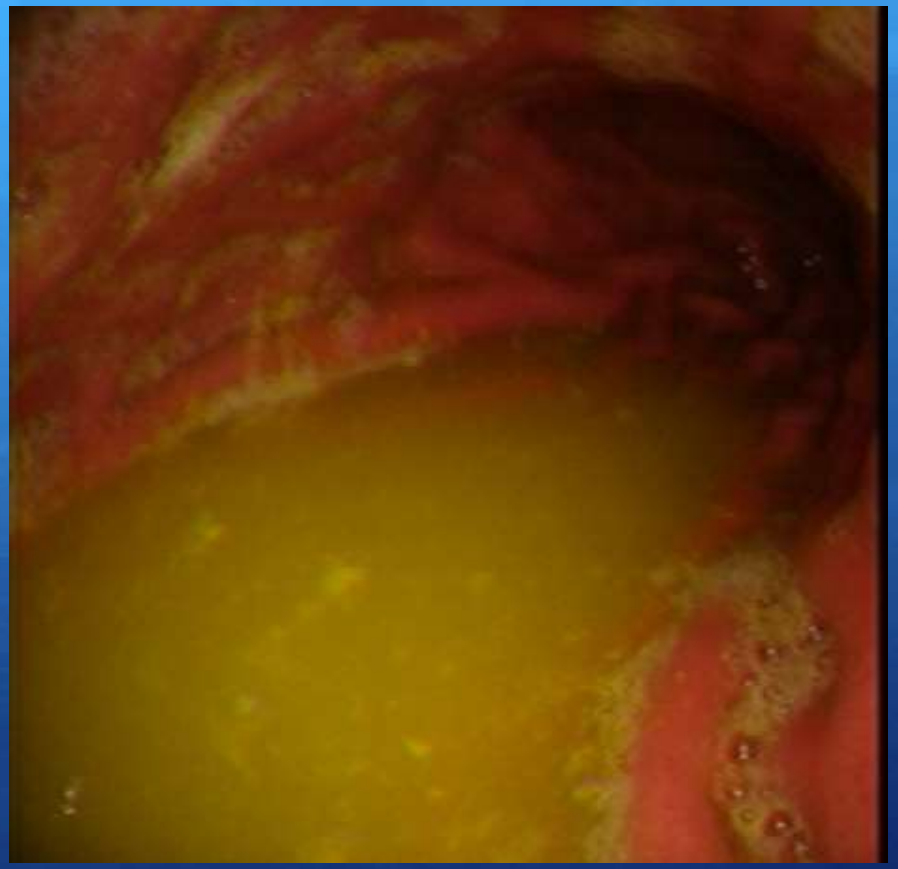
5. Which organ products bile?

a. Pancreas

b. Liver

c. Gall Bladder

d. Stomach



Digestive Quiz

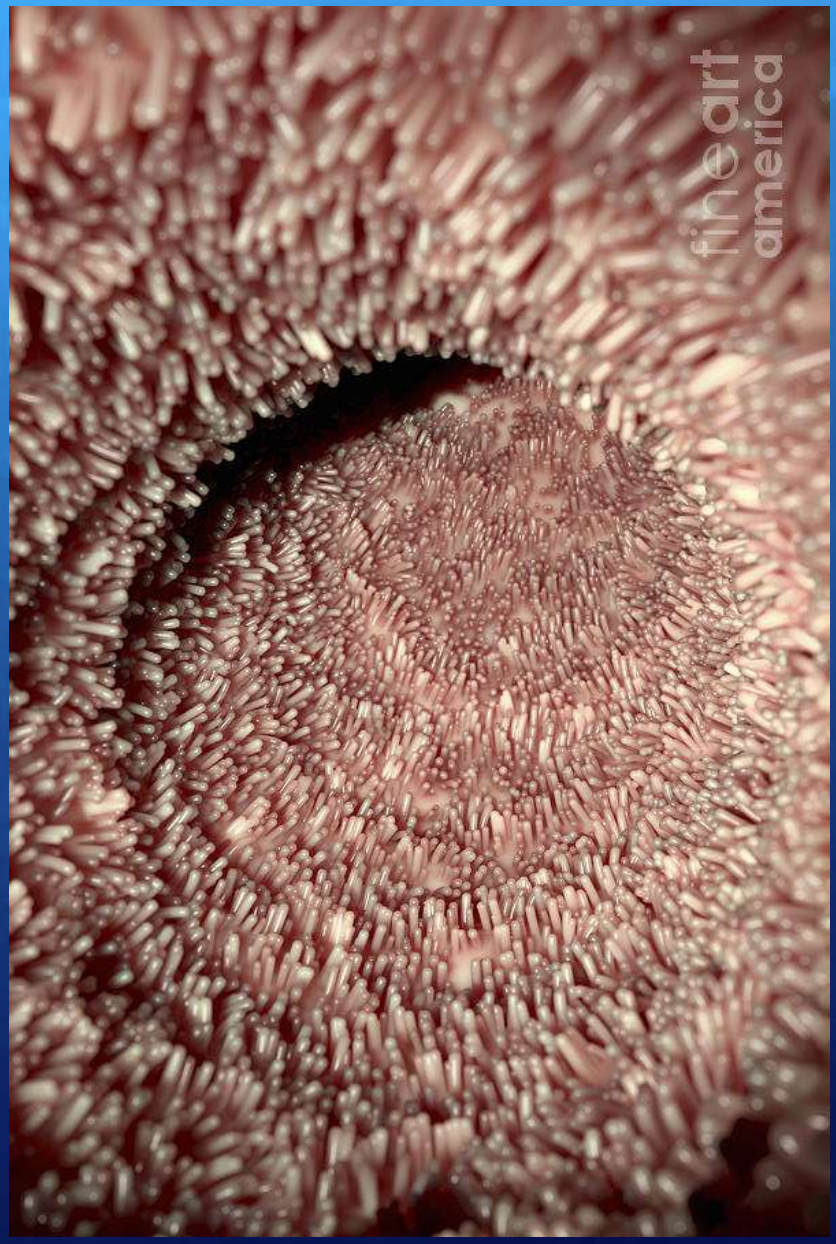
6. Your small intestine is folded into **villi** to

a. Provide more area for food to touch the lining of the intestine

b. Increase surface area

c. Make nutrient absorption more efficient

d. All of the above



Digestive Quiz

7. Your large intestine absorbs

a. Proteins and Lipids

b. Water, Vitamins and Minerals

c. Carbohydrates and Lipids

d. Toxic Waste

Digestive Quiz

8. The point of your digestive system is to

absorb _____ into the

_____ _____

러닝머신

Running Machine

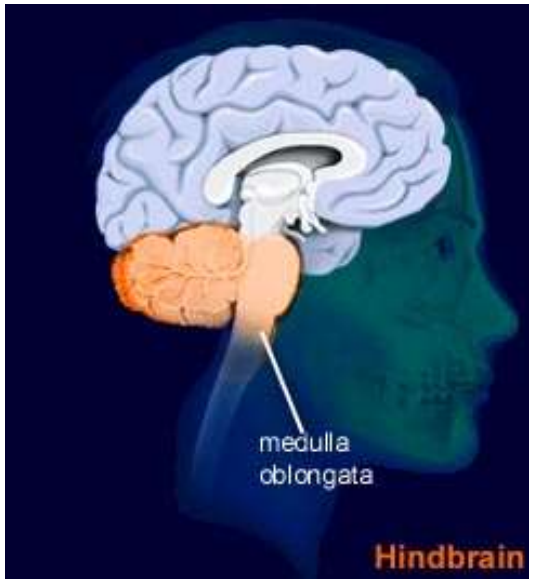
Breathing

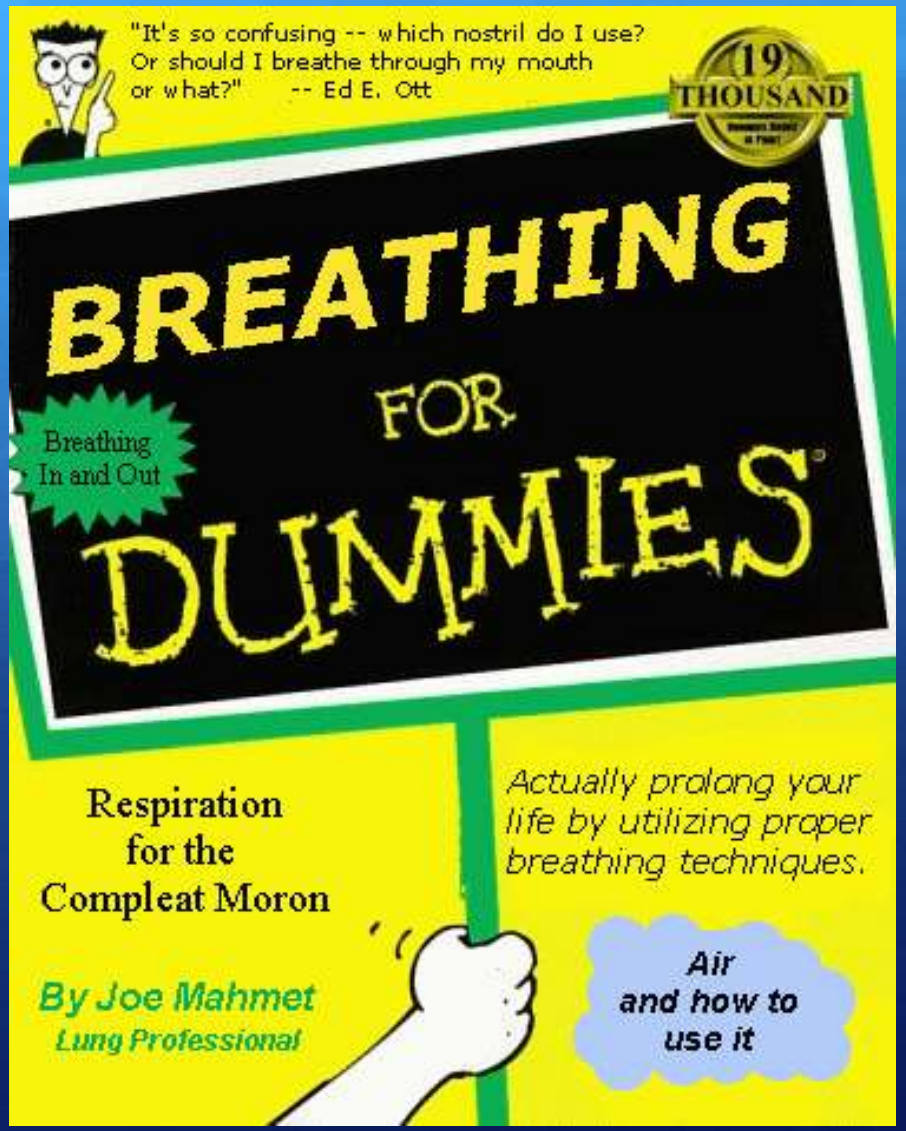
How do we breath??

What actually causes us to breath?

Paper Bag experiment

medulla oblongata





Paper Bag Experiment

1. While seated and relaxed, count how many breaths you take in 30 seconds. Times this number by 2 to calculate breaths per minute.

2. Take a paper bag and seal it around your mouth and nose. For the first 30 seconds breath into the bag without counting, then for the next 30 seconds count how many breaths you take and times by 2 for B.P.M.

3. What change did you notice… Why did this happen?

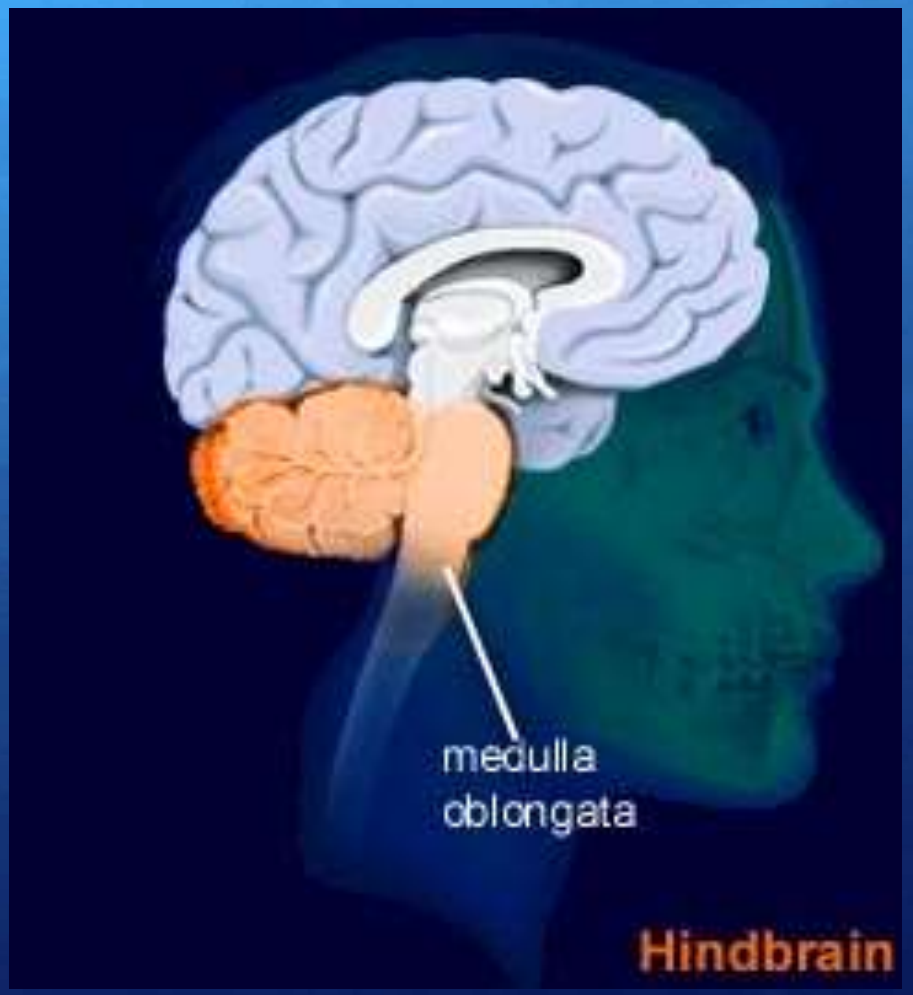
4. **OPTIONAL, DO NOT DO THIS IF YOU HAVE A HEART OR BREATHING CONDITION**

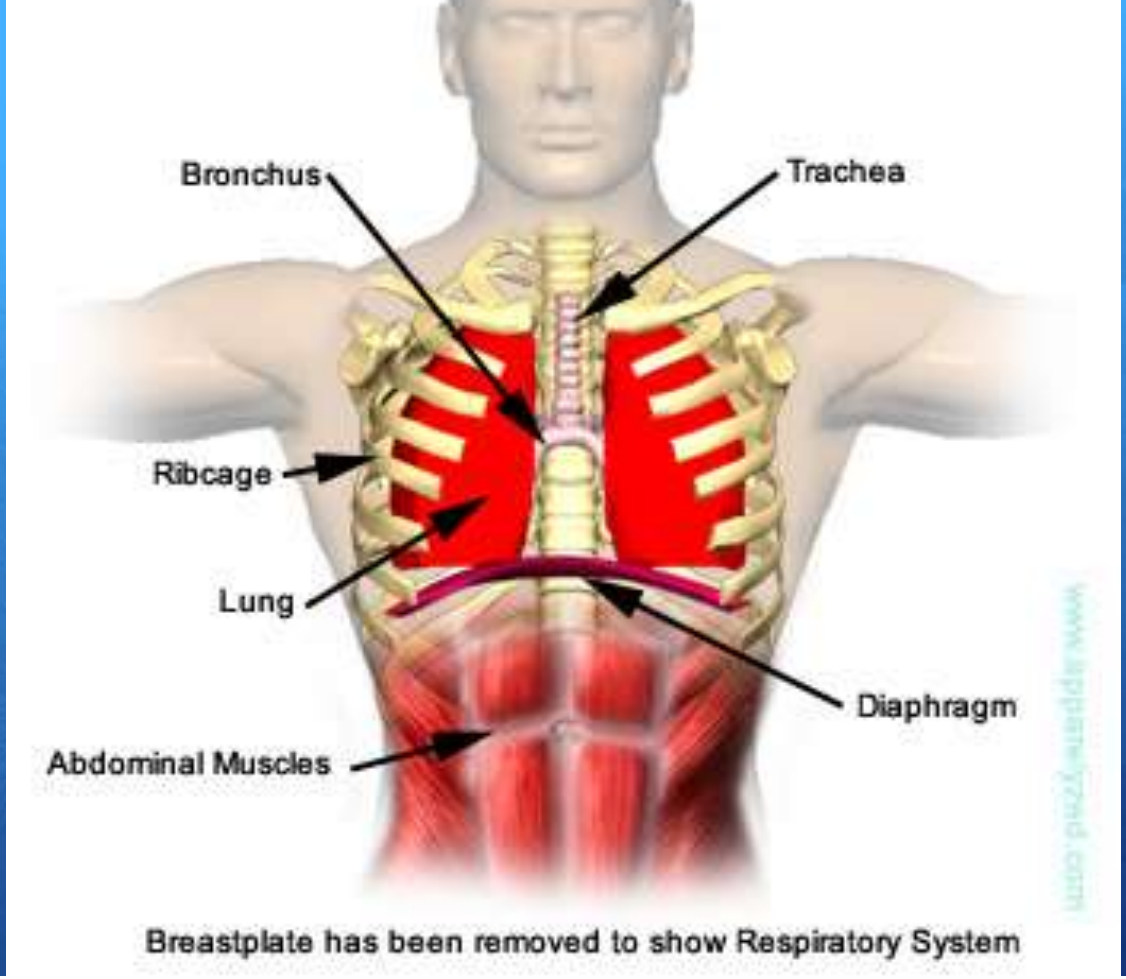
Paper Bag Experiment

1. You should have noticed that when you breathed into the bag for 30 seconds, and then counted, you had to take several more breaths than breathing normally

2. This is because you are breathing out CO_2 into the bag (Cellular waste!) The amount of CO_2 in you lungs is measured by your Medulla Oblongata (in your brain stem). Too much CO_2 causes you to take in a new breath

3. This is why you can hold your breath until you pass out, but as soon as you are unconscious your medulla oblongata kicks in and makes you breath again!

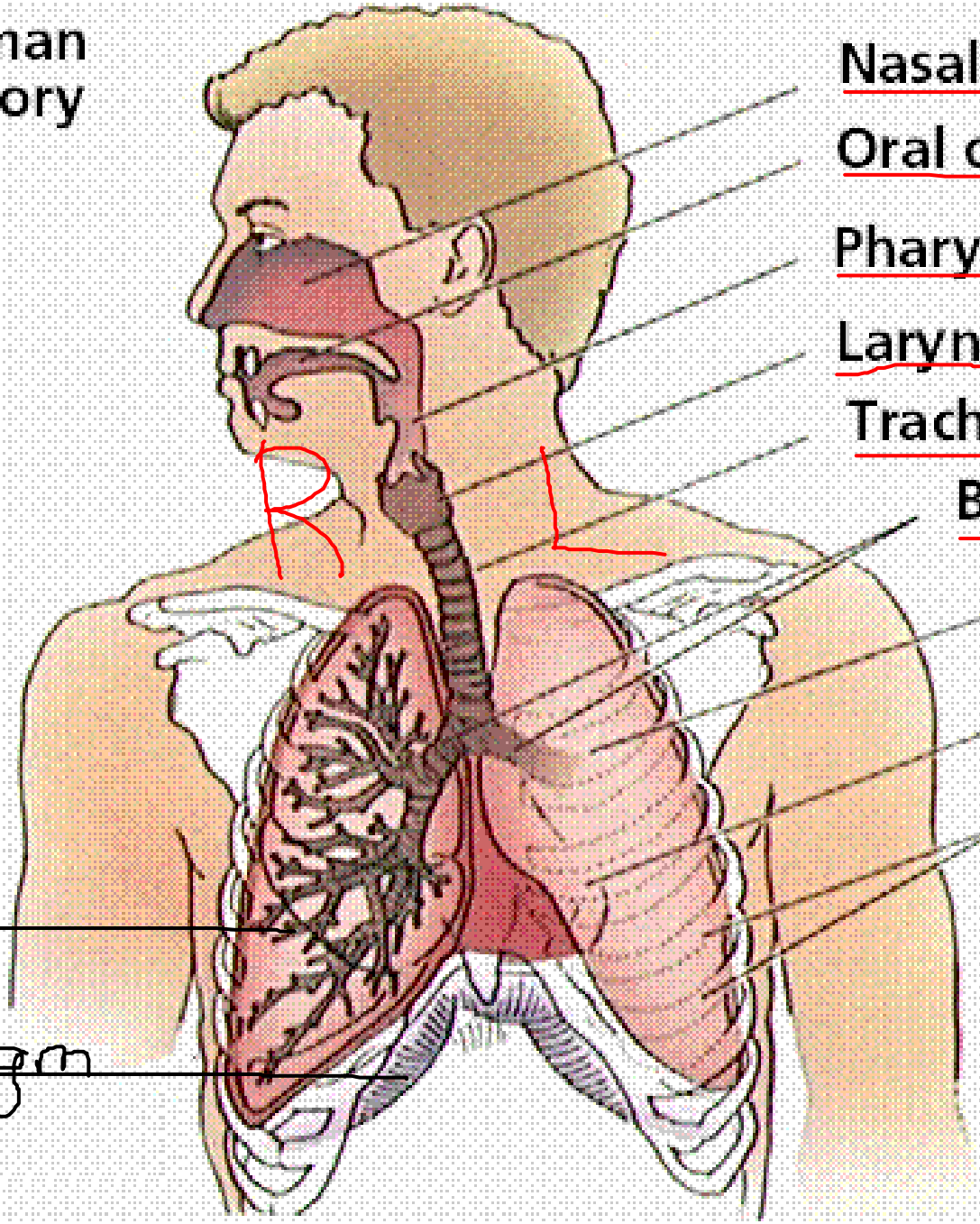




The Respiratory System

Supplies your blood with fresh oxygen and removes carbon dioxide waste

The Human Respiratory System

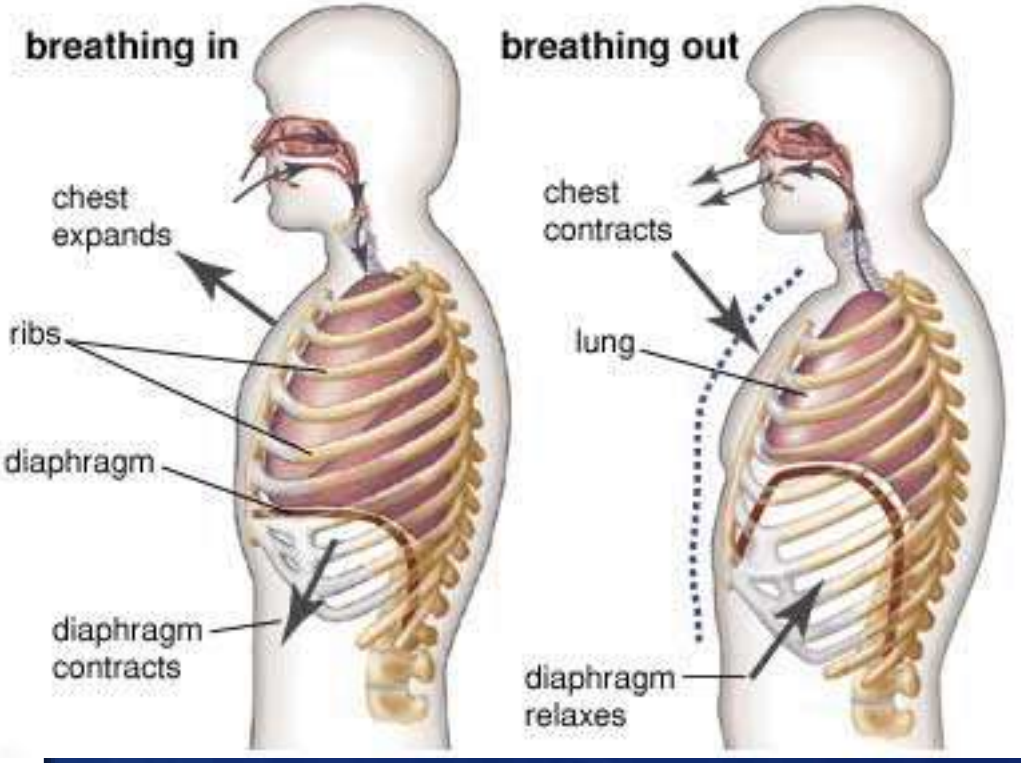


Breathing

Copy

Diaphragm: Large muscle below the lungs that helps move air in and out of the lungs

- Breathing in:
  - The muscles in your torso contract, pulling the ribs up and the diaphragm down
  - The lungs get bigger and clean air is pushed in (oxygen)
- Breathing out:
  - The muscles relax (ribs in, diaphragm up)
  - The lungs get smaller and push dirty air out (carbon dioxide)



The Gas Exchange Process

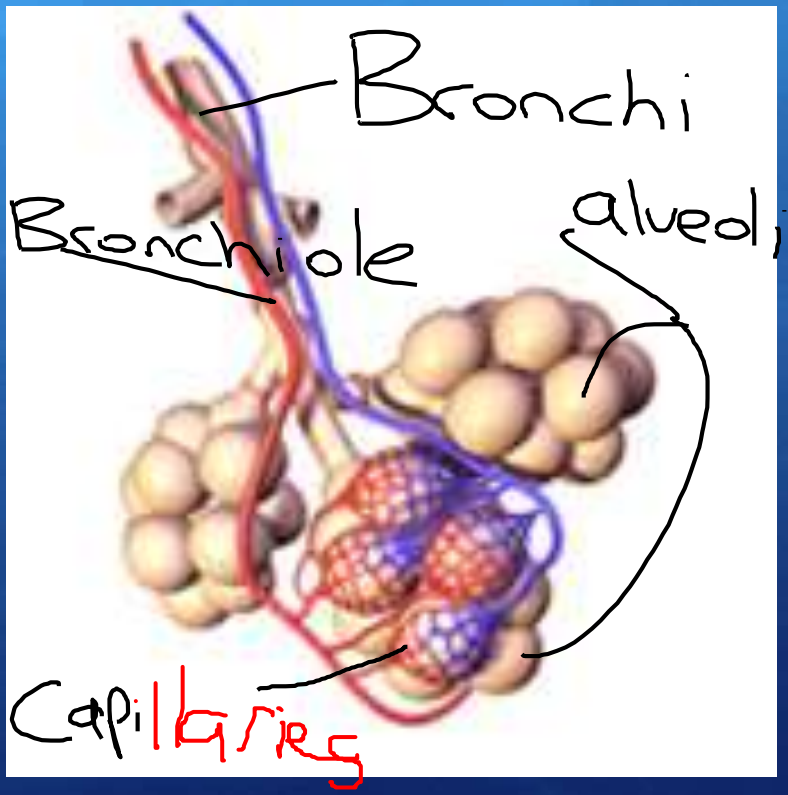
Bronchi – two main branches off of the trachea that lead into the lungs

Bronchioles – tubes that connect bronchi to air sacks (alveolus) in lungs

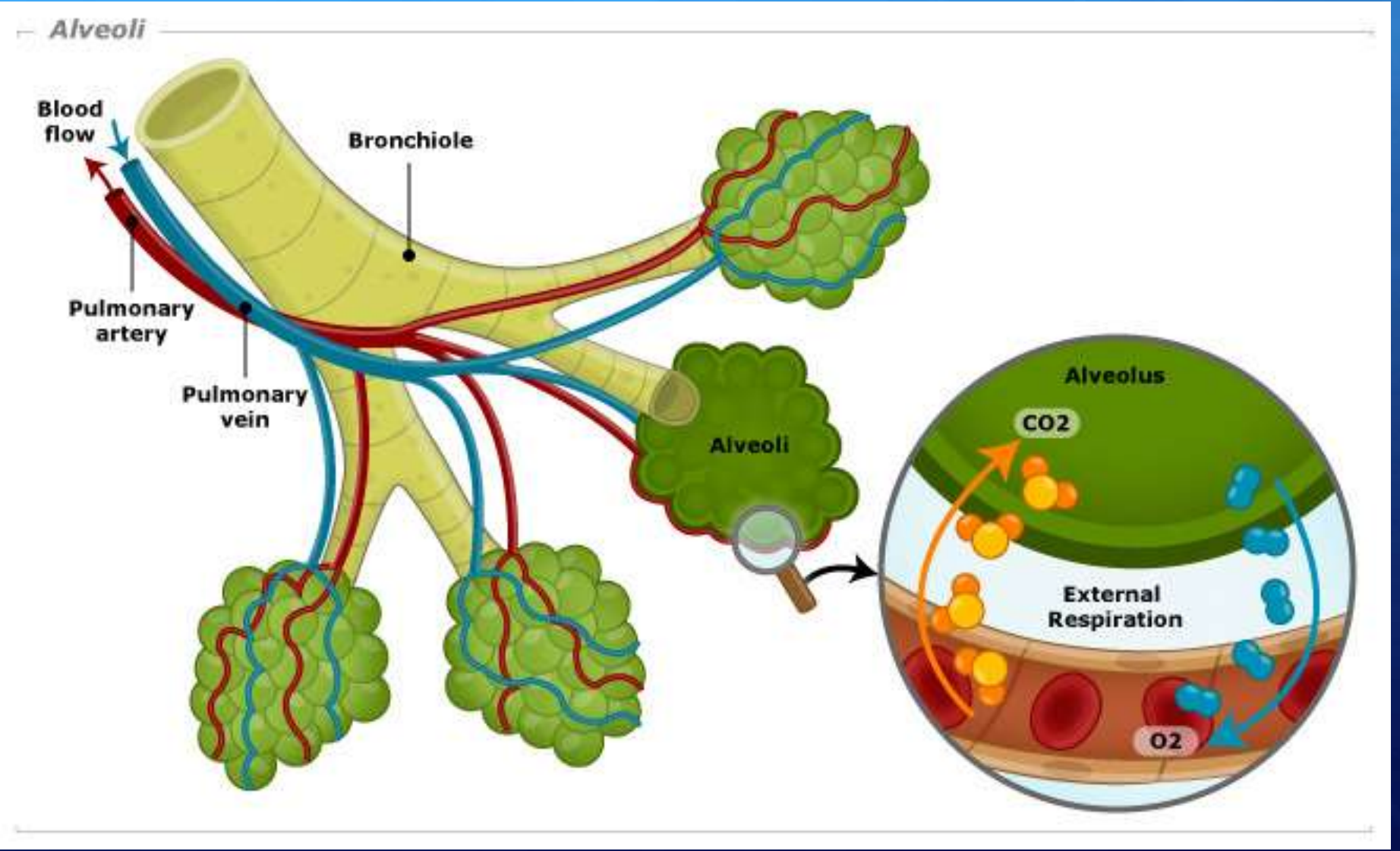
Alveoli – Tiny air filled sacs in the lungs. The site of gas exchange

Draw the diagram from the white board into your notes.

Lung Lobes



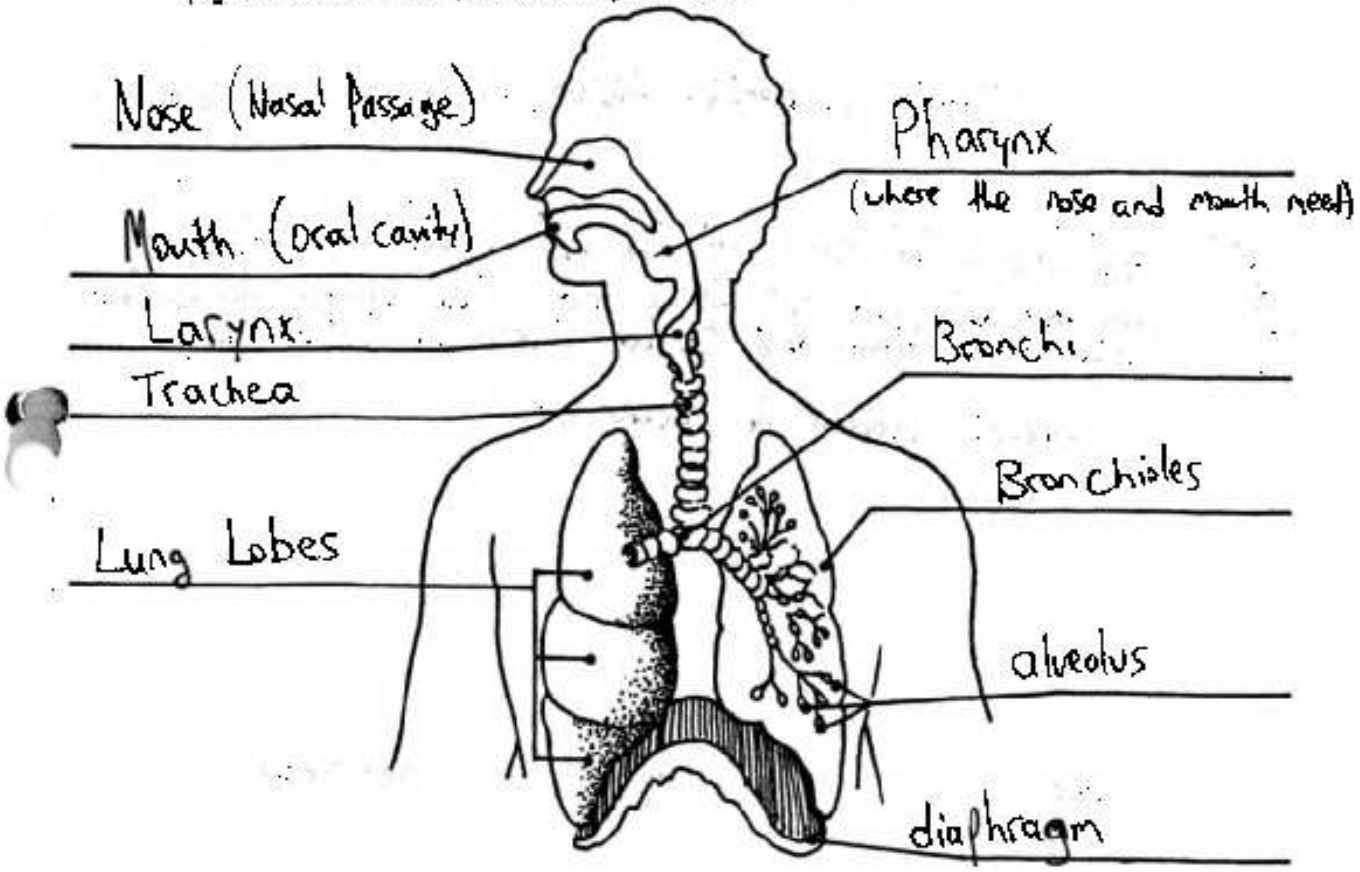
GAS EXCHANGE



The Respiratory System

Your body needs oxygen in order to survive, and it also must rid itself of carbon dioxide. Both of these needs are met by breathing. Breathing is the process your respiratory system uses to move air in and out of your lungs.

Using your knowledge of the *Respiratory System* and your Science in Action textbook, pages 132-134, correctly label the diagram below.



Unit 8: Cells and Systems
Topic 3.2 Respiratory System
Vocabulary Exercise

1) Breathing occurs because of your rib cage and diaphragm muscles. When you inhale these muscles contract, pulling your ribs up and your diaphragm down.

2) A. The respiratory system draws air into the lungs through a series of tube-like passageways called bronchi

B. Describe what these passageways are made of and why they are made of such material? - Tough connective tissue to keep from collapsing

3) What are alveoli and what do they do?
Tiny air filled sacs at the end of each bronchiole. They are only one cell thick and allow oxygen to diffuse into your blood, and Carbon dioxide to diffuse out.

4) What role do bronchioles play in the respiratory system?
Connect bronchi to bronchioles alveoli.

5) Your body needs oxygen in order to survive. What waste gas must it rid itself of?

4) What role do bronchioles play in the respiratory system?

Connect bronchi to ~~bronchioles~~ alveoli

5) Your body needs oxygen in order to survive. What waste gas must it rid itself of?

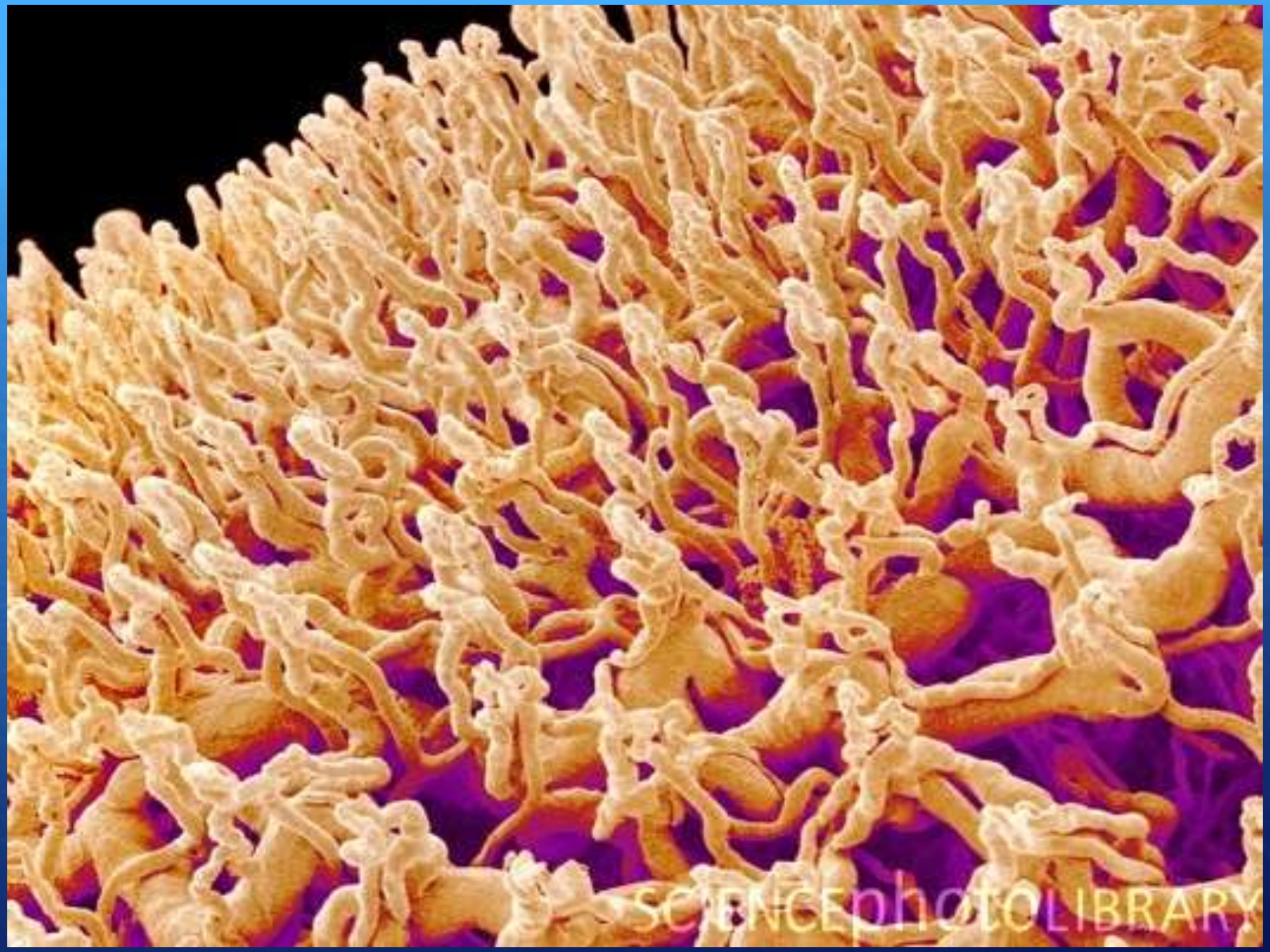
CO_2

6) When you exhale your diaphragm and rib muscles relax. In this case, your ribs go down and your diaphragm goes up. This decreases the size of your chest and lungs which forces air out.

7) Describe, in order, the pathway of air into the lungs.

Nose / Mouth, Pharynx, Larynx, Trachea, Bronchi, bronchioles, alveoli, blood capillaries in lungs.

1


SCIENCEphotoLIBRARY

Factors that affect the respiratory system

The biggest factor is……?

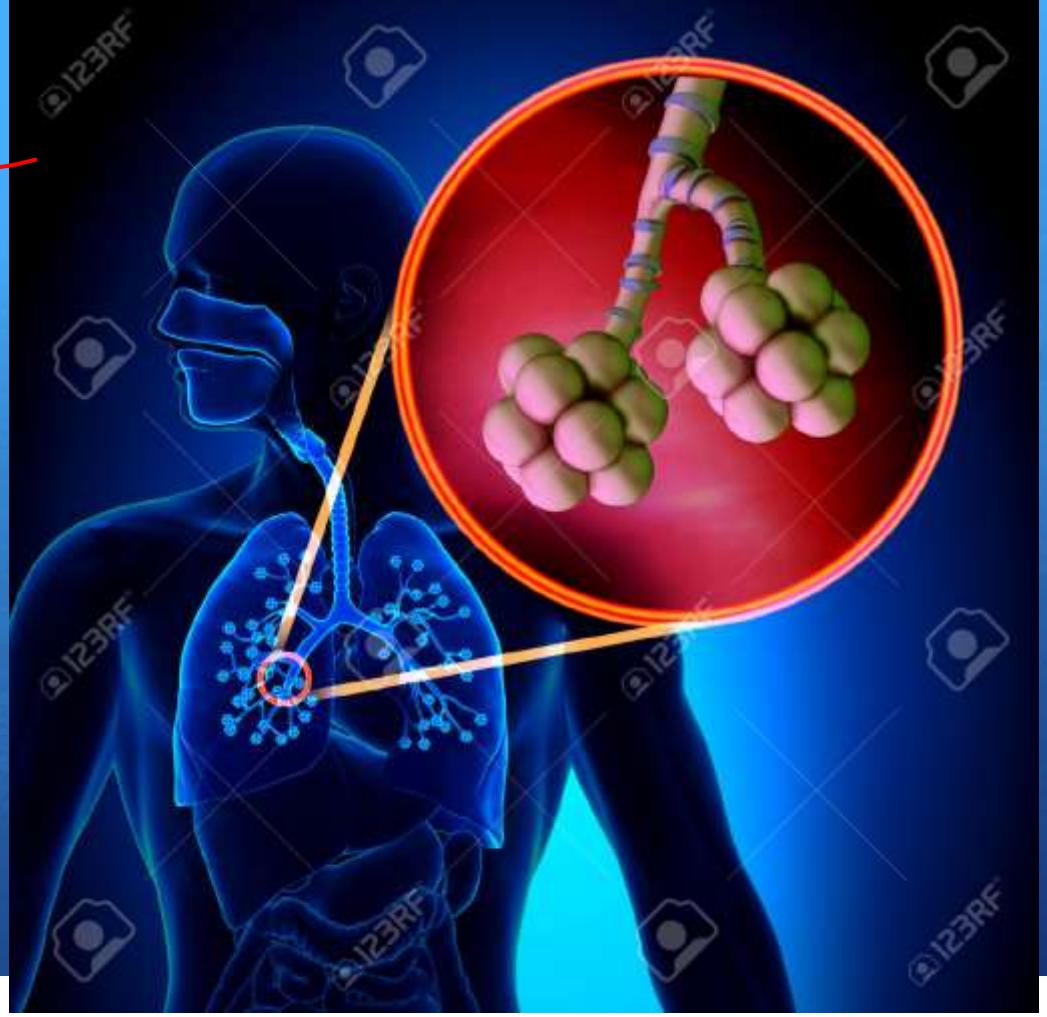
Your Assignment

C / R P 134: 1-4:

#1: (include diaphram, nose / mouth, trachea, lungs (bronchi, bronchiole, alveolus, capillary)

"Help Me Get to Know You" sheets

Name



Respiratory Systems Quiz (13 marks)

Respiratory Quiz

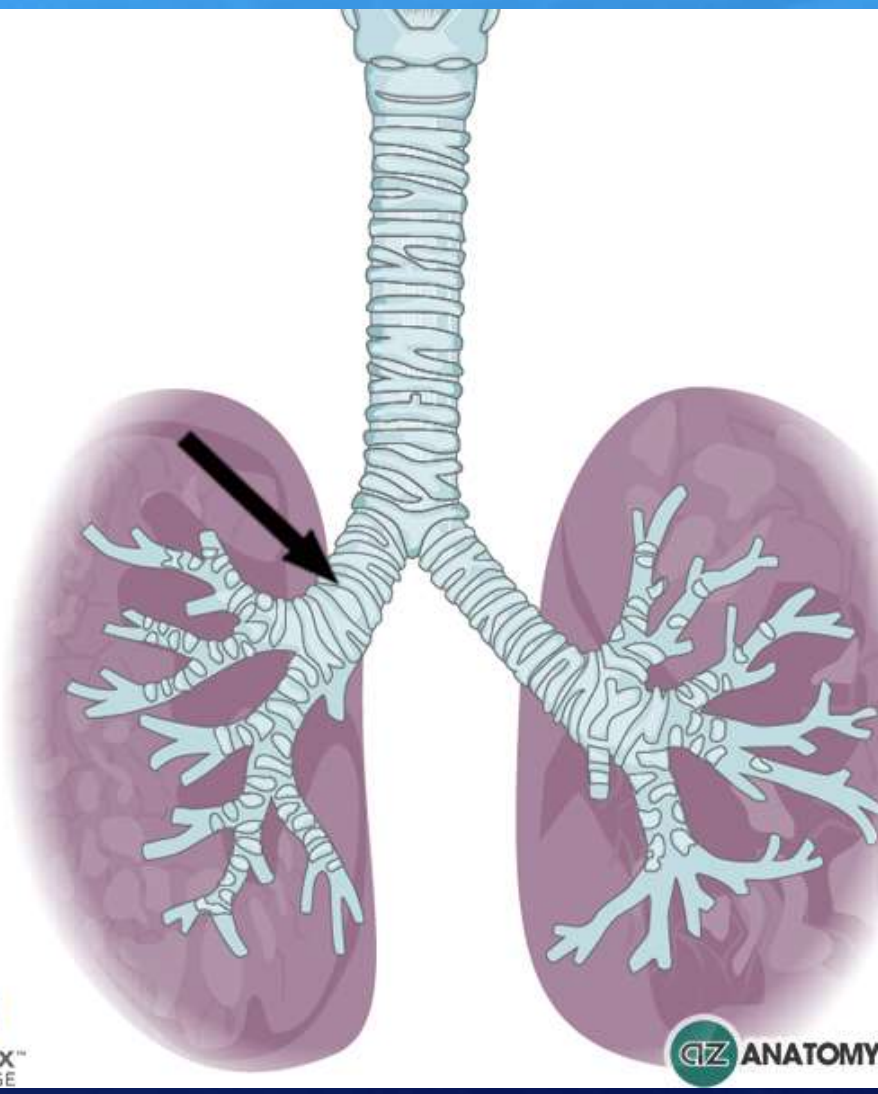
1. The arrow is point to

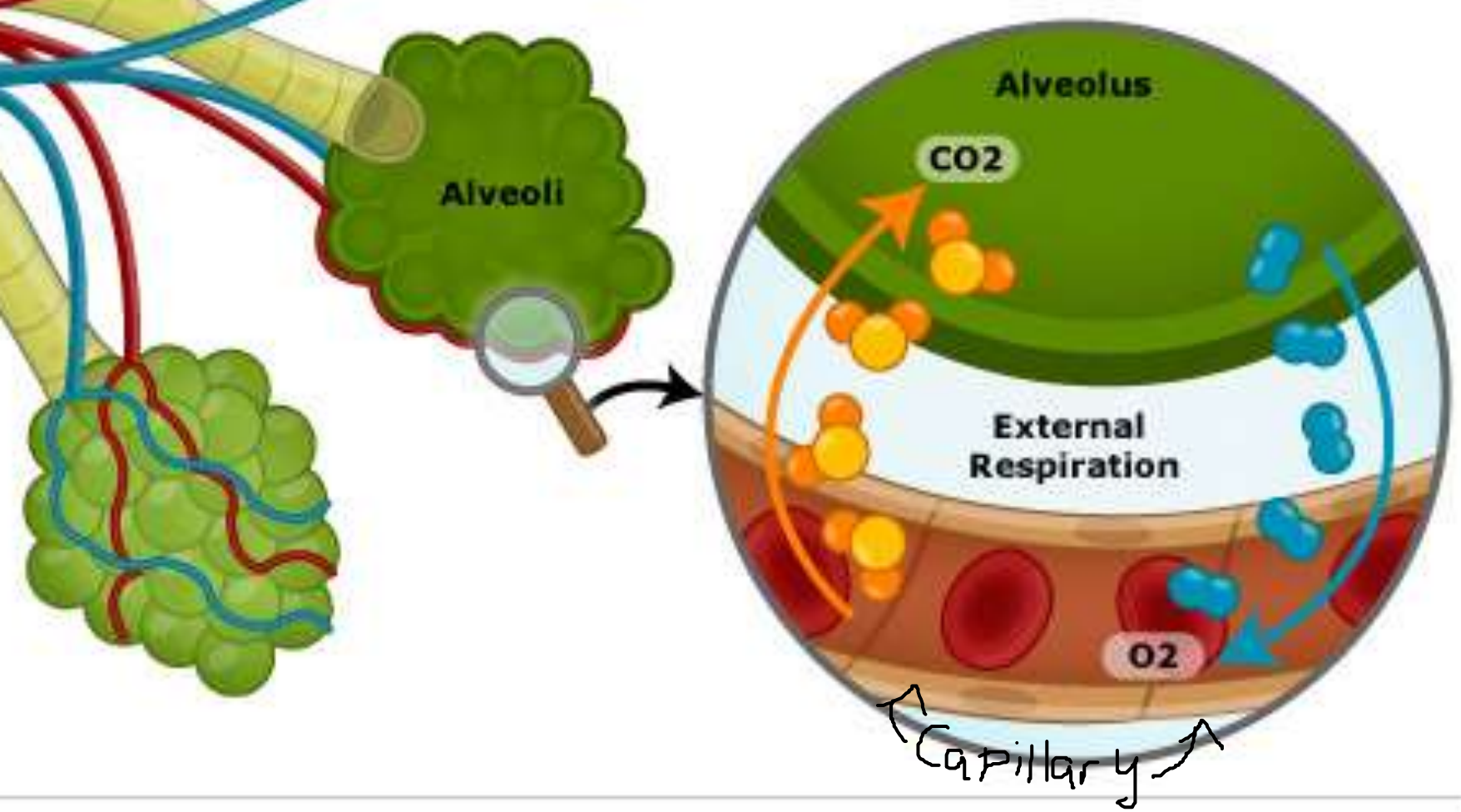
a. Bronchioles

b. Bronchi

c. Alveoli

d. Trachea





Digestive, Respiratory, Circulatory Quiz

2. This diagram represents
   a. Oxygen Diffusing into Blood
   b. Carbon Dioxide Diffusing out of Blood
   c. Gas Exchange
   d. All of the above

Respiratory Quiz

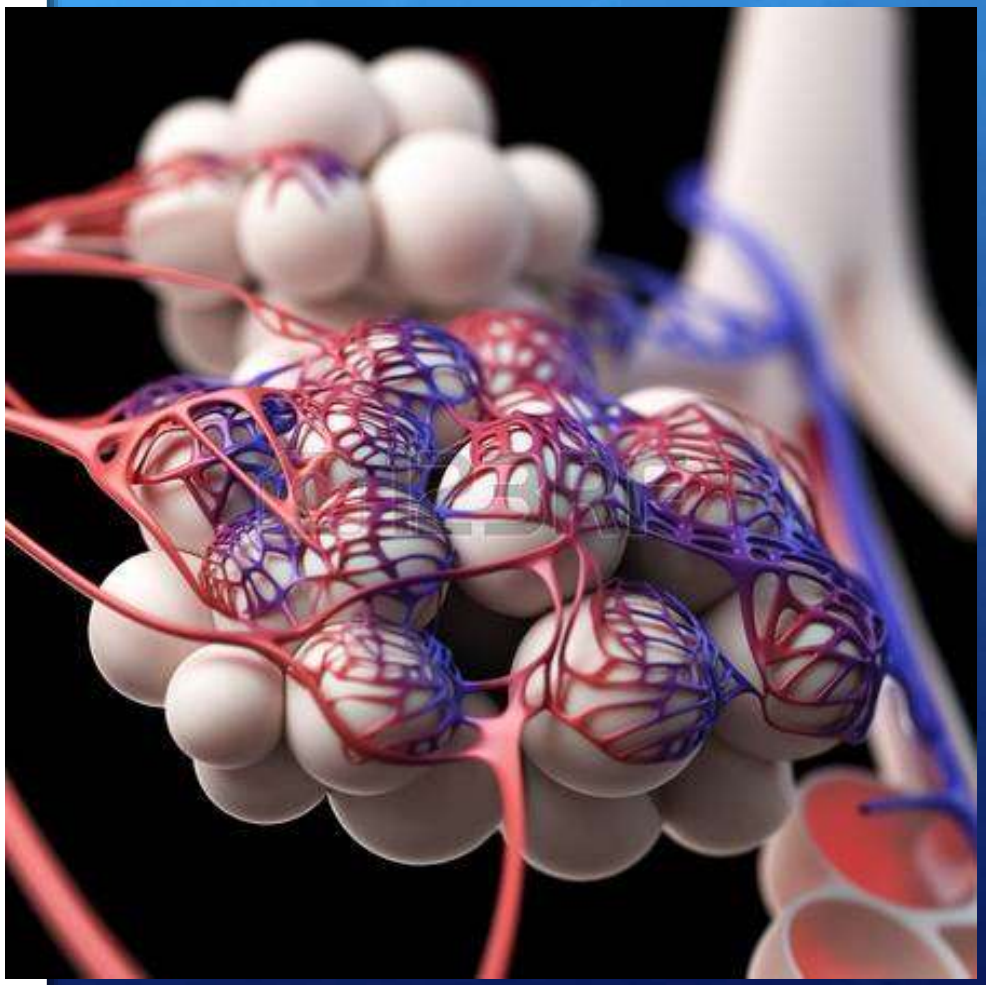
3. Alveoli are always surrounded by

a. Capillaries

b. Bronchi

c. Gastric Juices

d. Trachea



Respiratory Quiz

4. BREATHING IN involves

a. Much concentration

b. Diaphragm relaxing and raising, rib cage dropping

c. Gastric Juices

d. Diaphragm contracting and dropping, rib cage rising

Respiratory Quiz

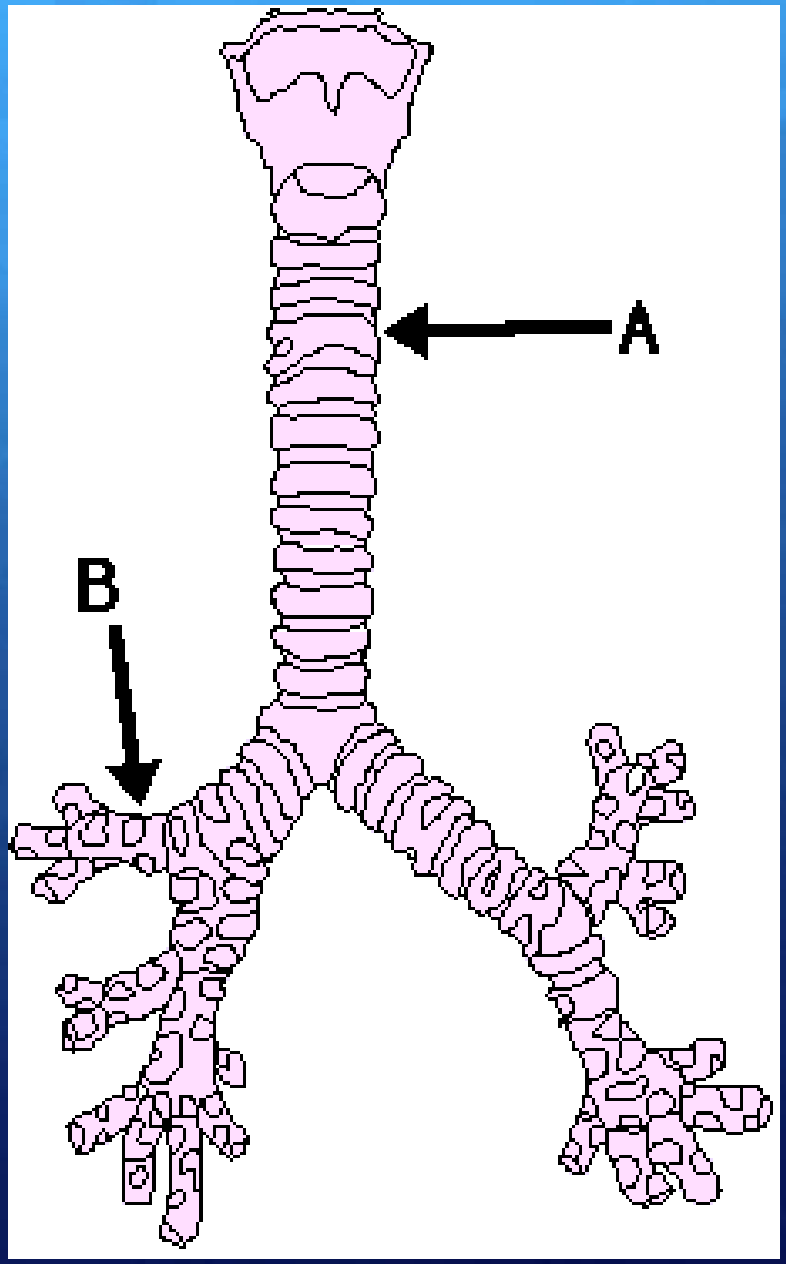
5. A is pointing to

a. Bronchioles

b. Esophagus

c. Trachea

d. Pharynx



Respiratory Quiz

6. Which is true about the RESPIRATORY system

a. It delivers oxygen to the blood

b. It delivers nutrients to the blood

c. Removes Carbon Dioxide waste from blood

d. A and C

Respiratory Quiz

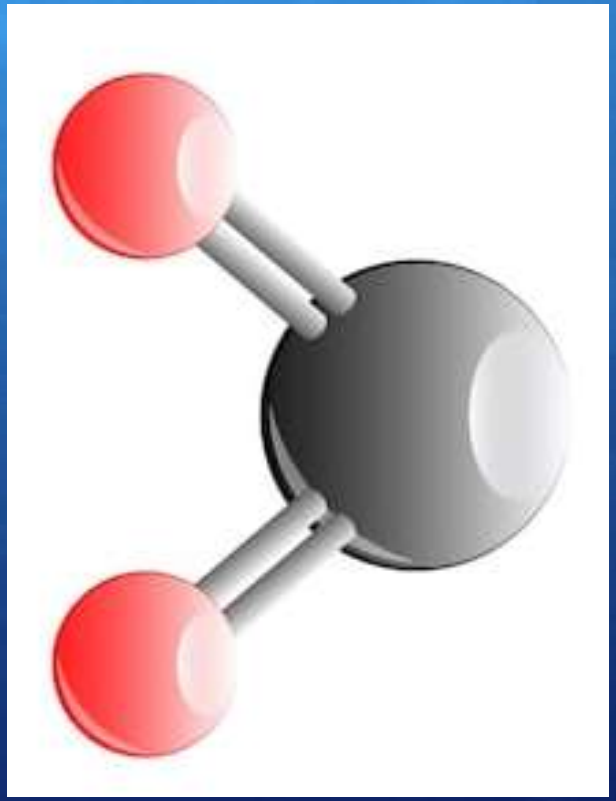
7. What toxic waste product builds up in blood, triggering an exhale?

a. Oxygen

b. Carbon Dioxide

c. Ammonia

d. Bile



Respiratory Quiz

8. What part of the brain detects waste buildup in blood, triggering an exhale?

a. Cerebral Cortex

b. Uvula

c. Medulla Oblongata

d. Hypothalamus

Respiratory Quiz

9. BREATHING OUT involves

a. Much concentration

b. Diaphragm relaxing and raising, rib cage dropping

c. Gastric Juices

d. Diaphragm contracting and dropping, rib cage rising

Respiratory Quiz

10. What happens to your respiration rate while exercising? Why? (2 marks)

Respiratory Quiz

11. What would happen to your respiration rate if you breathed into a paper bag for five minutes? Why? (2 marks)

Circulatory System "Transportation Network"

Delivers nutrients and oxygen to every cell, then removes those cell's waste products. (metabolic waste)

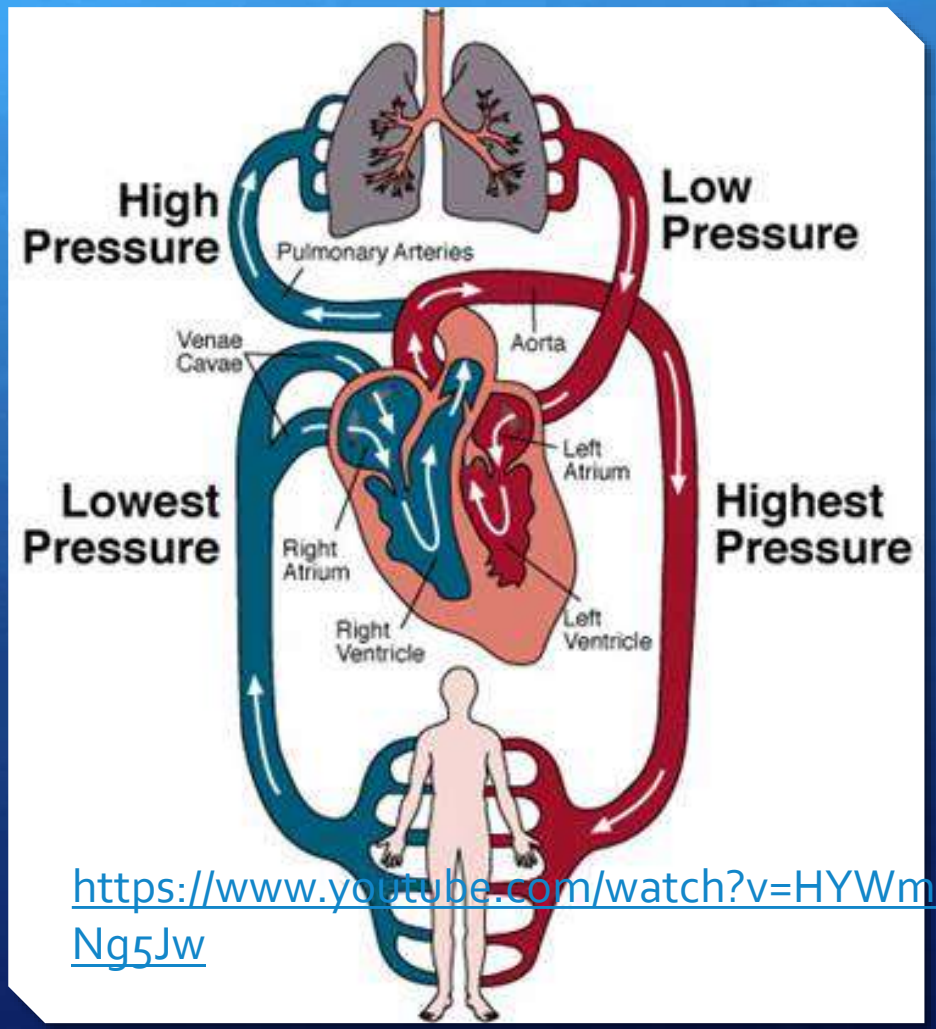
Pigs Heart

http://www.youtube.com/watch?v=ZbgFKB7u4n8

https://www.youtube.com/watch?v=rrhVgdoezQ4

https://www.youtube.com/watch?v=G4dFVeP9Vdo

https://www.youtube.com/watch?v=qmpd82mpVO4



https://www.youtube.com/watch?v=HYWmYNg5Jw

The Heart

- A combination of 2 pumps: (Right side and left side

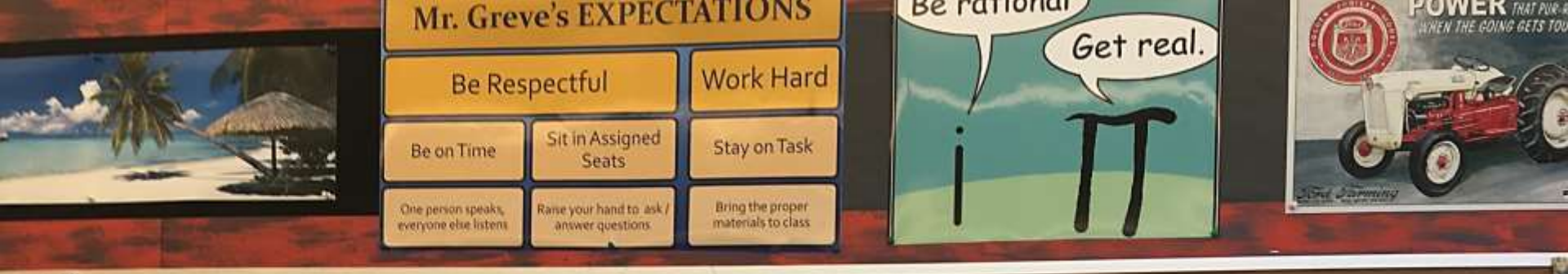
- Right side pumps "used" blood into your lungs

- Left side pumps oxygen-rich blood from the lungs to your body

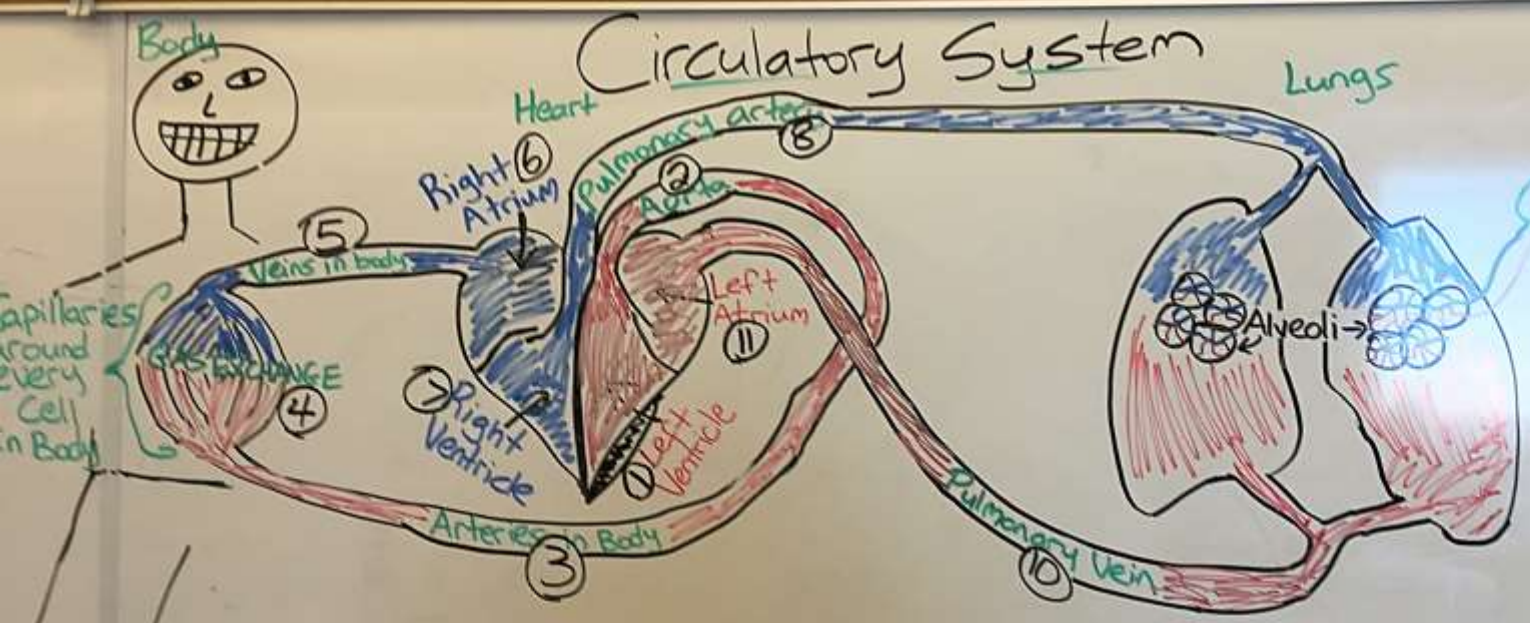
- Atria: Top two chambers of the heart

- Ventricles: Bottom two chambers of the heart

- Get up! Heart Rate Activity



Circulatory System



Oxygen Rich Blood

Deoxygenated Blood

Circulatory System

The Path of Blood: copy diagram as well

1. **LEFT VENTRICLE** squeezes oxygen rich blood to aorta
2. **AORTA** distributes blood to major arteries
3. **ARTERIES** take oxygen rich blood to body
4. Oxygen diffuses into body's cells and carbon dioxide diffuses out in **CAPILLARIES** (GAS EXCHANGE). Blood is now deoxygenated
5. Blood returns to heart in **VEINS**
6. Blood enters **RIGHT ATRIUM**
7. Blood passes a valve into the **RIGHT VENTRICLE** where it is squeezed into the **PULMONARY ARTERY**
8. **PULMONARY ARTERY** takes blood to lungs
9. **CAPILLARIES** in lungs release carbon dioxide from blood and take in oxygen (GAS EXCHANGE). Blood is now oxygenated
10. **PULMONARY VEIN** returns blood to heart
11. Blood enters **LEFT ATRIUM** then passes through a valve to the **LEFT VENTRICLE**

RED: OXYGENATED BLOOD (O_2 RICH)
BLUE: DEOXYGENATED BLOOD

Arteries, Veins, Capillaries

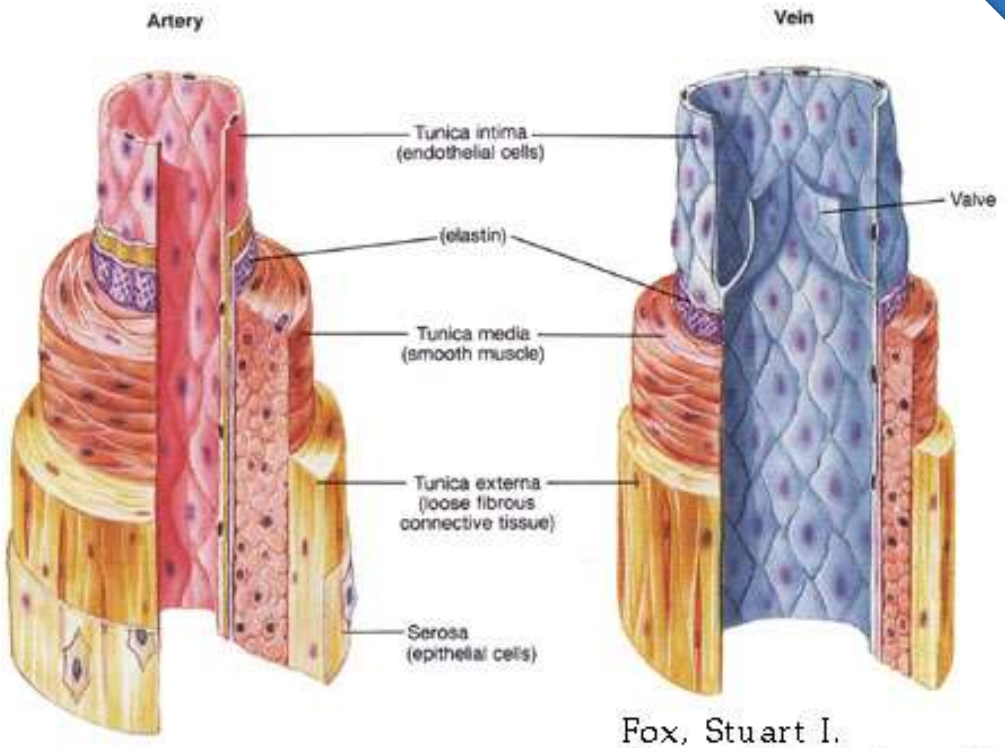
The Body has 100000 km of blood vessels

Arteries: Oxygen-rich blood is pumped away from the heart to the body in arteries (pulse)

Veins: Blood and waste products (CO_2) return to the heart in veins

Capillaries: Where gas exchange takes place. Made of epithelial tissue only 1 cell thick to allow for diffusion or O_2 and CO_2

Thin Narrow



Fox, Stuart I.
Human Physiology 4th
Brown Publishers

The Blood

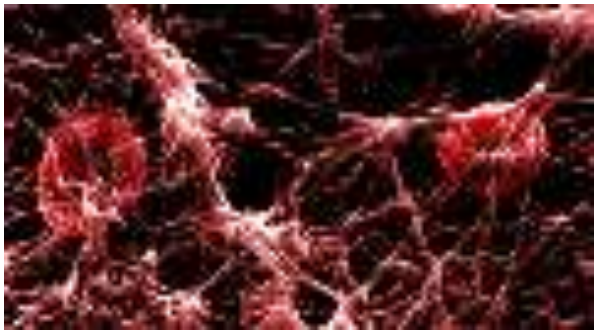
55% plasma: Liquid: Holds Nutrients and CO_2

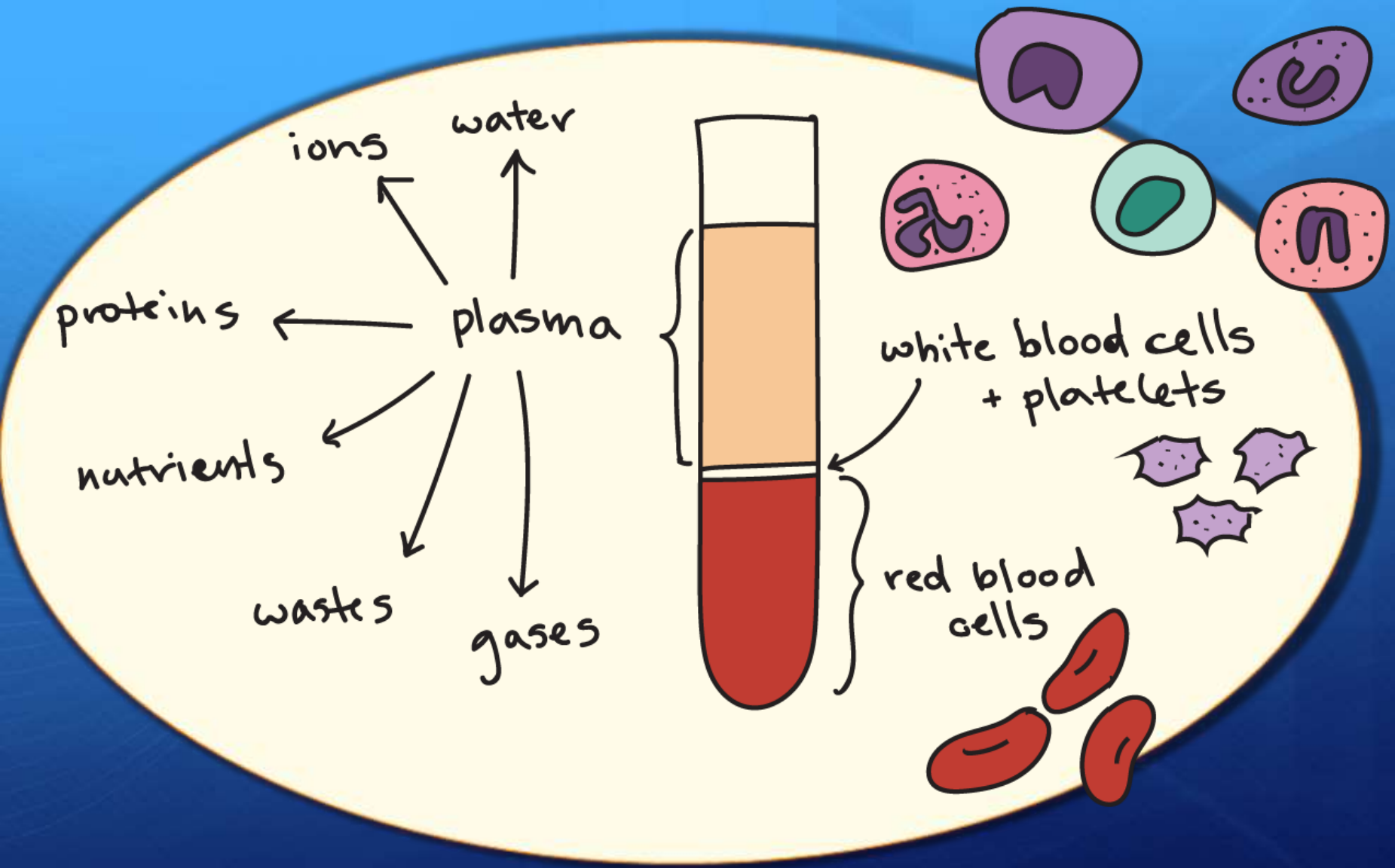
45% red blood cells (carry O_2), white blood cells, and platelets

White Blood Cells: Specialized cells to fight infection The Angry Macrophage

Platelets: Help stop bleeding of cuts

Billy Nye, Heart: 0 – 5:10




ions
water
proteins
plasma
nutrients
wastes
gases
white blood cells
+ platelets
red blood
cells

USING THE DIAGRAM ON PAGE 137, List the path blood takes from the left ventricle, to the body, and back to the left ventricle. USE ALL OF THE LABLES PLEASE

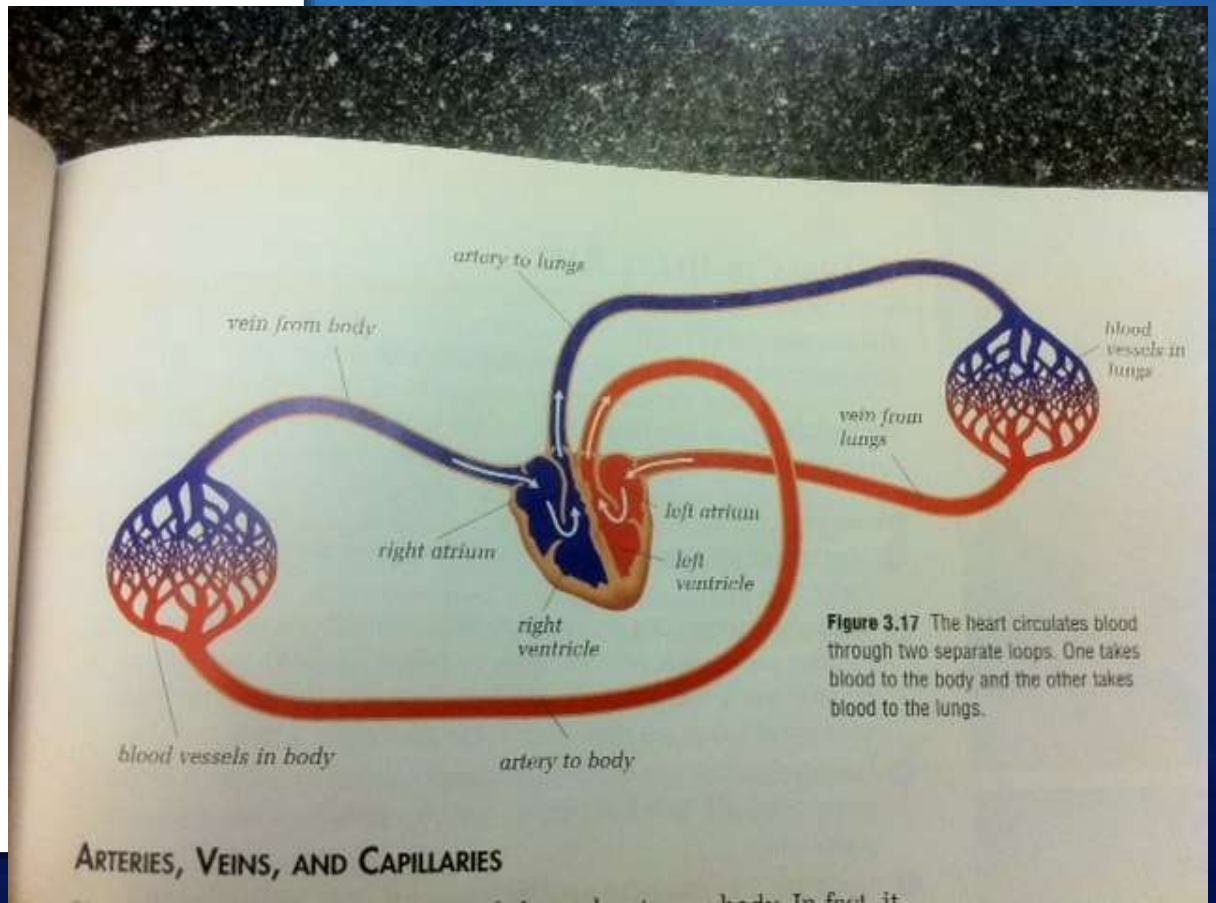


Figure 3.17 The heart circulates blood through two separate loops. One takes blood to the body and the other takes blood to the lungs.

Arteries, Veins, and Capillaries

Your Assignment

Heart Handout (both sides)

C/R p 140 # 1, 3-5

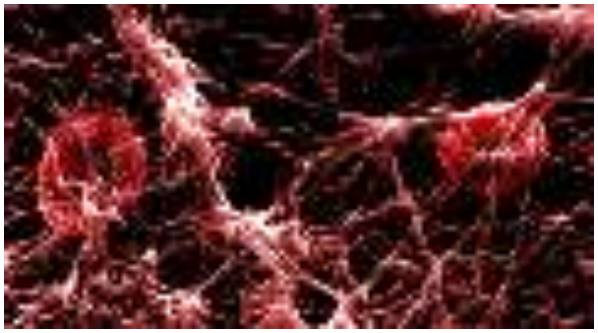
We will mark C/R at the end of class.

The Blood

List the 4 types of cells and materials found in the blood. What is the function of each?

On the back: What is the order the blood flows through from the point that oxygen physically enters the body? (use below)

Capillaries, Heart, Lungs, arteries, veins



Name

Circulatory System Quiz (11 marks)

Circulatory Quiz

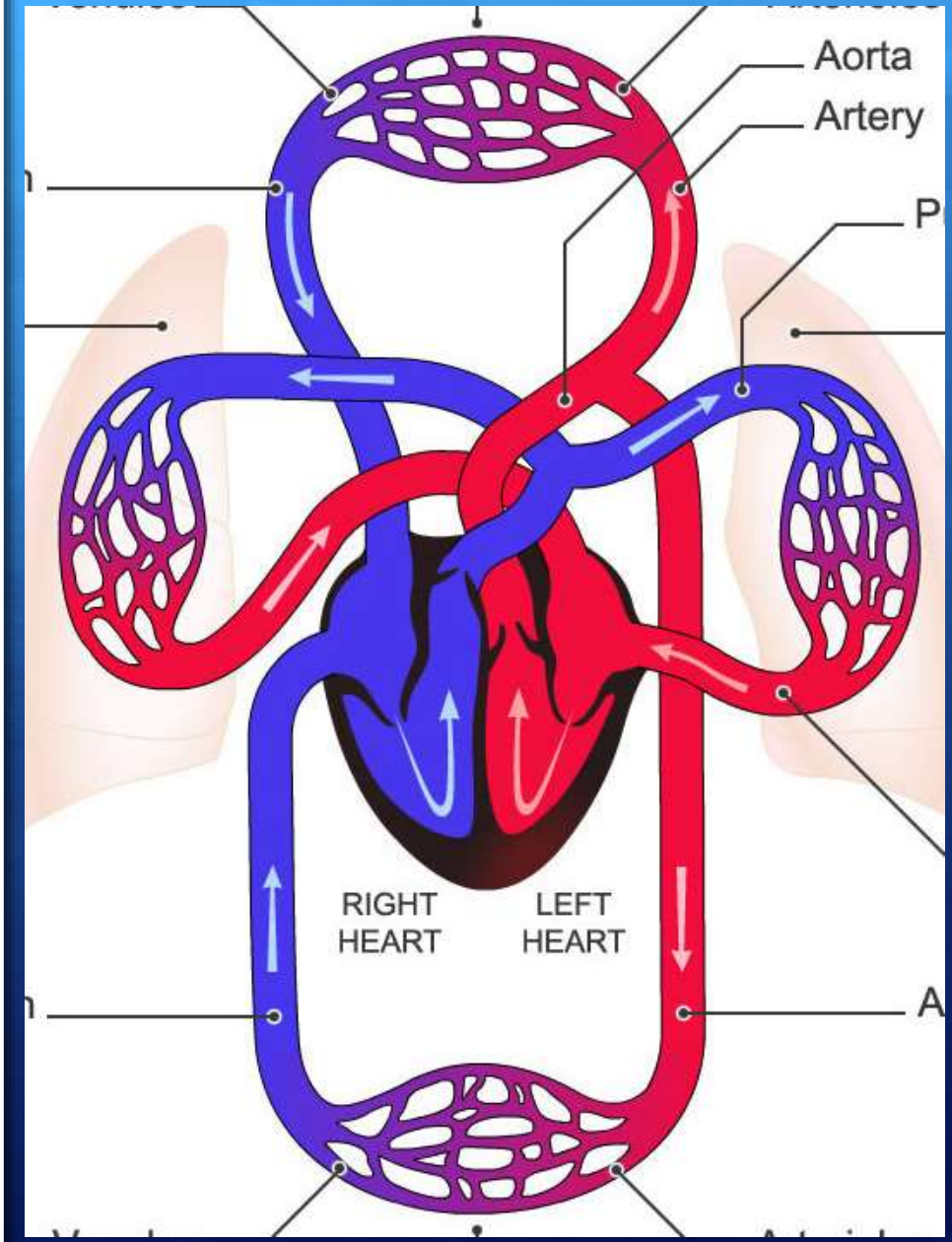
1. The right side of the heart pumps blood to the

a. Body

b. Left Side of the Heart

c. Lungs

d. All of the above



Circulatory Quiz

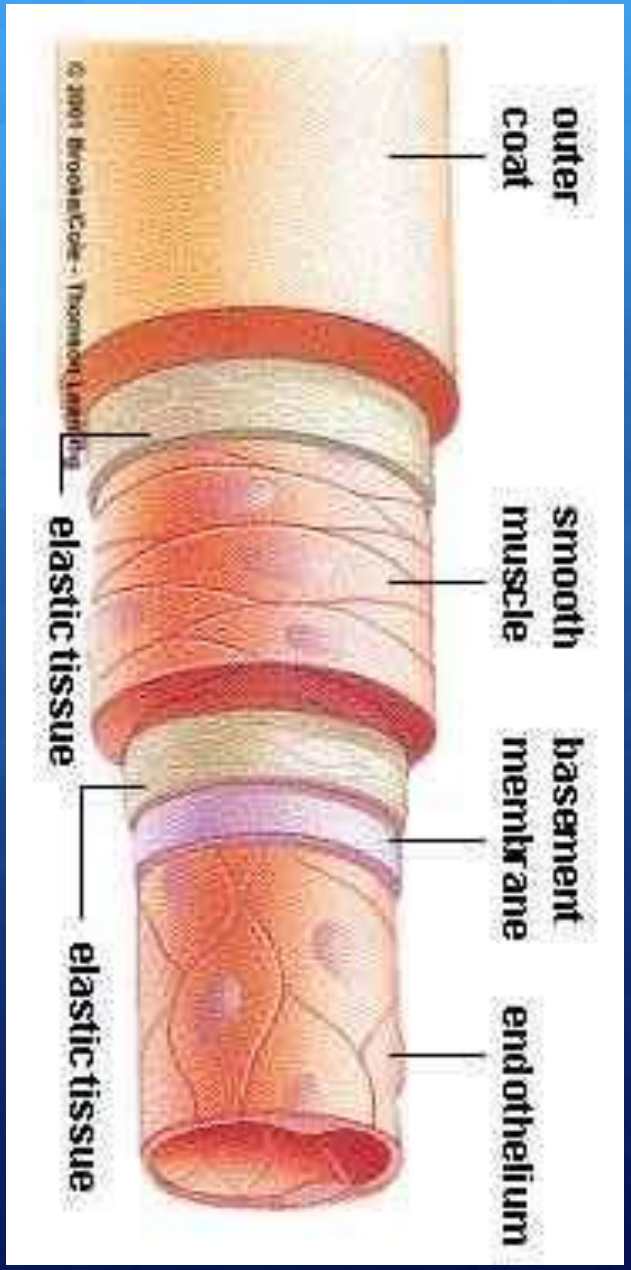
2. Blood Vessels that carry high pressure blood AWAY from the heart are called

a. Arteries

b. Veins

c. Capillaries

d. Valves



Circulatory Quiz

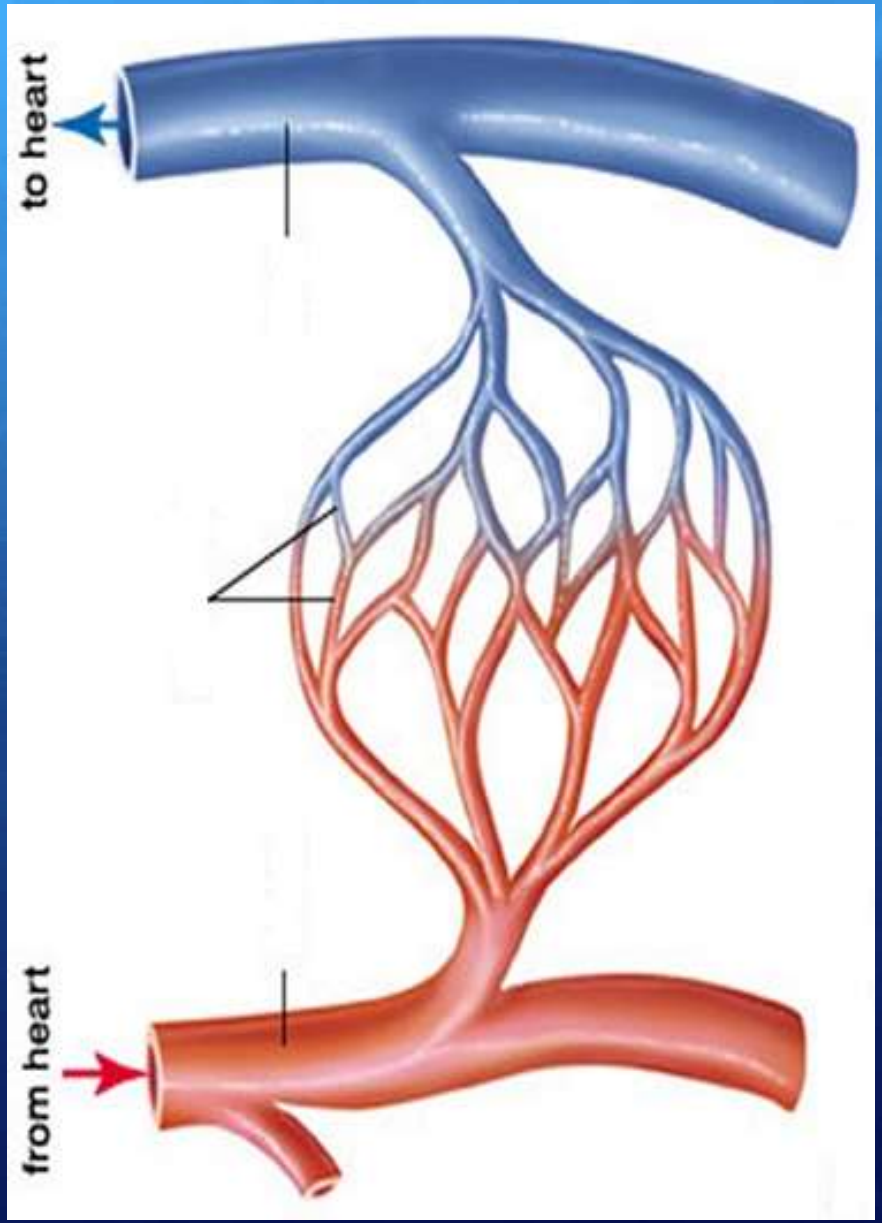
3. What is the smallest type of blood vessel? Hint: They allow exchange of gas and nutrients to every cell in the body

a. Arteries

b. Veins

c. Capillaries

d. Aortas



Circulatory Quiz

4. The Atria of the heart

a. Collect blood from lungs and body

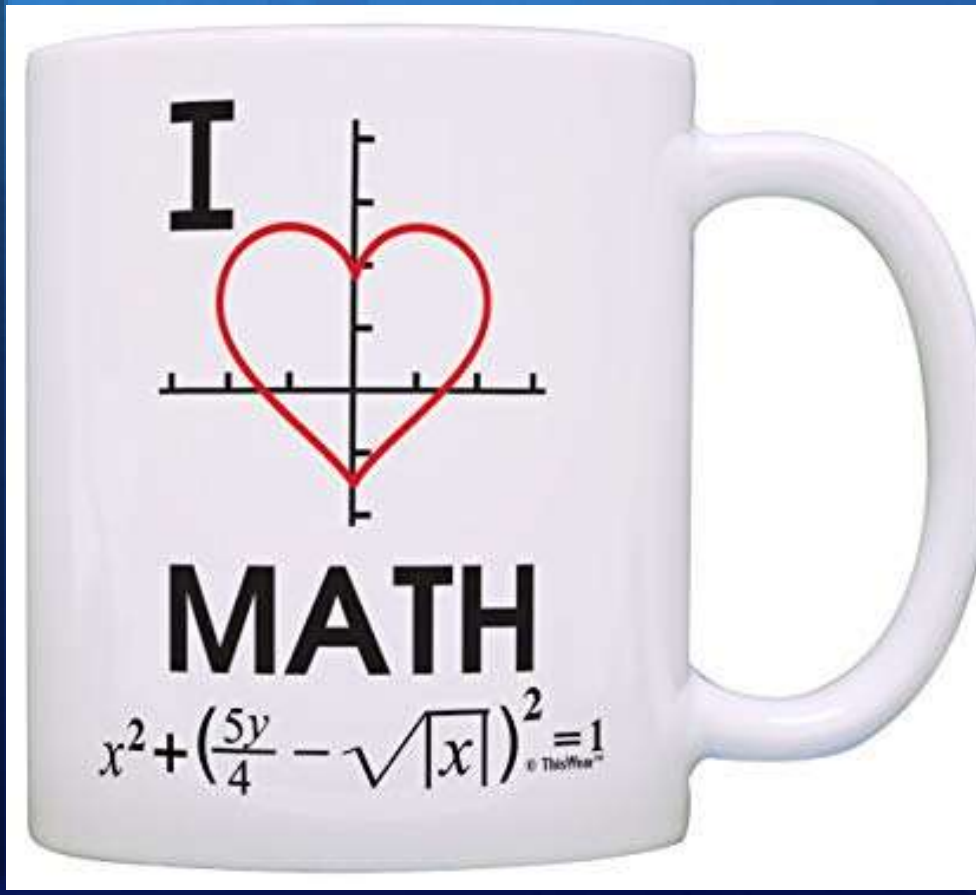
b. Squeeze blood out to lungs and body

c. Load the Ventricles

d. Collect blood from ventricles

e. Both a and c

f. Both b and d



Circulatory Quiz

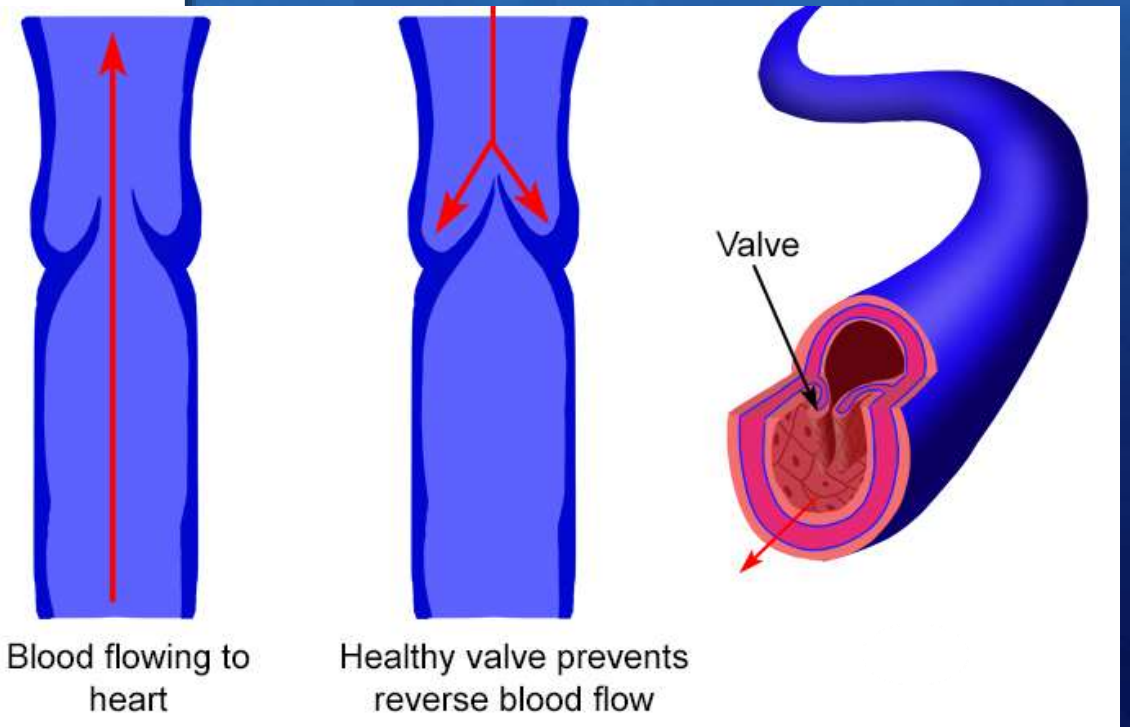
5. Which type of blood vessel has valves to prevent blood from traveling the wrong direction during he resting phase of the heartbeat?

a. Capillaries

b. Veins

c. Arteries

d. Aorta



Circulatory Quiz

6. Which chamber of the heart has the most muscle tissue surrounding it?

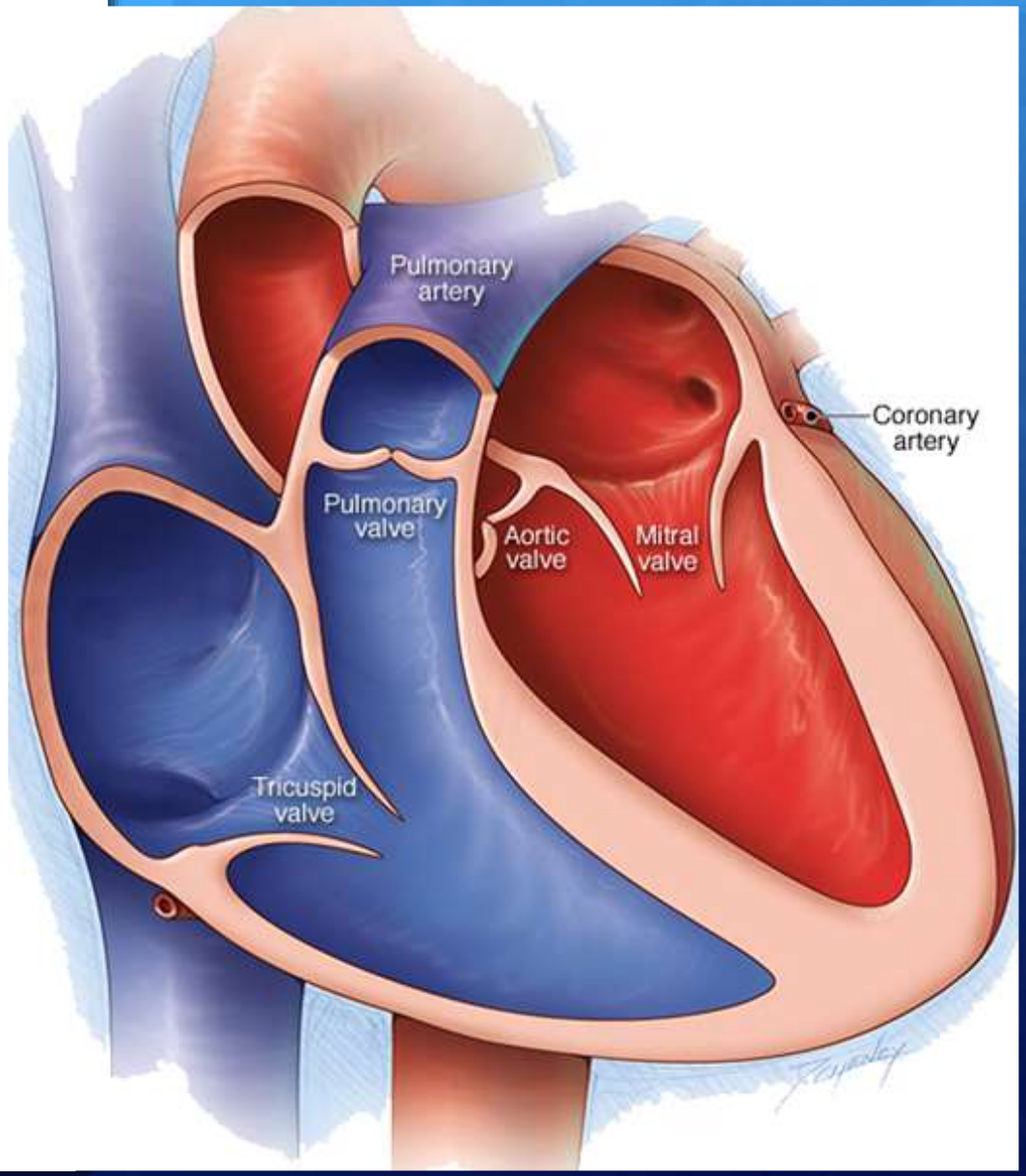
WHY? (2 marks)

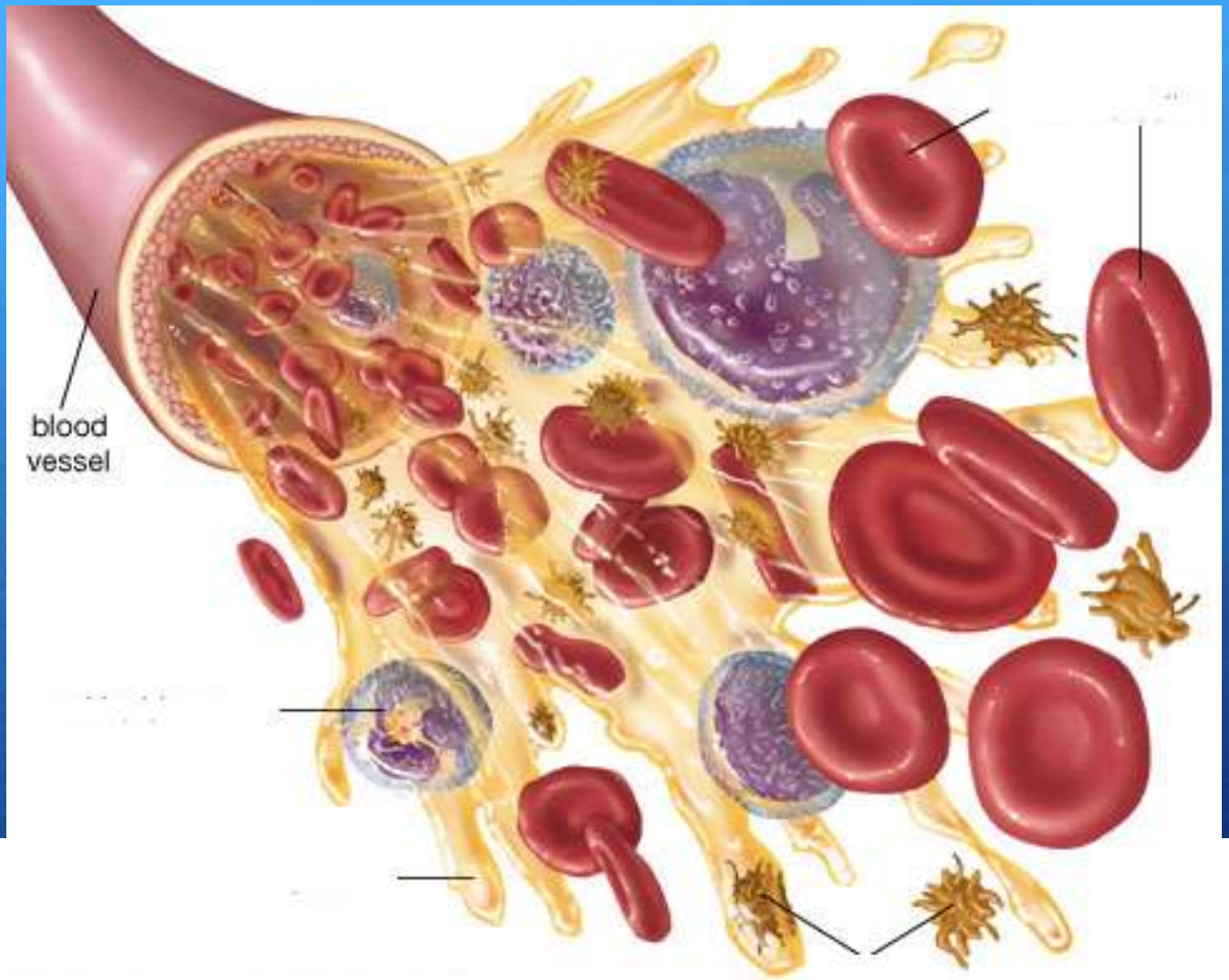
a. Right Atrium

b. Left Atrium

c. Right Ventricle

d. Left Ventricle





7. List the four parts of blood (4 marks)

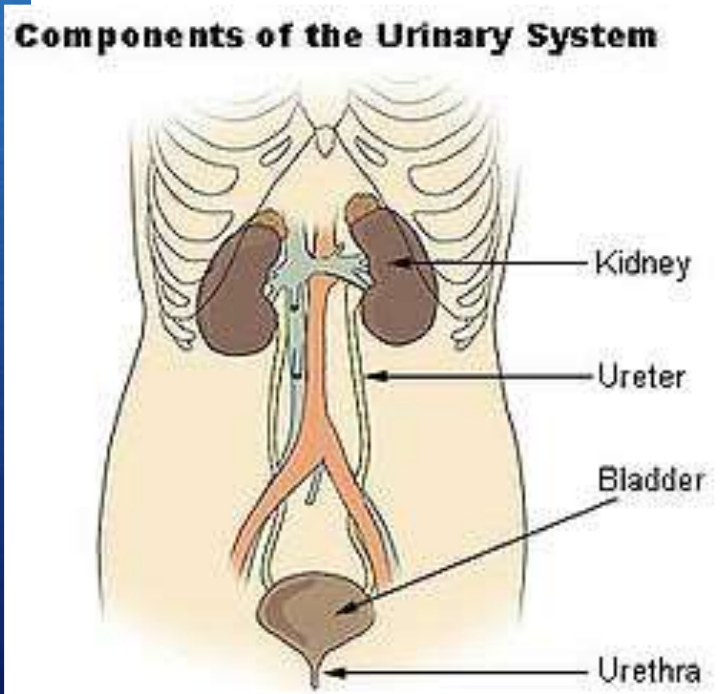

H
ELES

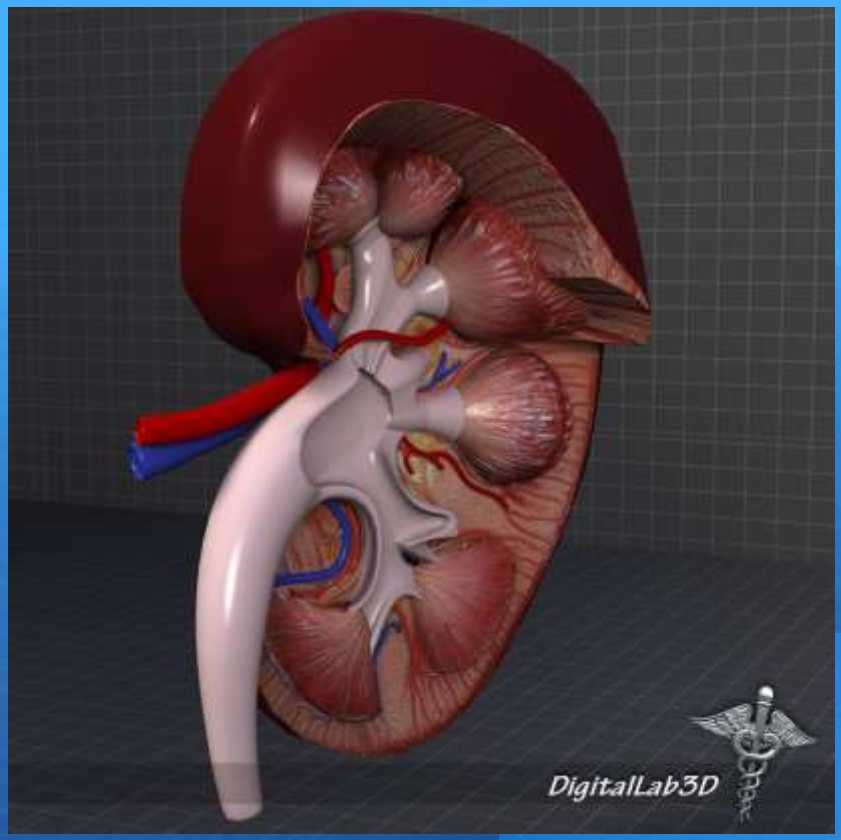

NASA

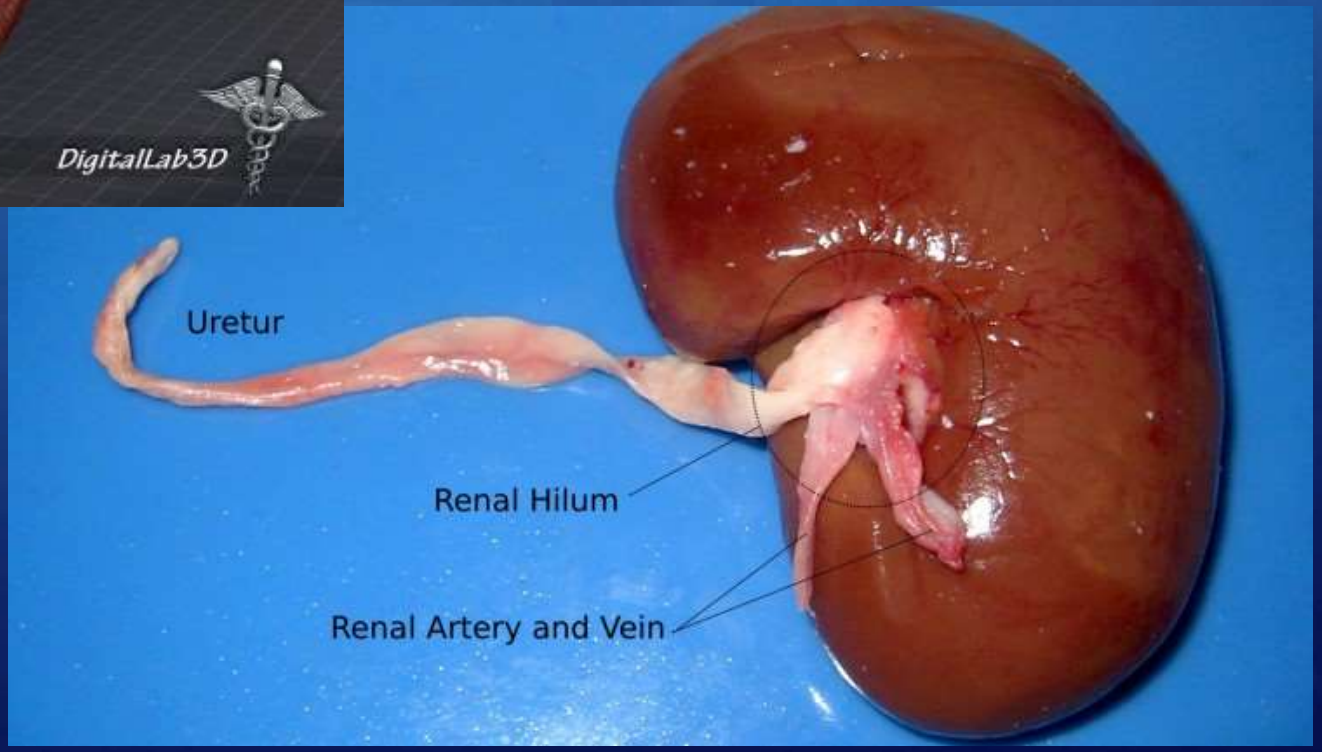
Excretory System

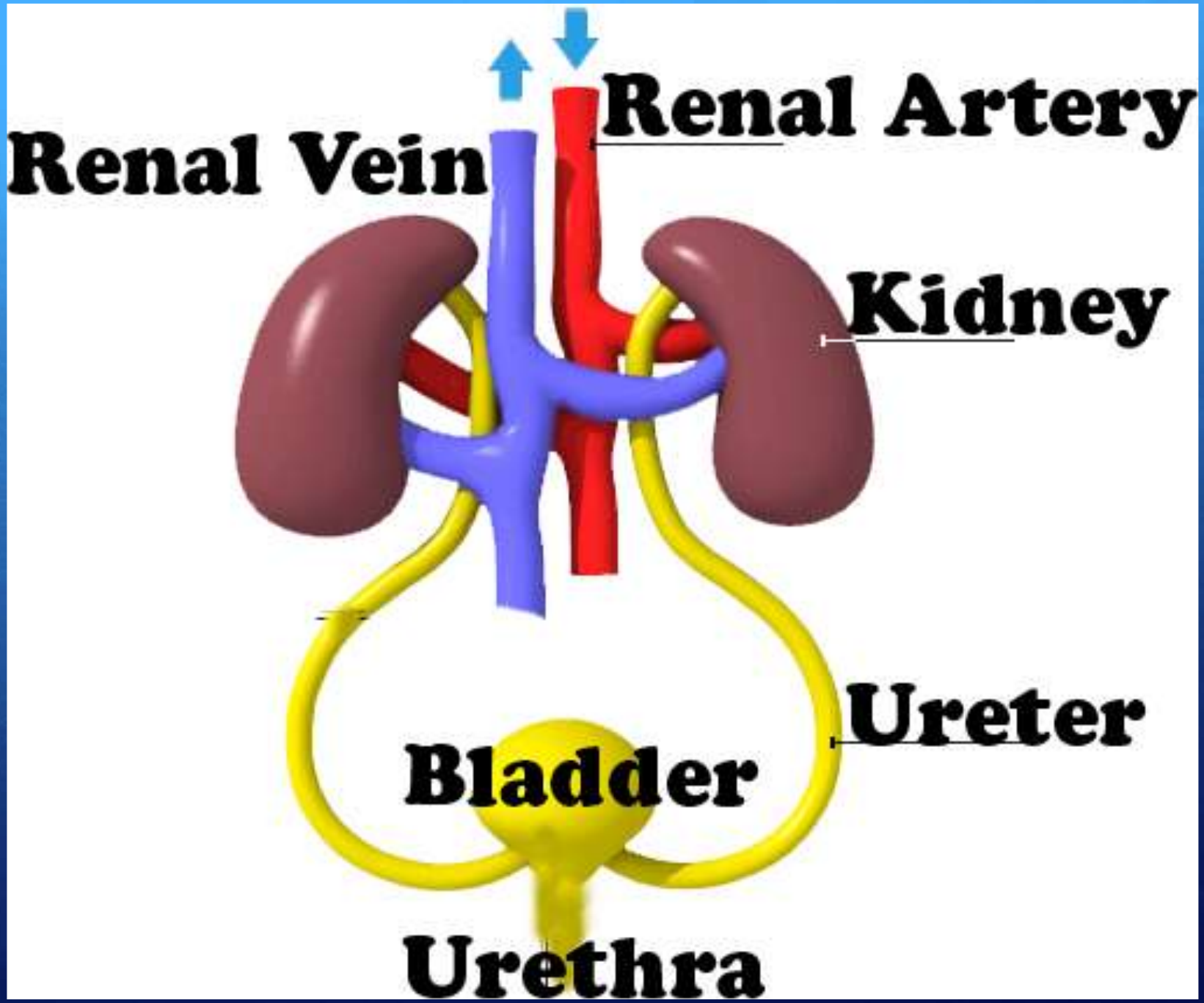
Excretion: The removal of metabolic (cellular) waste from the body.

Waste Products: Carbon dioxide (removed by lungs), Ammonia (from the break-down of proteins), salts, water. These are METABOLIC WASTES




DigitalLab3D


Uretur
Renal Hilum
Renal Artery and Vein

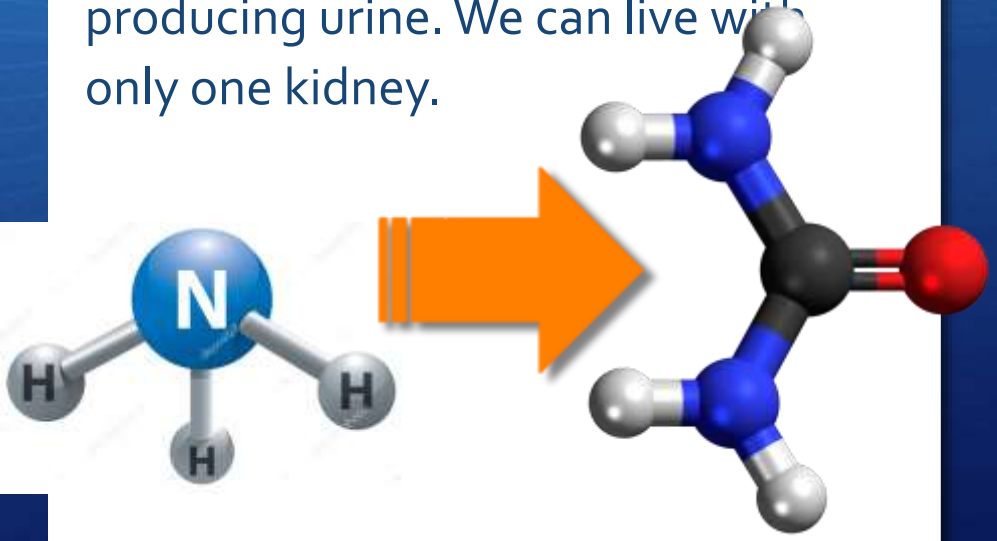

Renal Artery
Renal Vein
Kidney
Ureter
Bladder
Urethra

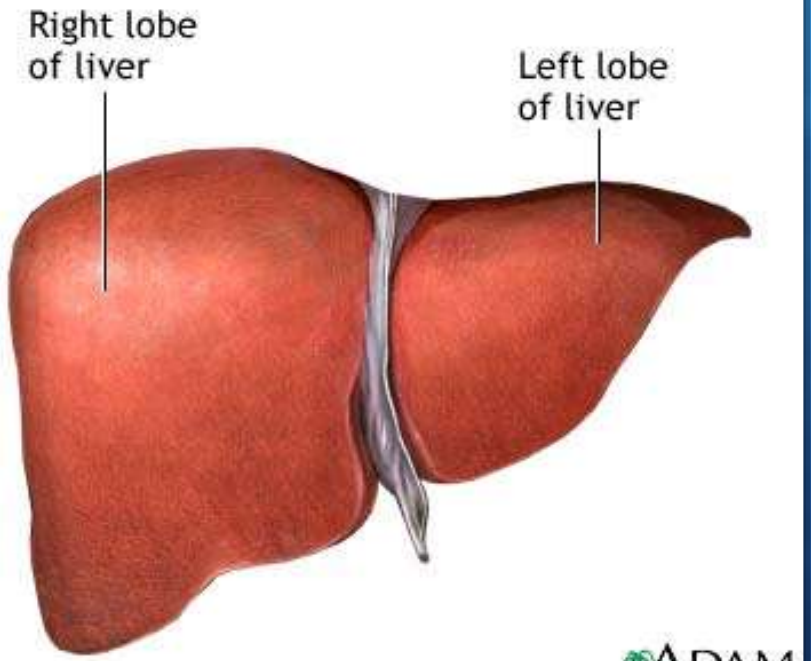
Excretory System

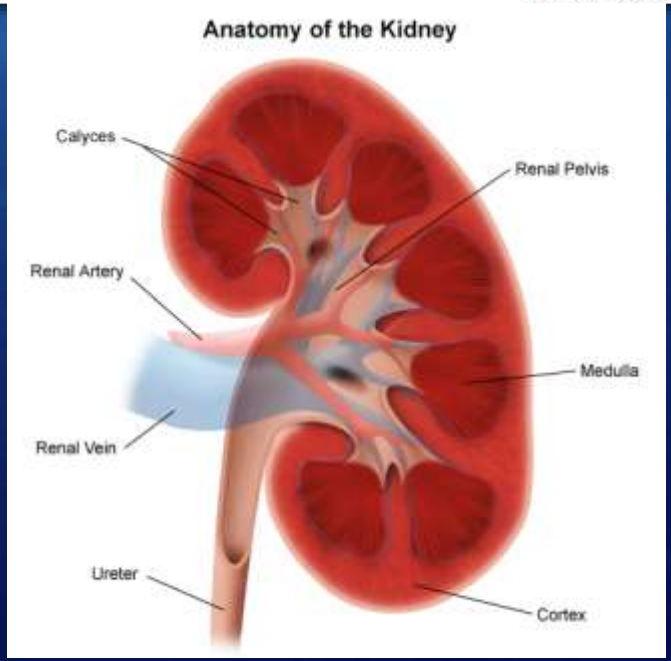
The Liver: Removes toxic ammonia from the blood stream and turns it into **Urea**. Urea is also toxic, but can be converted to Urine by the kidneys.

What else does the liver do?

The Kidneys: Filter the blood. Take out urea, extra water, and salts, producing urine. We can live with only one kidney.





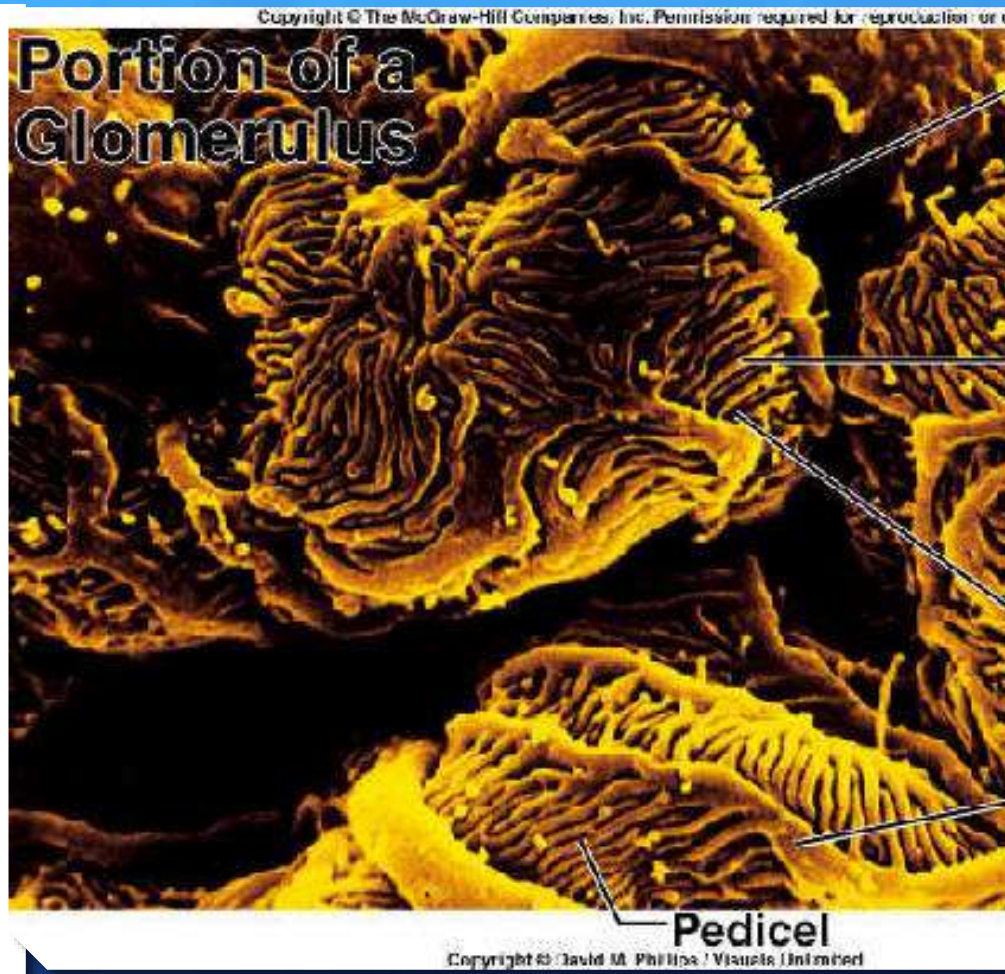


The Formation or Urine

- Nephrons:
  - Microscopic filtering units inside the kidney that clean blood.

Skin: Excess salt removed when we sweat

Nephrons

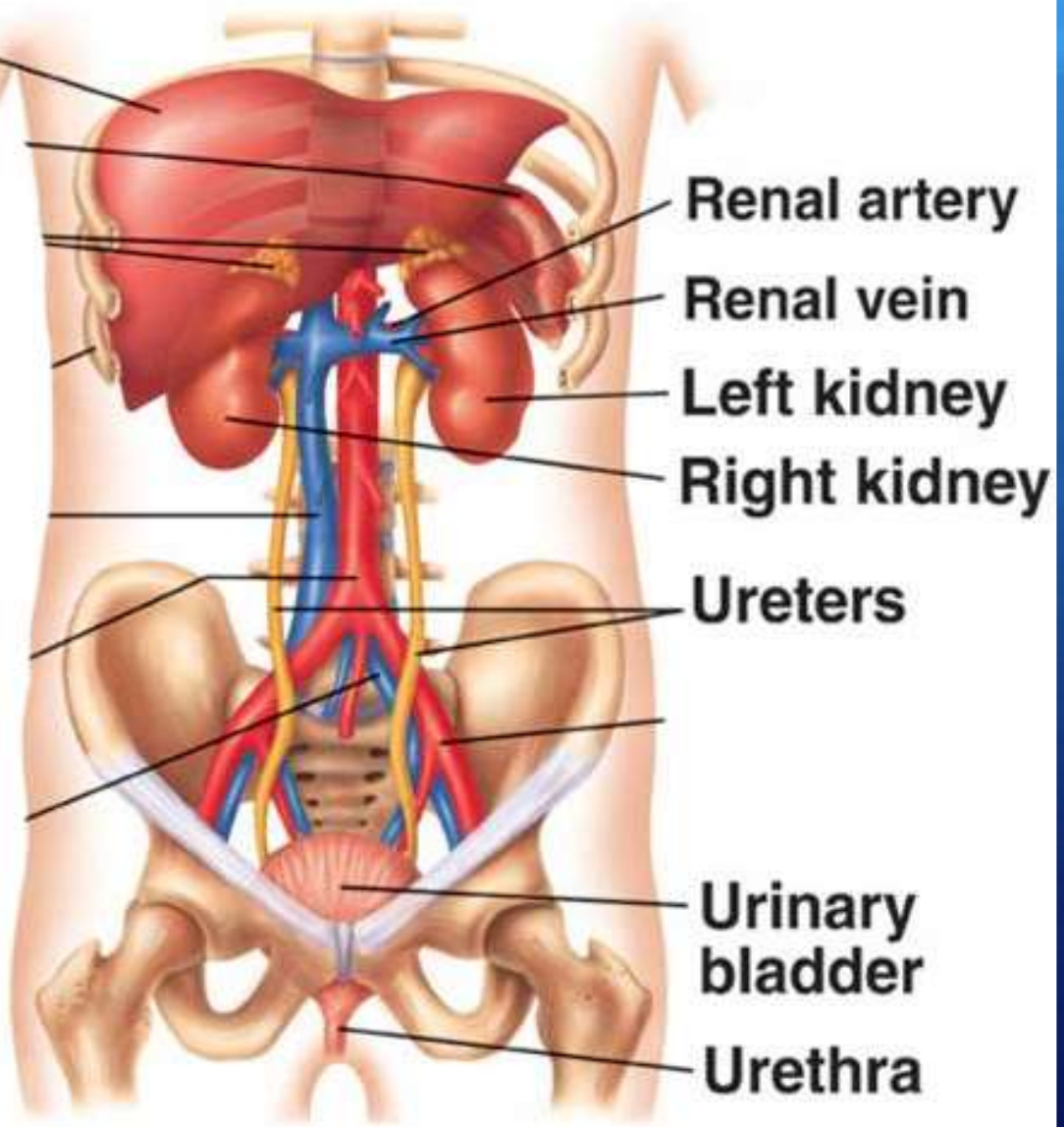


PUT IT ALL TOGETHER:

Cells produce ammonia

Liver turns ammonia to urea

Kidneys add water and salt to urea to form urine

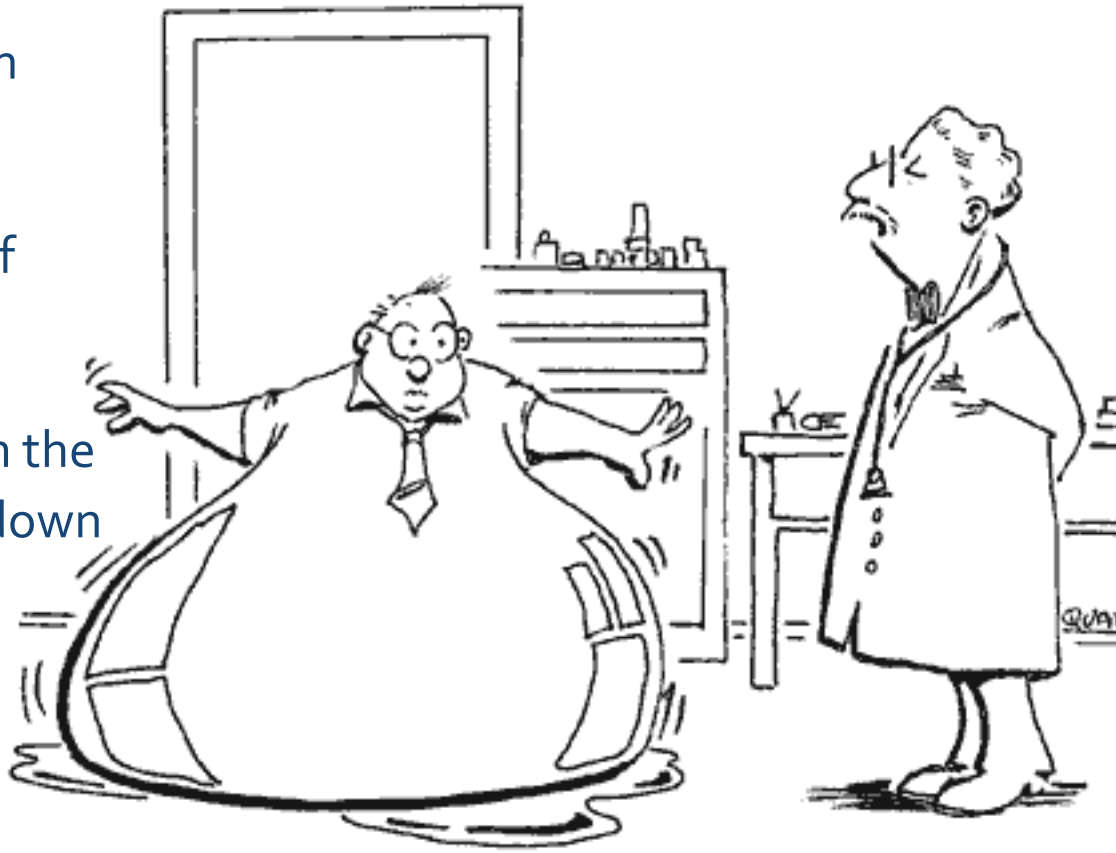


Urine can reveal diseases

If protein is found in urine: sign on kidney failure

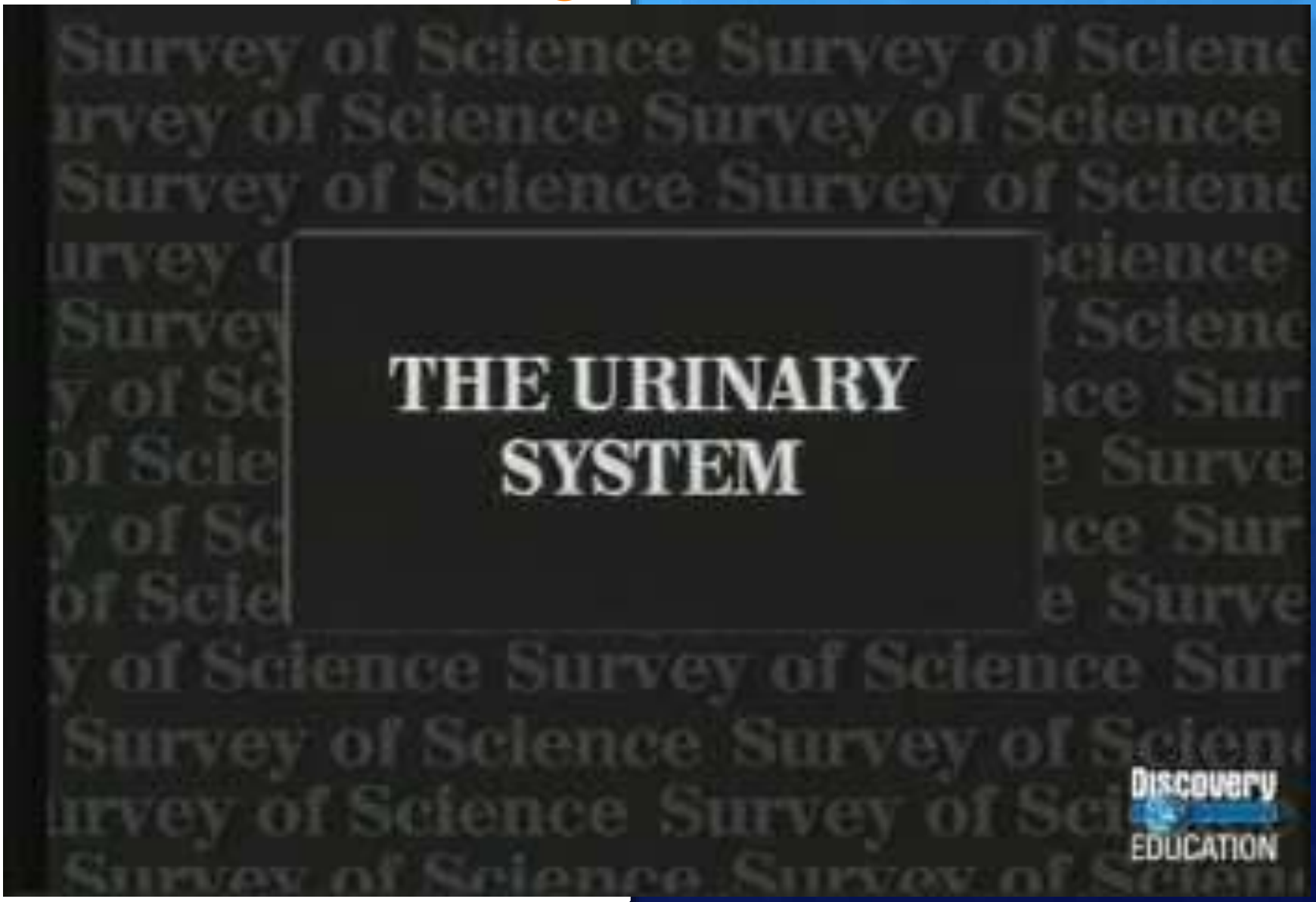
If glucose is found in urine: sign of diabetes

Dialysis: A way to artificially clean the blood if a person's kidney's shut down



https://www.youtube.com/watch?v=mi34xCfmLhw

https://www.youtube.com/watch?v=IQKQ4eoKfTg


Survey of Science
THE URINARY SYSTEM
Discovery
EDUCATION

Your Assignment

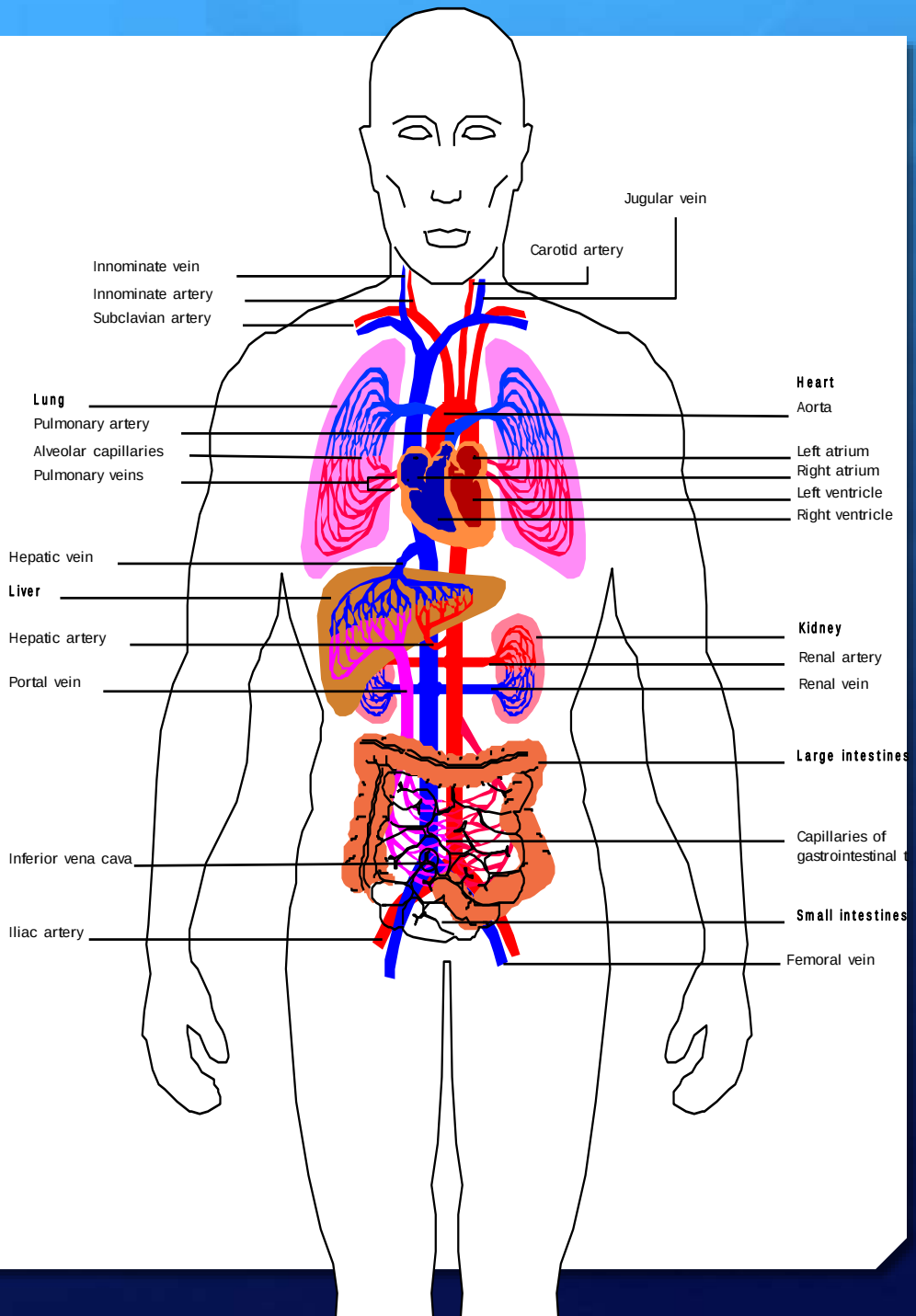
-Excretory Handout

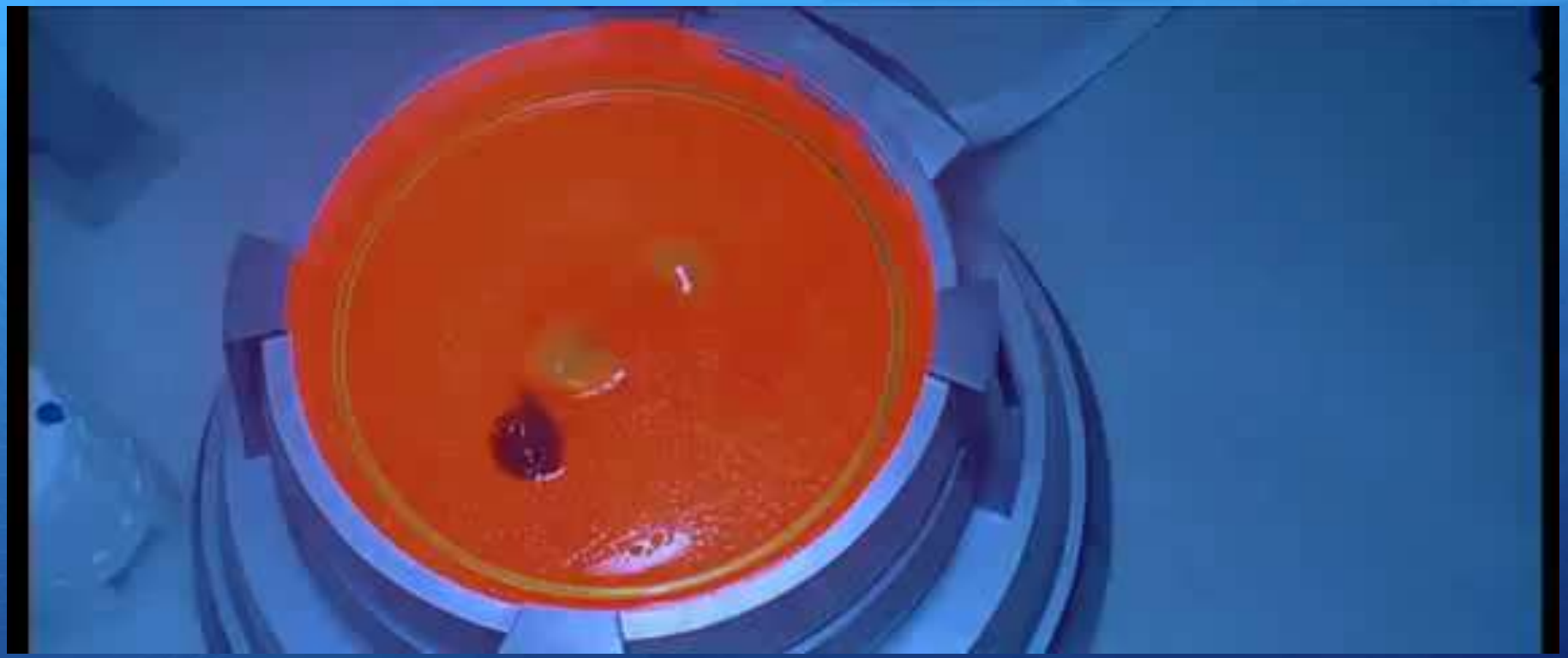
-C/R p 145 # 2-4

-On the same piece of paper as C/R: List the 4 organs in the excretory system

Excretory System

Quiz





What do we call the removal of waste products from an organism?

excretion

+What are the different systems used to bring necessities to the cell and carry away wastes?

What are all the chemical processes going on in the body called?

metabolism

- The chemical processes of the body creates waste, what if these wastes build up?

Some **chemical** wastes include?

- CO_2
- H_2O
- Nitrogen
- Salts
- Heat
- And more

What are some of the organs of the excretory system?

Kidneys

Liver

Skin

The Urinary System

+What are some of the parts of the urinary system?

Kidneys

Kidneys

Ureters

Ureters

Bladder

Urethra

Kidneys

- The kidneys are responsible for filtering the **blood.**

The clean blood is returned to the circulatory system. What's left is the excess water, salts, and other wastes. This wastewater is called urine.

The wastewater from the kidney drains into a tube called the

Ureter

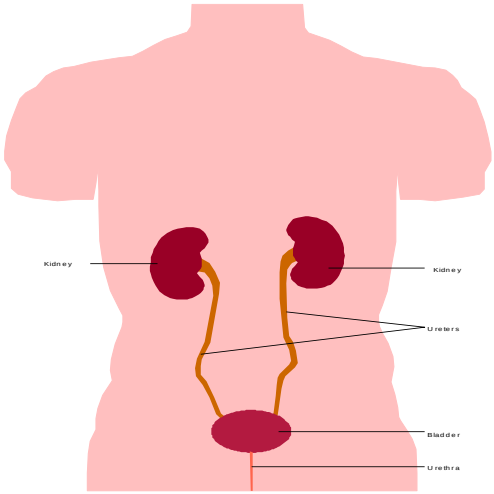
+ These tubes connect the kidney and the

Bladder

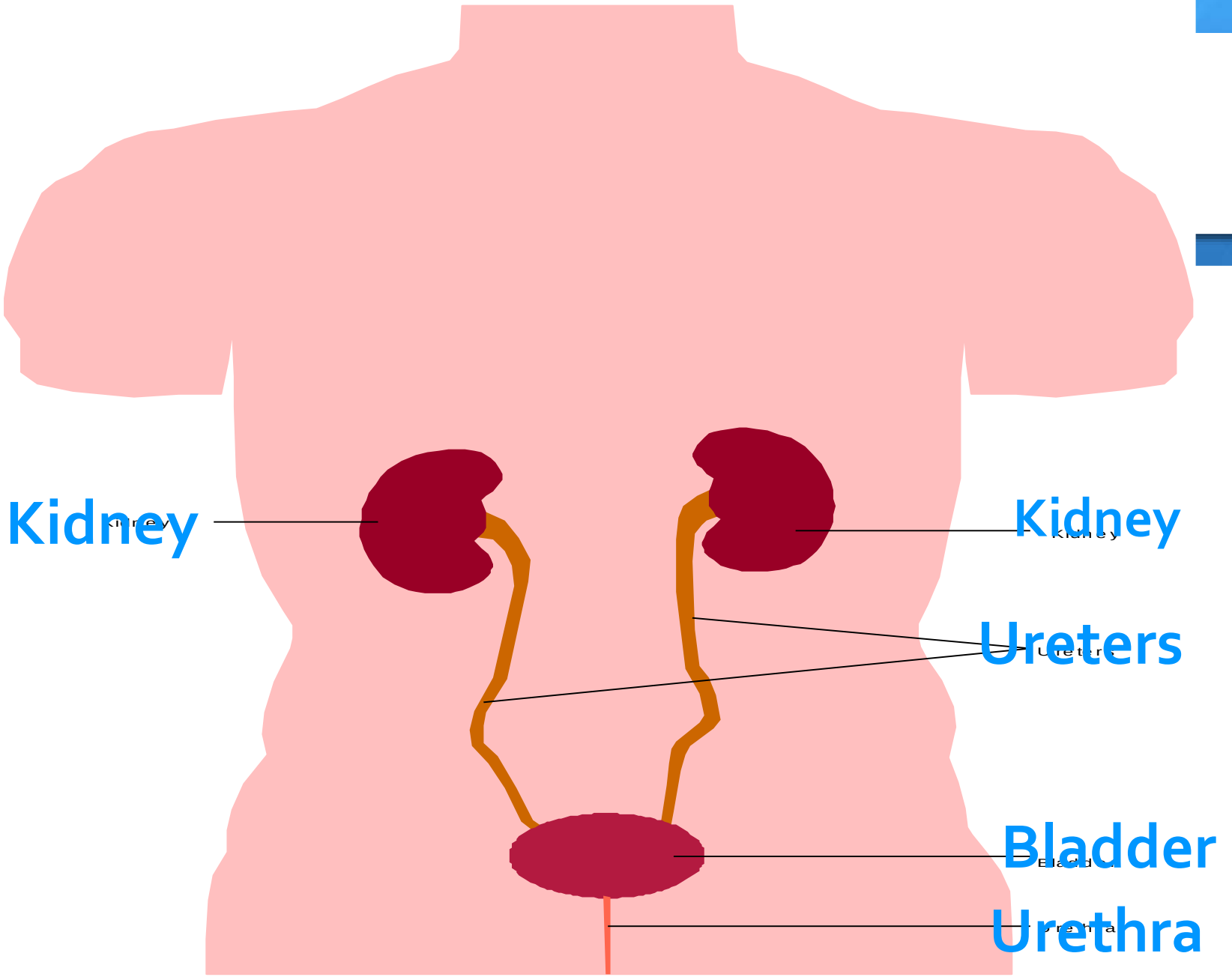
allowing the urine to drain from the kidneys to the bladder.

The bladder is an elastic, muscular organ, that holds urine. When the bladder is full the urine leaves the body through a tube called the

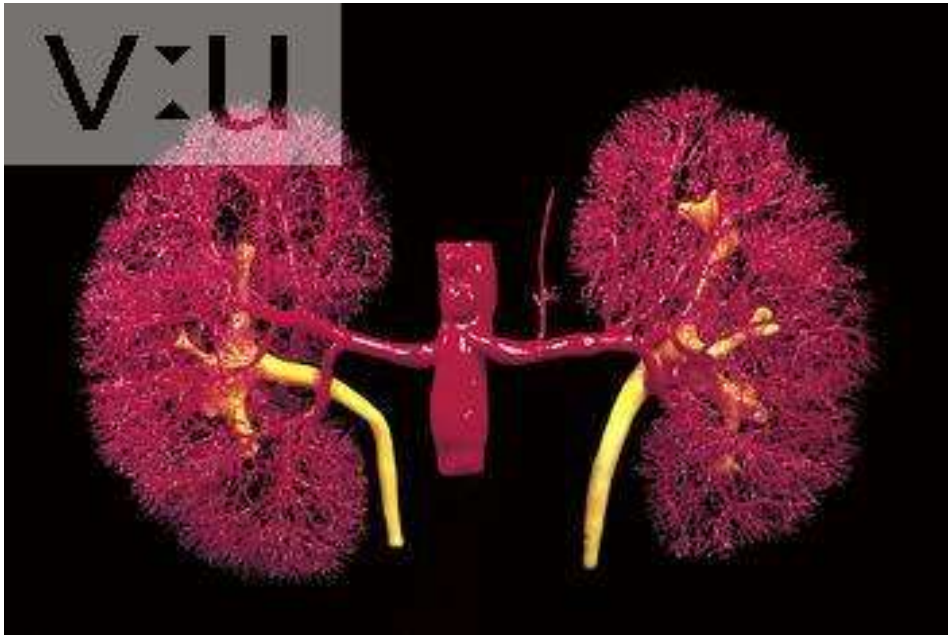
Urethra



URINARY SYSTEM


Kidney
Kidney
Ureters
Bladder
Urethra

When a persons kidneys are not functioning, they must undergo a process called **Dialysis** in which a machine filters the waste out of the blood.



Liver

- The liver also is an organ of the excretory system.
- The liver converts

Ammonia

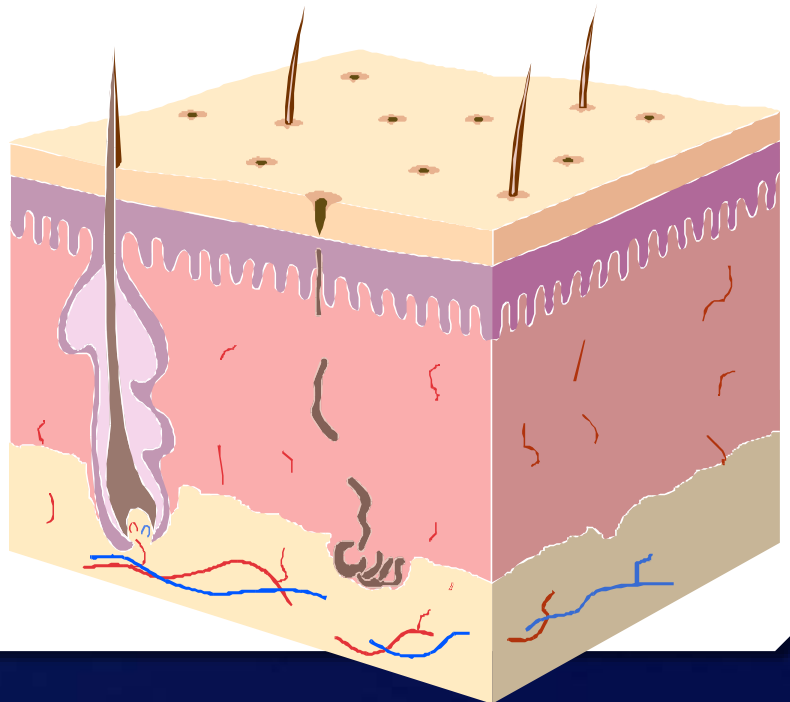
To: **Urea**

Skin

- The skin helps eliminate salts as well as other waste products.

The skin eliminates:

Salt



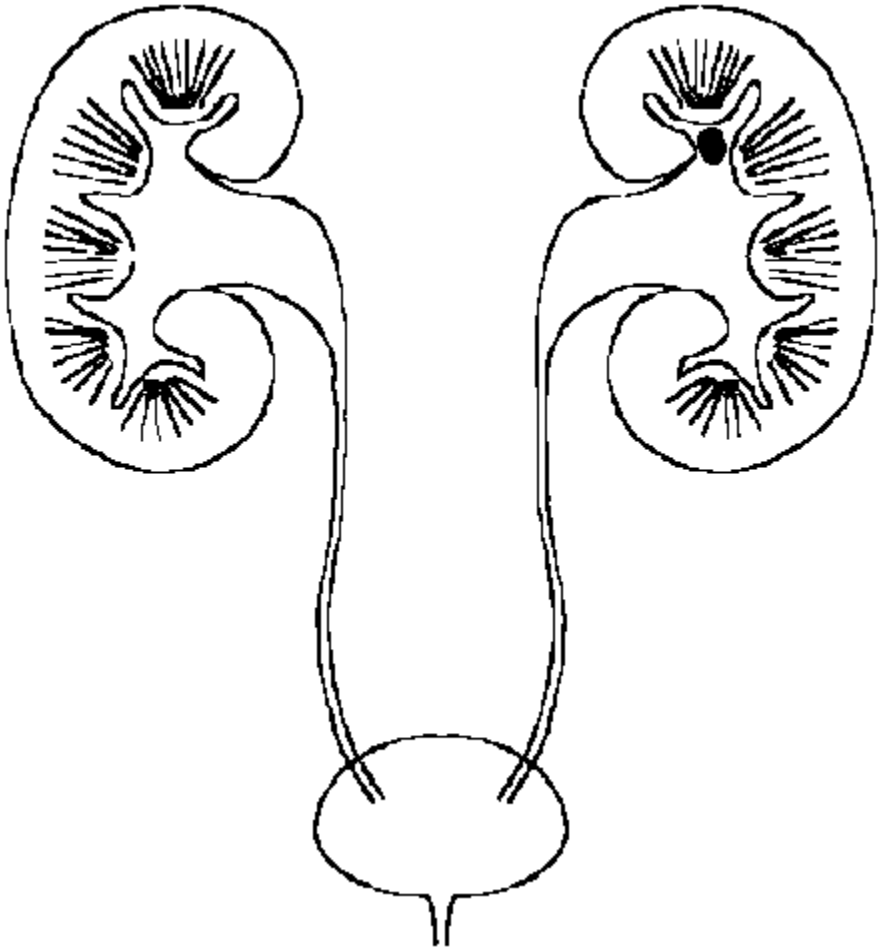
1. Which of the following is not part of the excretory system?

+A. Skin

+B. Ureter

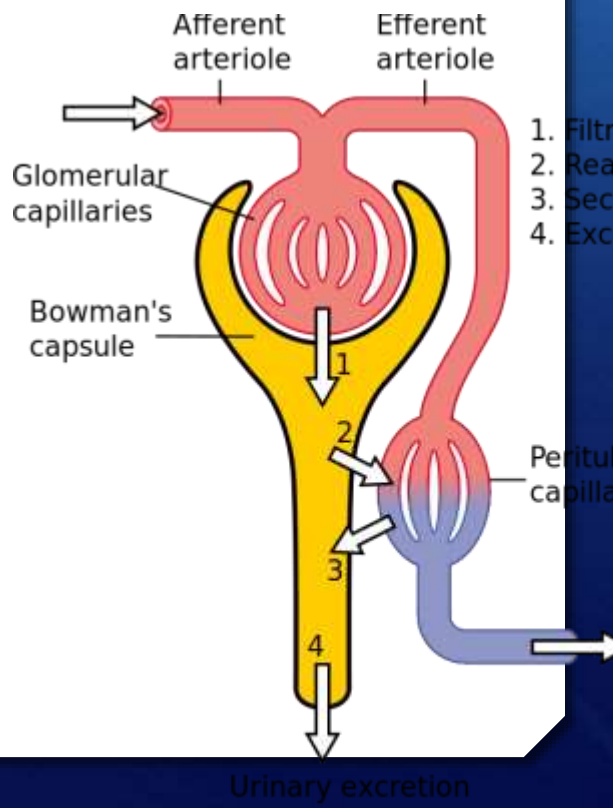
+C. Liver

+D. appendix



2. Excretion is:

- A. the removal of indigestible wastes only
- B. Release of energy from food
- C. Removal of Metabolic Wastes
- D. Dissolving of insoluble foods



3. What is responsible for filtering the blood?

+A. Lungs

+B. Kidneys

+C. Bladder

+D. Urethra

4. Where does urine leave the body from?

+A. Bladder

+B. Urethra

+C. Ureter

+D. Dialysis

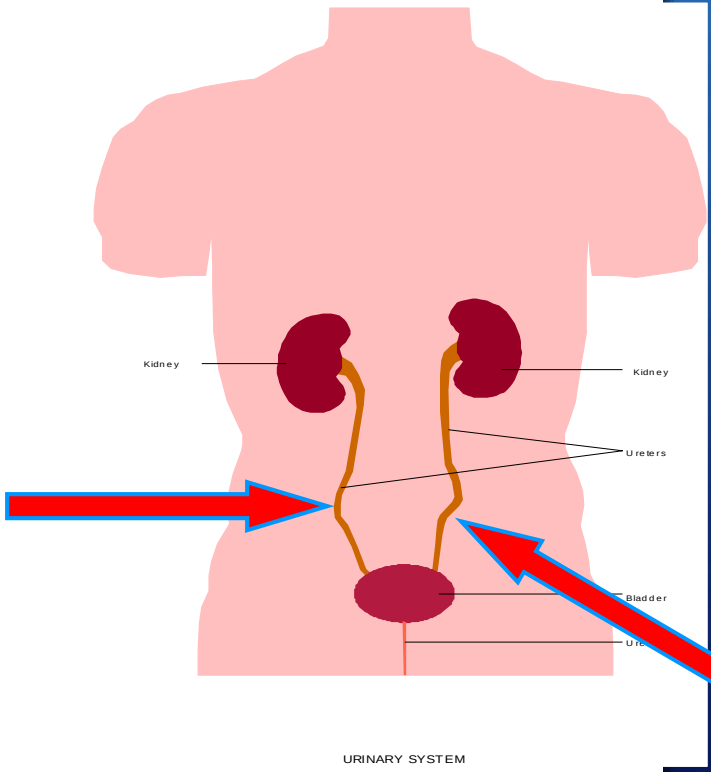
5. Which part of the urinary system are the arrows pointing?

+A. Urethras

+B. Dialysis

+C. Ureters

+D. Bladder



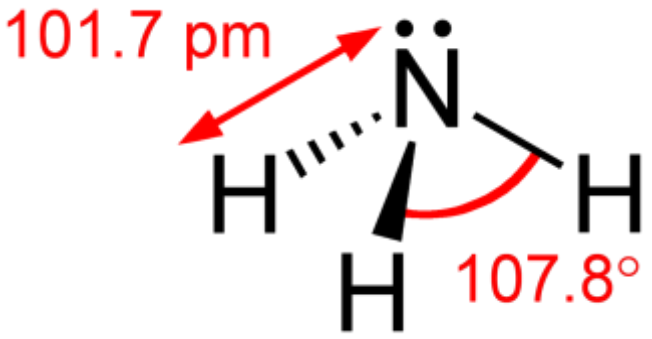
6. Which organ is responsible for turning ammonia into urea

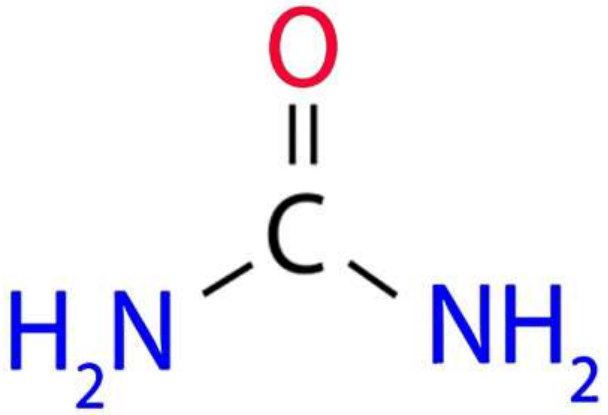
+A. Bladder

+B. Lungs

+C. Liver

+D. Skin





7. What is the process by which a machine does the work of the kidneys?

+A. metabolism

+B. respiration

+C. perspiration

+D. dialysis

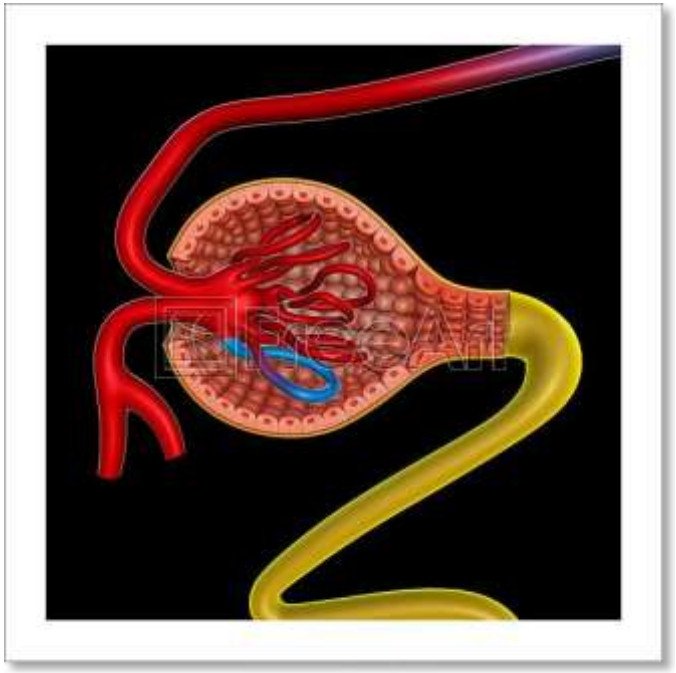
8. What is the removal of waste products from an organism?

+A. excretion

+B. secretion

+C. dialysis

+D. metabolism



9. Why do some people need kidney dialysis

- A. They have a disease prevents proper kidney function
- B. They have an injury that prevents kidney function
- C. Their kidney's cannot filter out protein from their urine
- D. All of the above

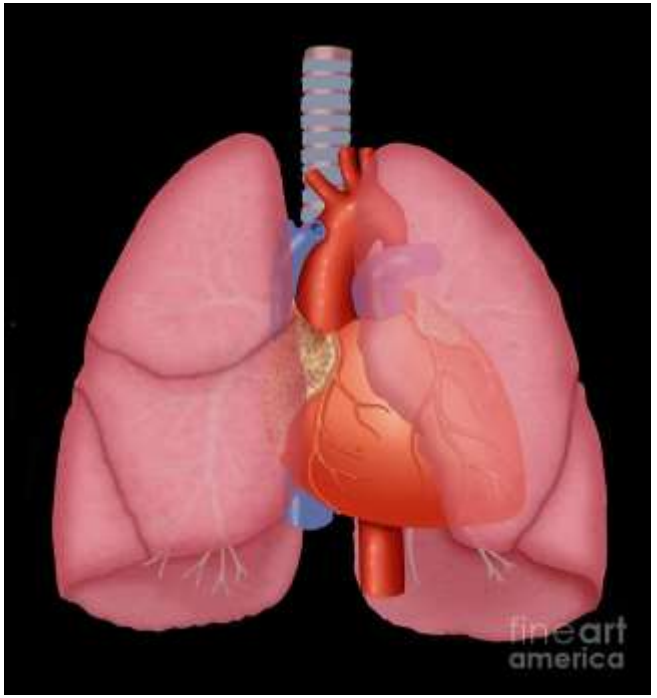
10. What other system is the respiratory system directly linked?

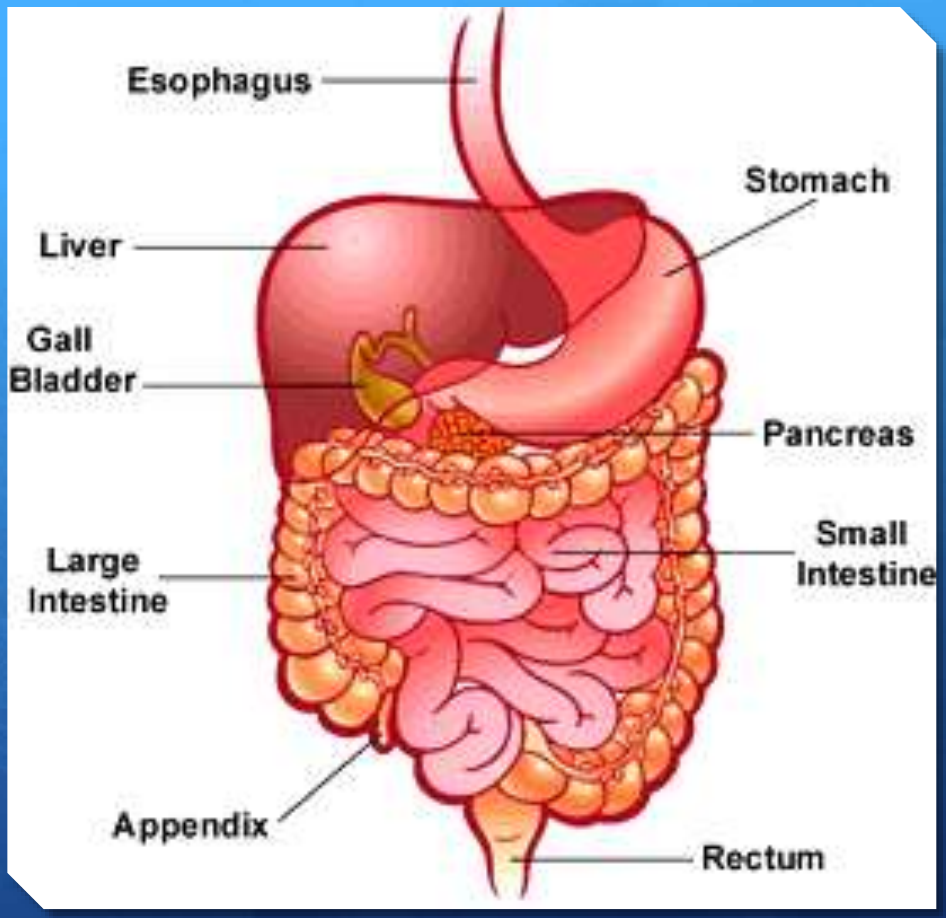
+A. Digestive System

+B. Perspiratory System

+C. Circulatory System

+D. Secretion System

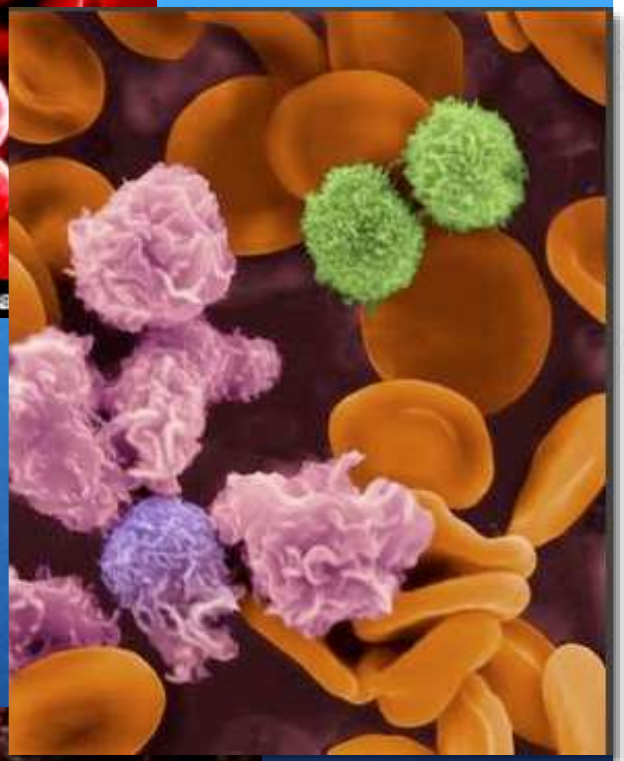


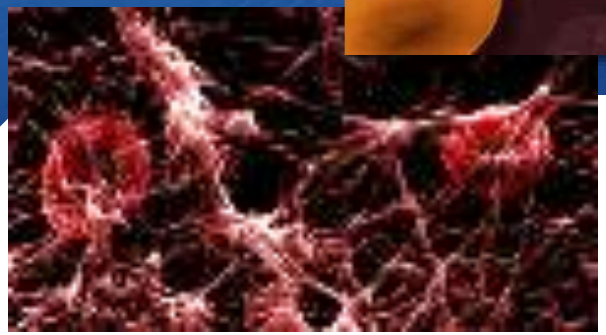


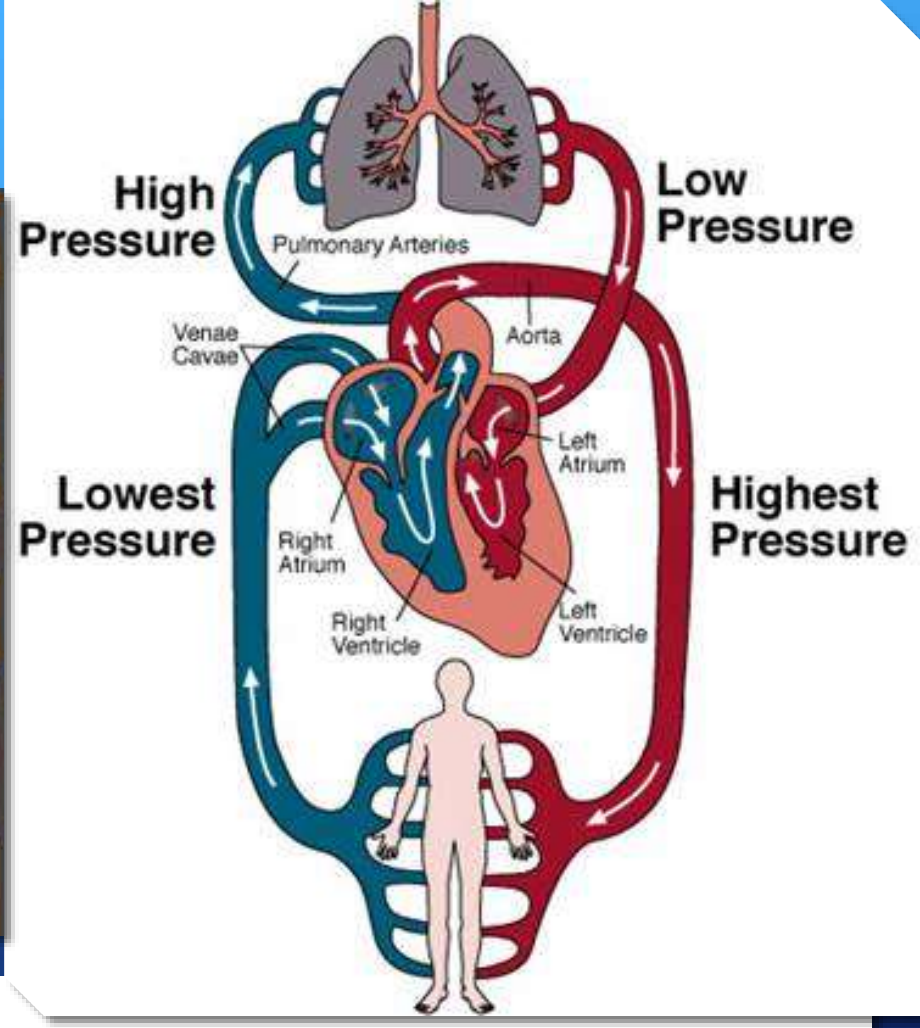
Digestive Review

Breastplate has been removed to show Respiratory System

Respiratory Review







Circulatory Review

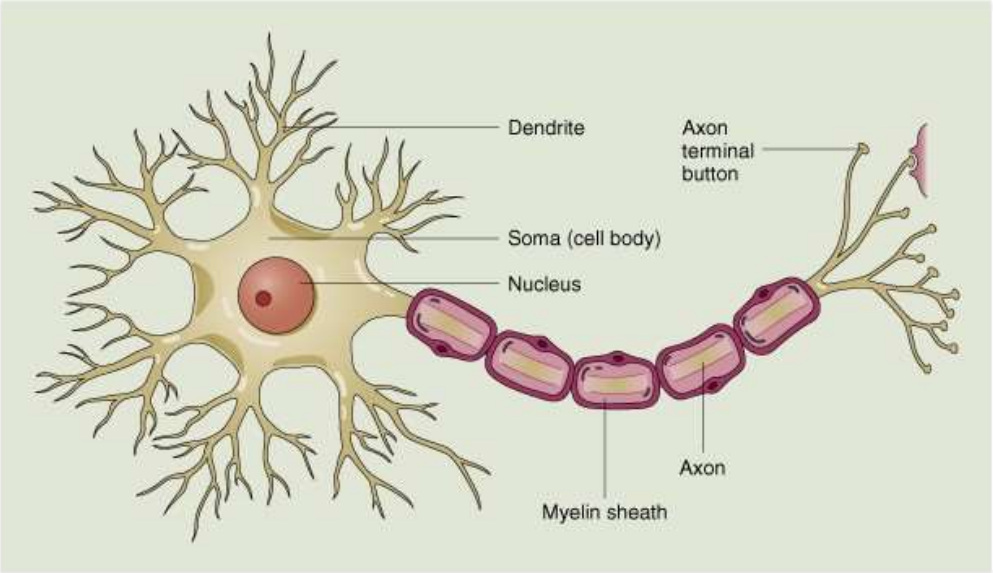
Nervous System

-Use your textbook (p 146) to fill out the notes up to Axon.

-Get a partner: Do the "Knee Jerk Response"

- -Which side is more sensitive?
- -Do you have control of this response?
- -What other things happen in your body that you don't have any control of?
- -What do you have control of?

Paper clip sensitivity test with partners



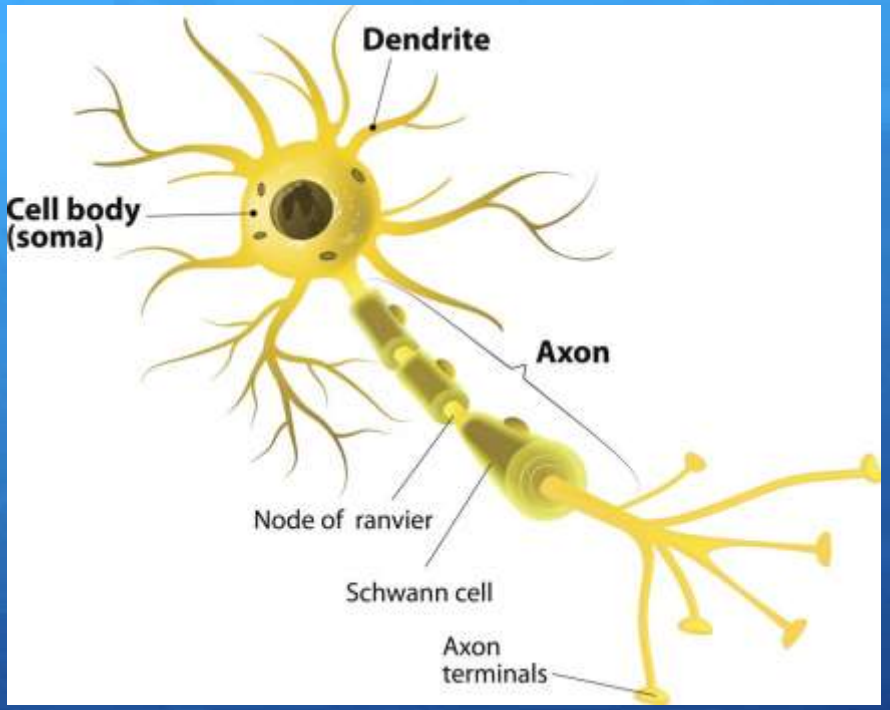
Nervous System Notes

Nervous Tissue: Brain, Spinal Cord, and Nerves

Neurons: Specialized cells in the nervous system that transmit and receive information

Dendrites: Small Branches of a neuron that receive information from neighboring neurons

Axon: Long extensions of the neuron used to transmit information to neighboring cells.



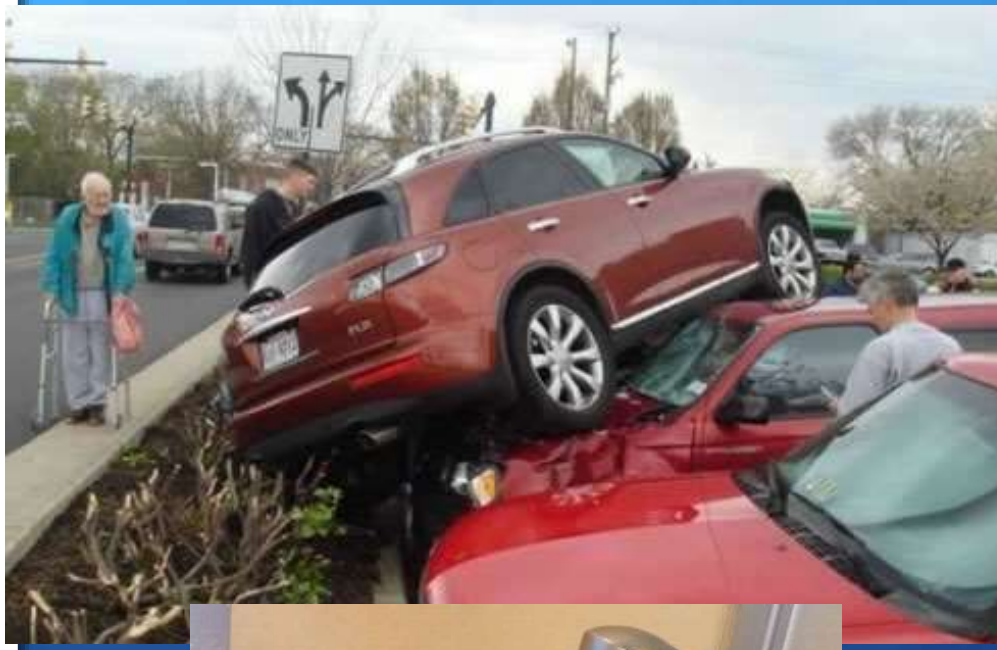

gettyimages
Ed Reschke
158800495

Nervous System

-Human Reaction Time Lab

Nervous System

- Science:
  - Stimulus
  - CNS / PNS
  - Nervous System Diagram
  - Bill Nye: "The Brain," plus handout
- Math:
  - 6.3 and 6.4 Notes
  - P 264: 1, 2, 3, 5, 7(calculate), 8, 9,10, 13, 15, 17
  - WK 6.1 / 6.2 (Hand in Tomorrow)

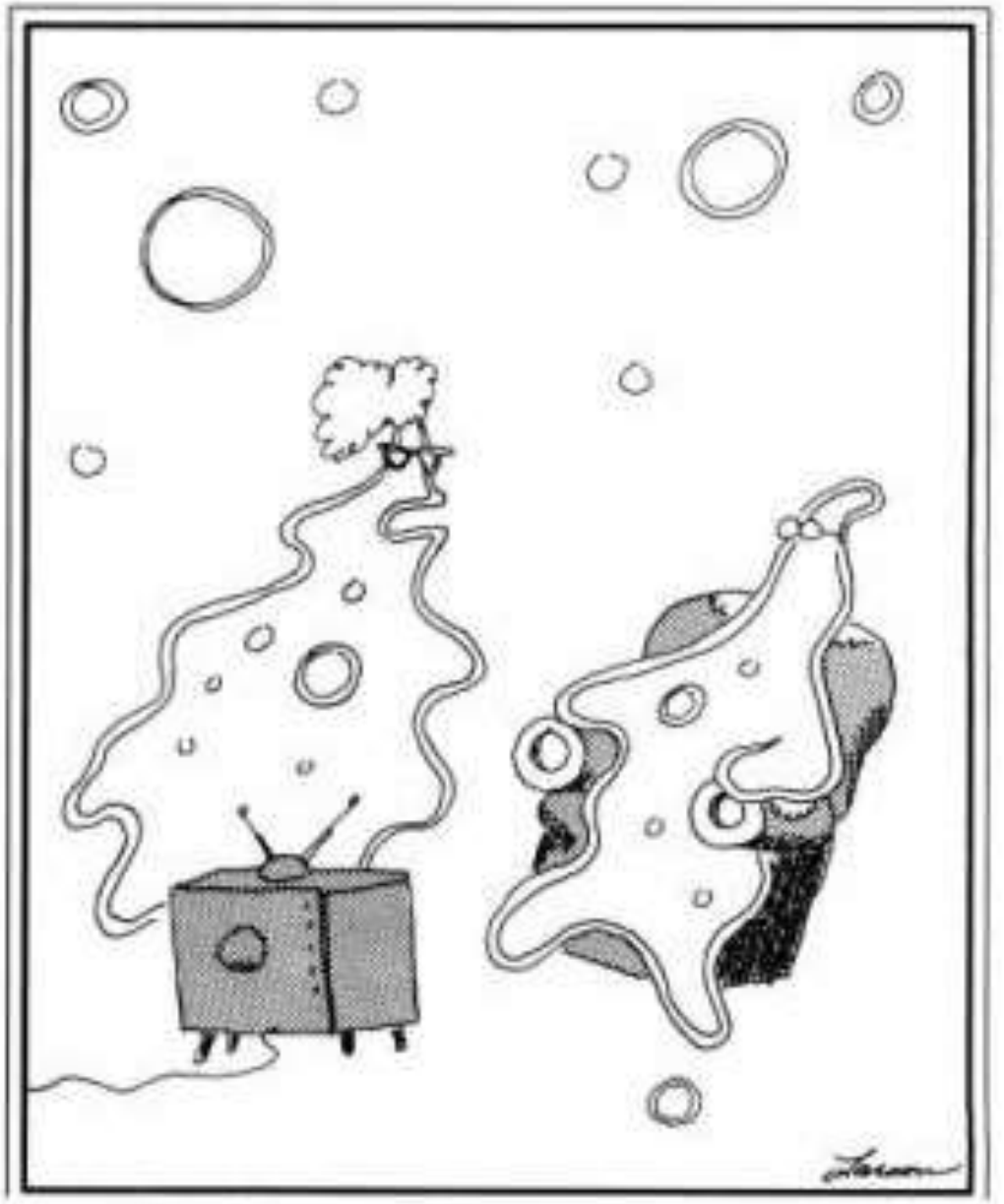


The Nervous System

Can you think of an example of a stimulus?

What are stimuli outside our bodies?

What are stimuli inside our bodies?



"Stimulus, response! Stimulus, response! Don't you ever *think*?"

The Nervous System

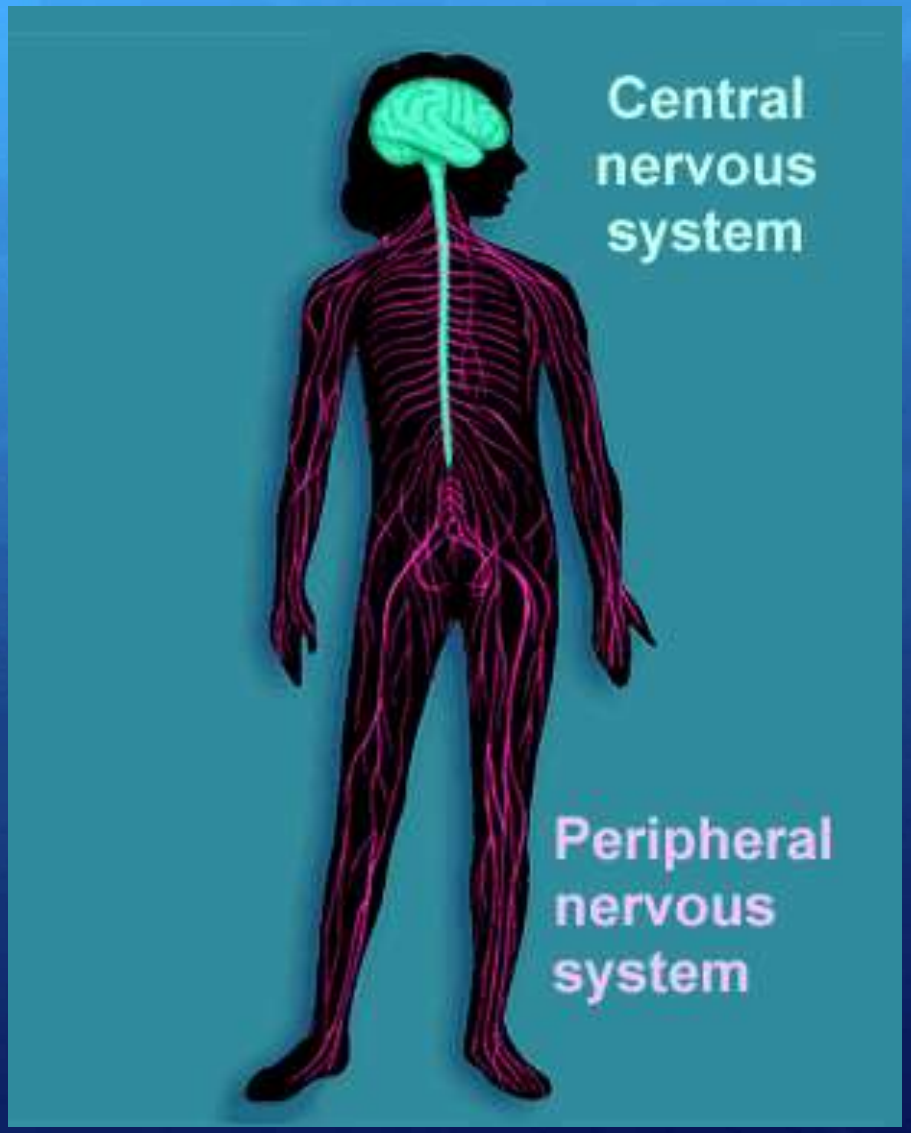
It is the job of our nervous system to monitor and respond to stimuli

How the nervous system is organized (notes)

-Two main divisions:

- **-The central nervous system** is composed of the brain and spinal chord
- **-The peripheral nervous system** is composed of the nerves that travel to all parts of the body

-Draw the Nervous System Diagram. Human Body Video



The brain has over 100 billion neurons

The Peripheral Nervous System

2 Types of Neurons (notes)

- Sensory Neurons: Carry signals from the body to the Brain (CNS). Where could these signals be sent from?

- Motor Neurons: Carry signals from the brain (CNS) to the body. Examples:

10 minutes: Human Body: pushing the limits

The two most important parts of the nervous system are the **Peripheral Nervous System**, which is made up of **cranial and peripheral nerves,** and **the Central Nervous System** which is made up of the **brain and spinal cord**

Under Yesterday's diagram, write the Following:

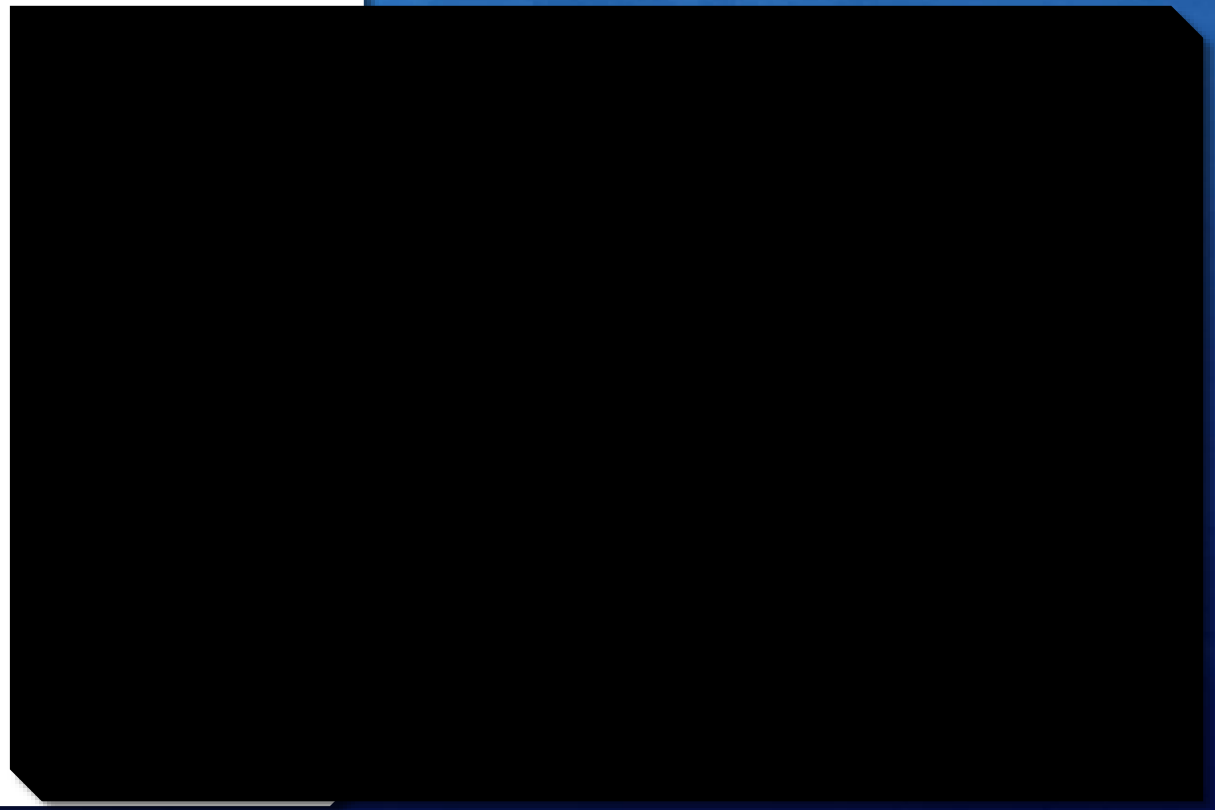
Tuesday Feb 23rd

-Stimulus Response Pathways

-Reflex Response

-Sensory / Motor Neuron Diagram

-Autonomic vs. Somatic Nervous system (try handout)



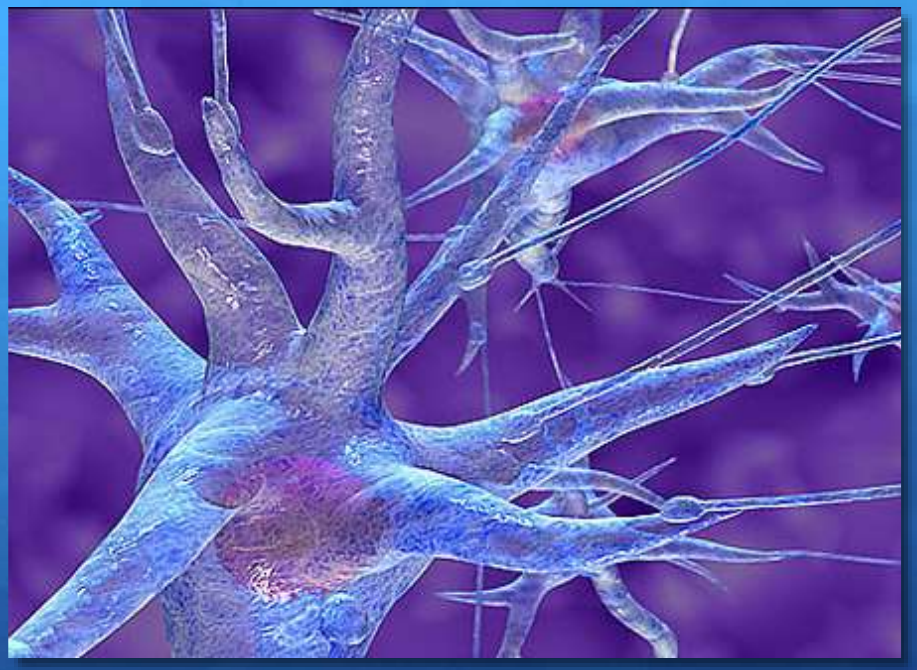
Sensory and Motor Neurons (PNS)

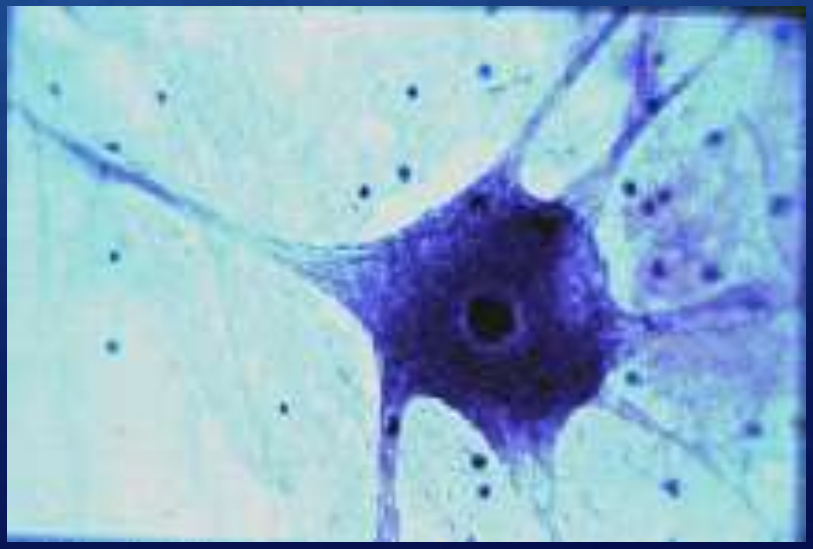
Try to follow the response pathway from the knee, to the CNS, and back to the knee:

http://198.45.22.27/connectext/psy/ch02/spina
.mhtml

What happens when our body needs to move very quickly? Think about putting your hand down on a hot stove; do you take time to think about moving your hand, or just move it?

Draw the sensory and motor neuron diagram





Peripheral Nervous system continued

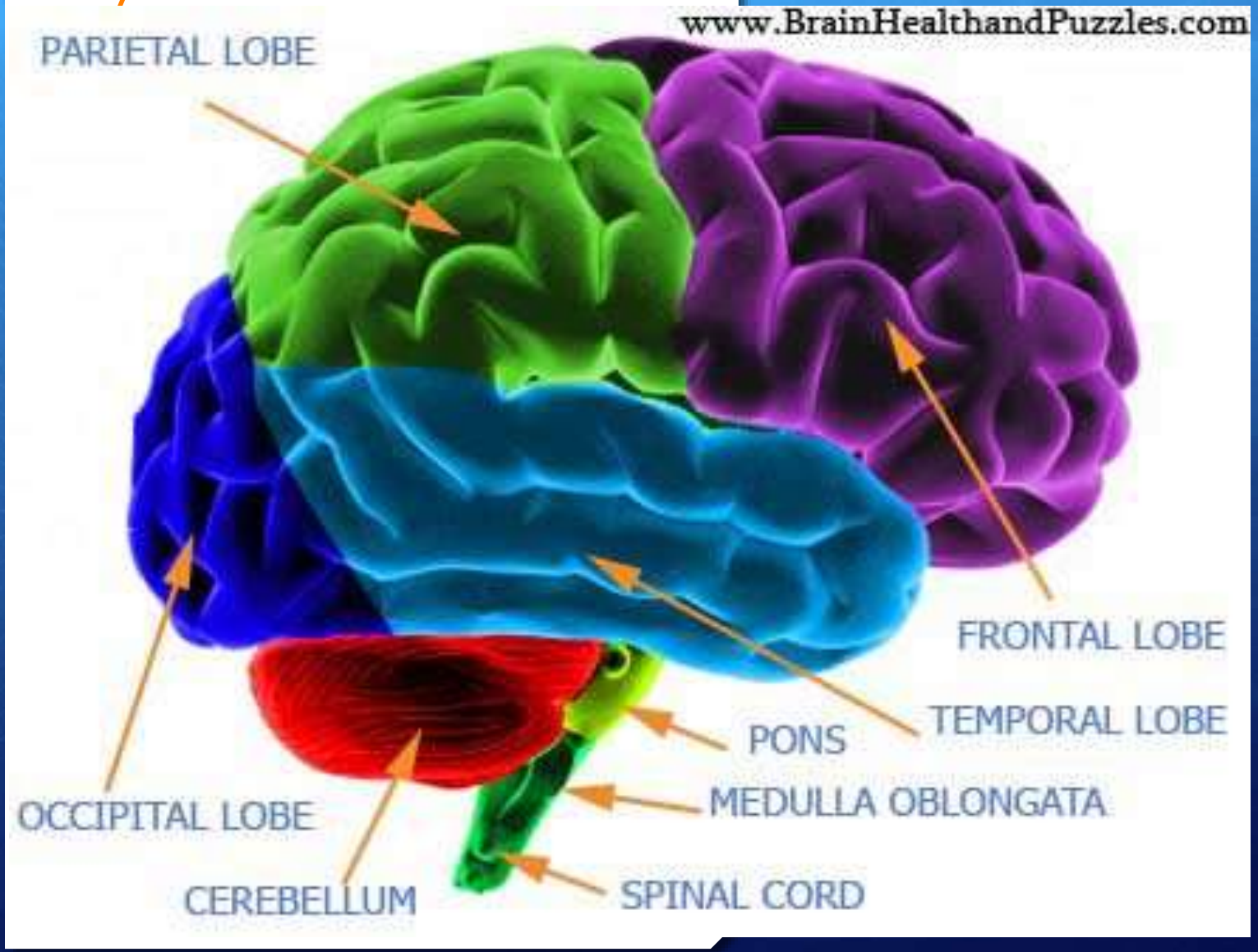
- Autonomic Nervous System:
  - Instant, unconscious responses to stimuli. (No control over)
- Somatic Nervous System:
  - Controlled Responses to stimuli
  - Eg) Choosing to respond to something you hear

Think of some examples of each

Autonomic
Pain
Breathing
Heart Rate

Somatic

Central Nervous System



Your Assignment

Please work quietly on:

C / R pg 151: # 2, 3, 4, 5, 6.

Wednesday Feb 24th

Mark C / R p 151 #2-6

An Uneven Sense of Touch

Think back to the paper clip lab about what areas on your body are sensitive to touch

Draw diagram B on p 151 into your notes.

Human Body: Pushing The Limits Video and handout

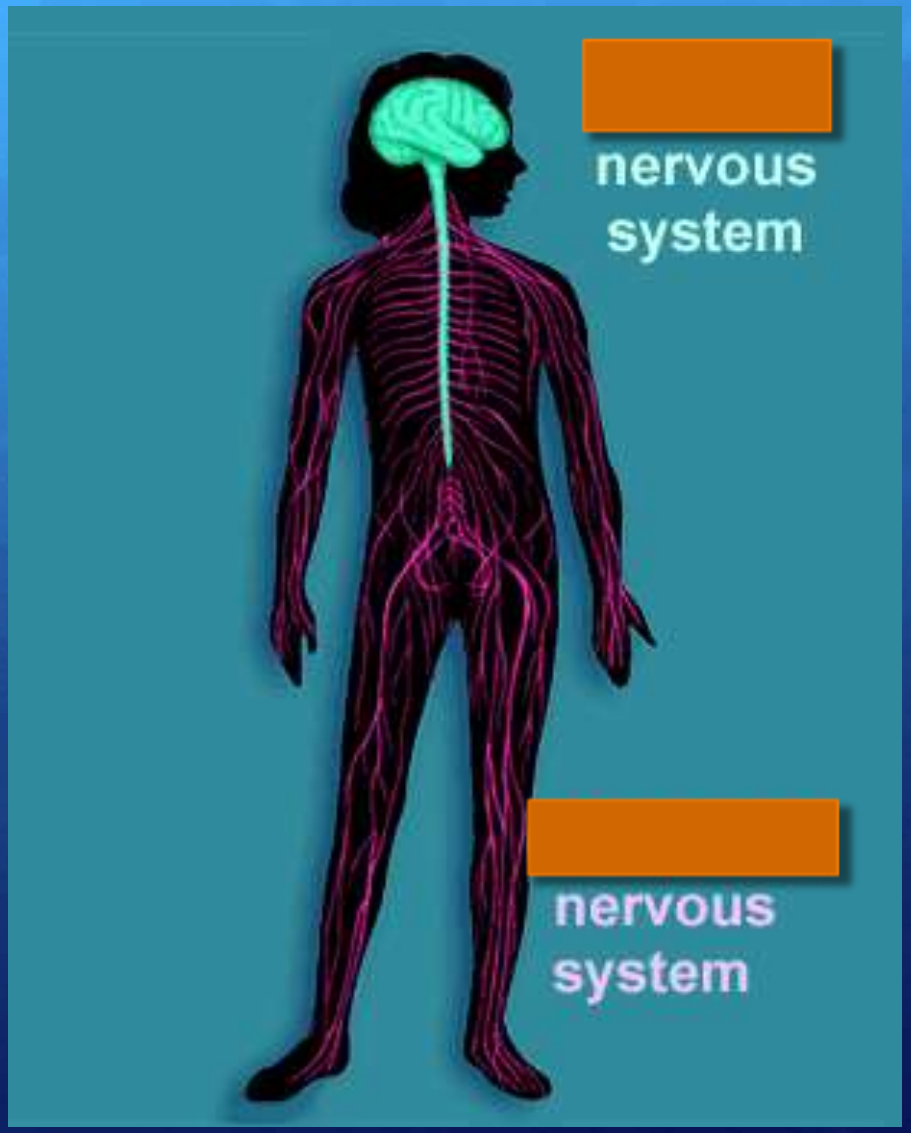
Nervous System Quiz

1. What are the two main divisions of the nervous system?

2. What is the difference between sensory and motor neurons?

3. Give an example of something your autonomic nervous system has done today

4. Give an example of something your somatic nervous system has done today



Nervous System Quiz

5. What are the two types of nerves in the peripheral nervous system (Hint: not motor and sensory)

6. Which type of neurons send impulses from the **body to the central nervous system?** (Hint: Sensory or Motor)

7. Which type of neurons send impulses from the **central nervous system to the body's muscles and organs?**

Nervous System Quiz

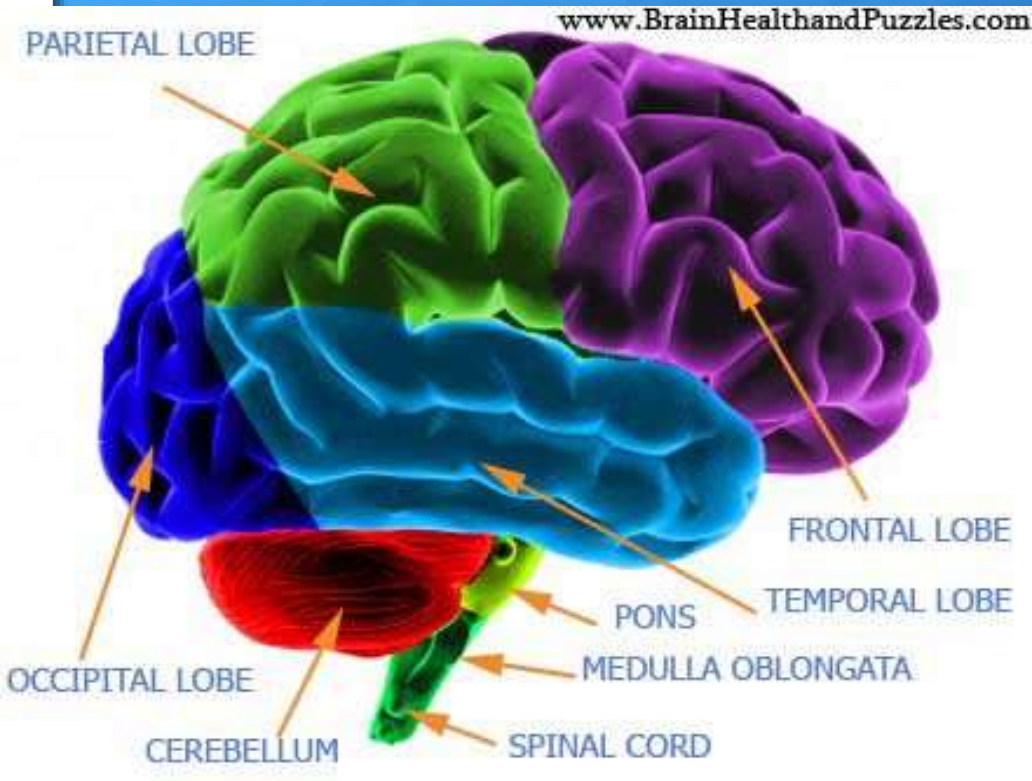
8. Which part of the nervous system is the control center for your whole body?

a. Neuron

b. Brain

c. Spinal cord

d. None of the above



Body Systems Playdoh Project

-In Your Groups:

- -Digestive System
- -Respiratory System
  - -Outside lung
  - -Inside Lung
- -Circulatory System
- -Excretory System
- -Nervous System
  - -Full
  - -Neuron

draw cards for selection order

SEVEN GROUPS OF FOUR

Section 4: Health and Diseases

-What is health, what does it mean to be healthy??

-Have you ever broken a bone?

-Have you ever had a wound that sent you to the hospital?

-Have you ever needed stitches?

Smallpox

From the 1600 to 1800 a terrible disease swept through Europe

Victims broke out in a rash, got chills, fever, nausea, and muscle aches. **40% died from the illness**

Millions upon millions were killed by smallpox.

Great news! Smallpox has been eradicated! We no longer have to worry about it thanks to VACCINES !

SMALLPOX TED X TALK

The beauty of science

One of the most malicious diseases to ever sweep the earth was also the source of one of the greatest discoveries in science:

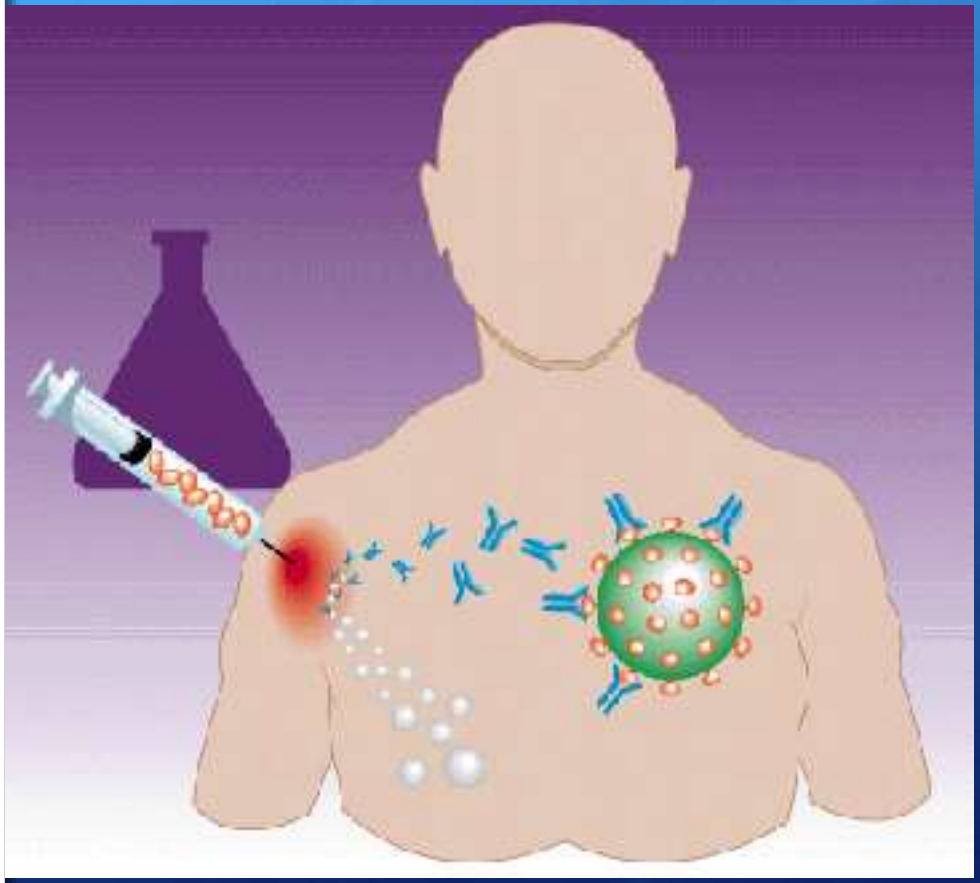
VACCINES

Diseases affect the body in two ways:

Sickness Immune Response

How Vaccines Work

Trigger an immune response without actually causing the illness!!



The point is to make your immune system
Think your sick when you are really not

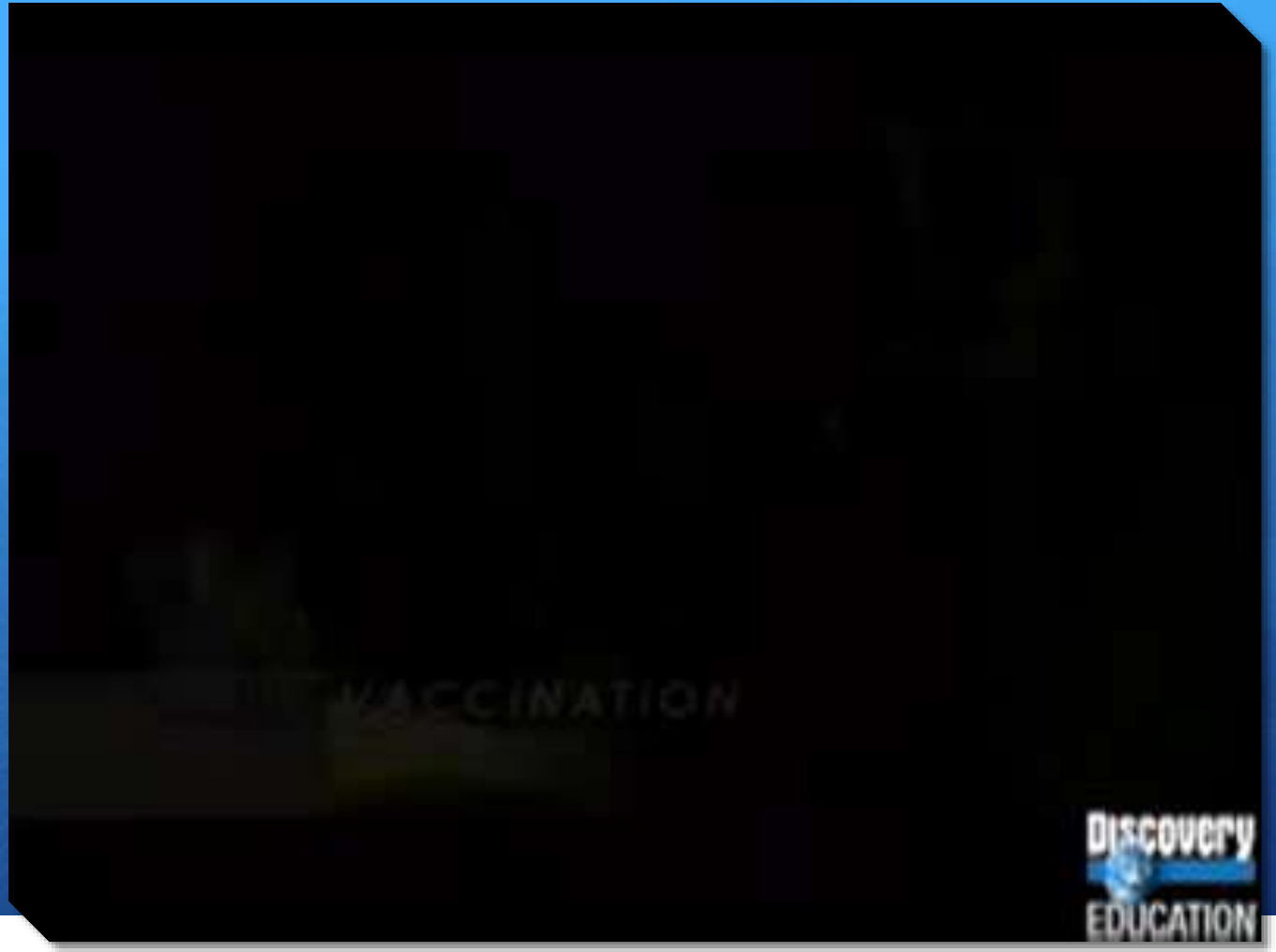
Then your body can build an immunity to
The virus and prevent your from getting
The strain that actually causes illness

The Smallpox Vaccine

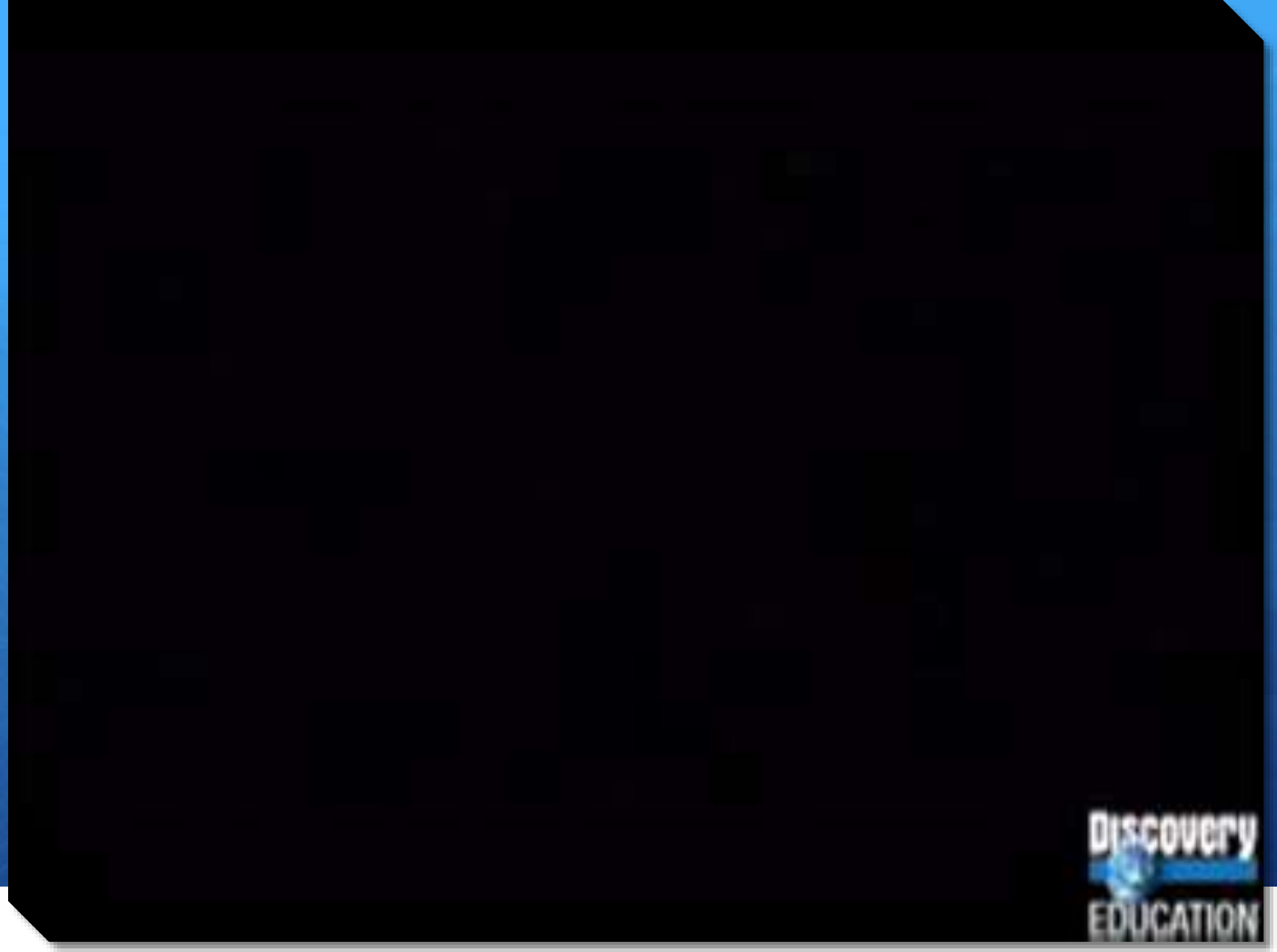
-Edward Jenner

-Really quite simple: It took cows, milkmaids and one very observant man.

-cowpox (Demo)



The Smallpox Vaccine



What About Germs

Louis Pasteur (pasteurization??) (Click this link ←)

Your Assignment

Use p 155 – 158 to answer

C/R p 158 # 1-4

Factors that Affect Health

Does anyone have asthma?

How does it affect you?

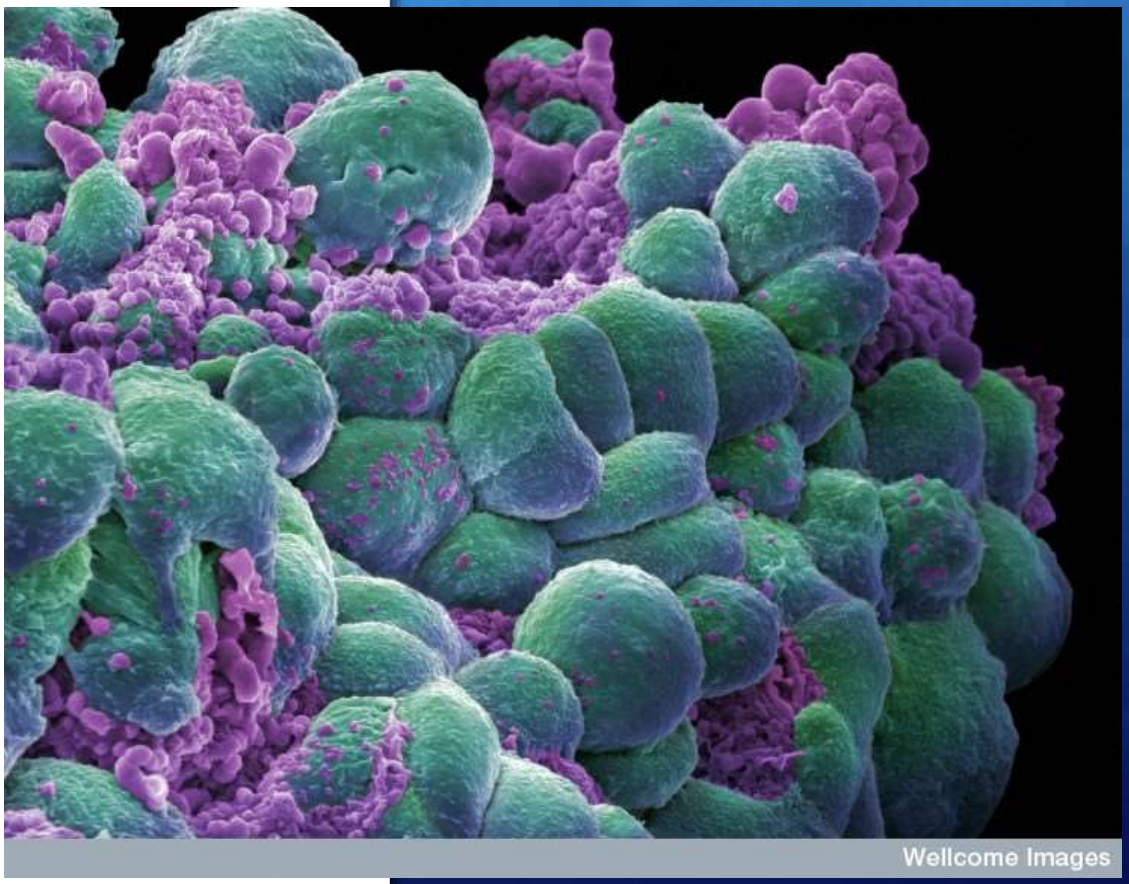
What causes it?

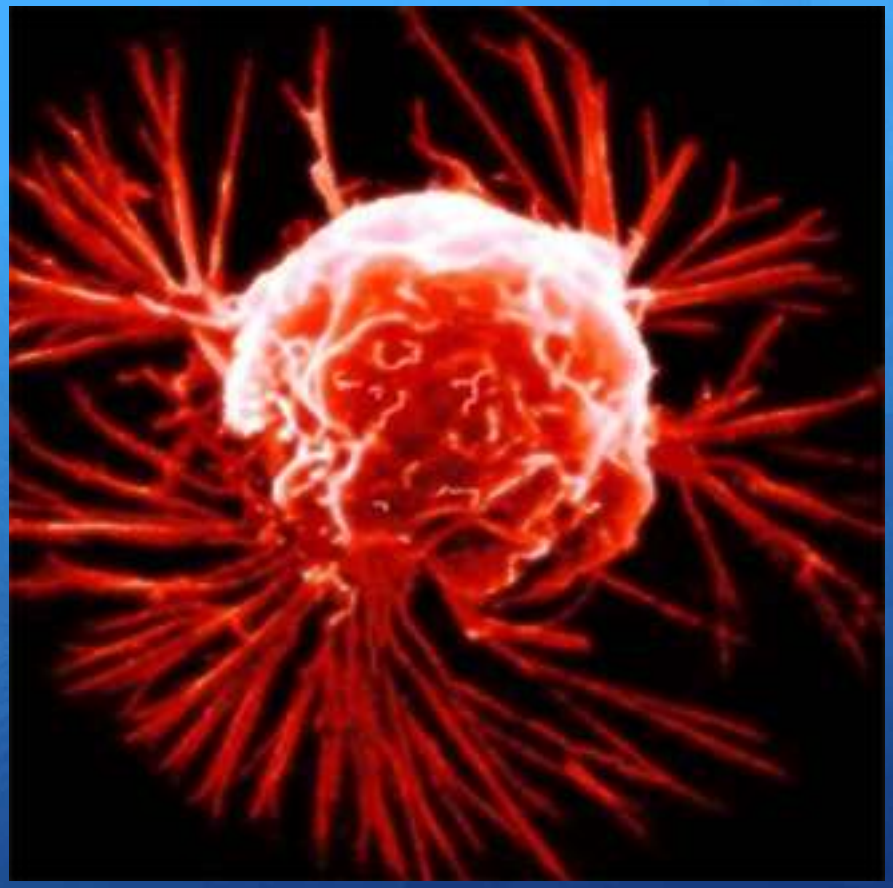
Do the asthma simulation

It all starts with your cells

The Health of cells filters out to the body

Breast Cancer Cells

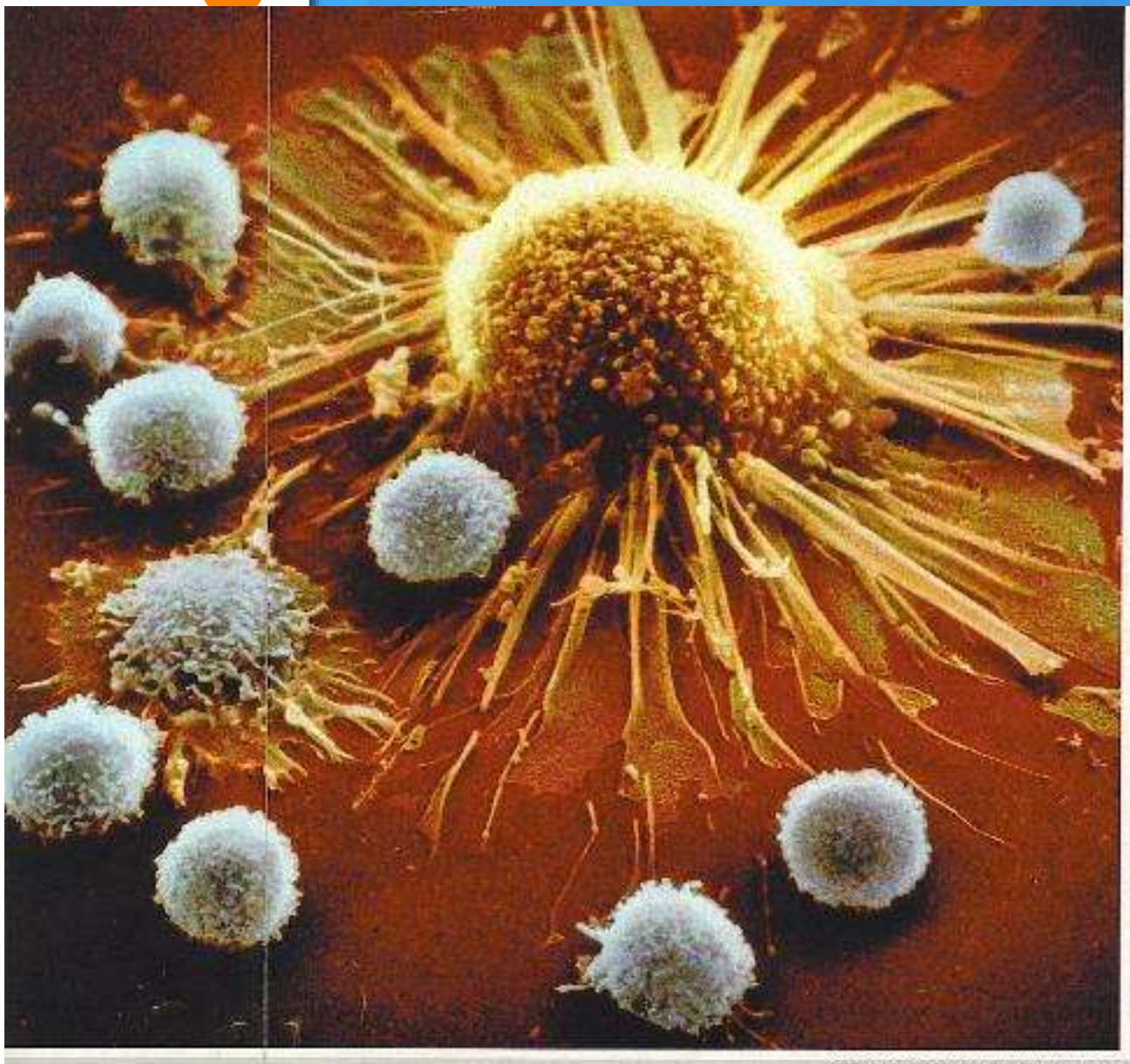




Cancer Cell

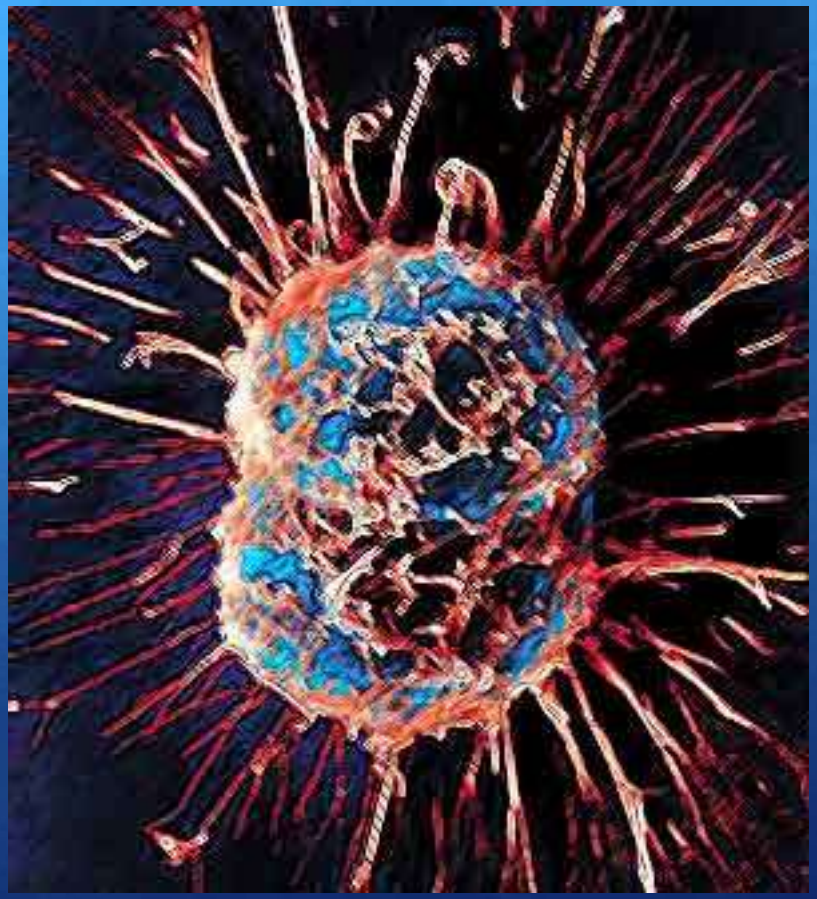
T cells attacking a

Cancer cell



Pancreas Cancer cell

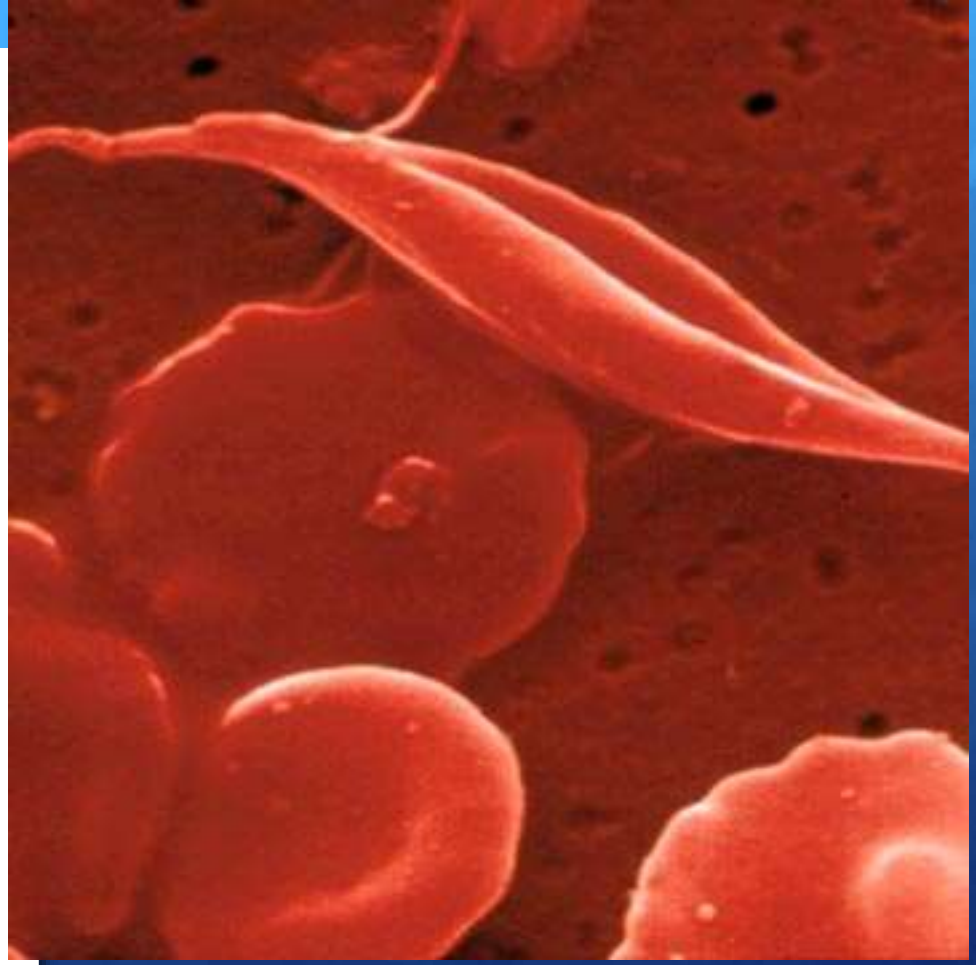
Unable to undergo cell division, so the cell just keeps growing and growing



What disease is this?

Who knows what malaria is?

Below: Haemoglobin



Factors that affect the respiratory system

The biggest factor is……?

Each Cigarette has over 4000 chemicals

Tar (affects cilia)

Nicotine

Carbon Monoxide

Check out this list!!

http://quitsmoking.about.com/od/chemicalsinsmoke/a/chemicalshub.htm

https://www.youtube.com/watch?v=lEc-Rsvgp Mc

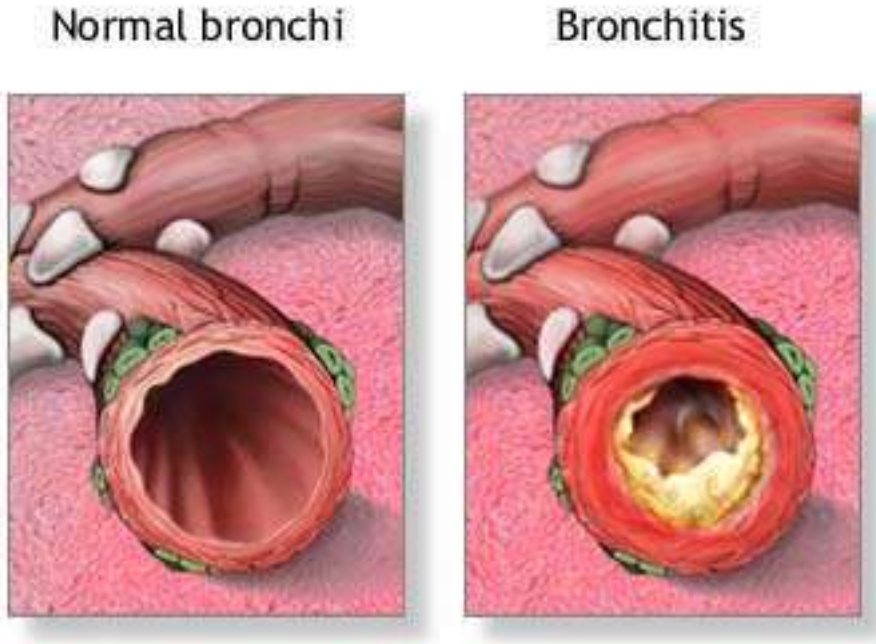
https://www.youtube.com/watch?v=wEfOzDZlJuY

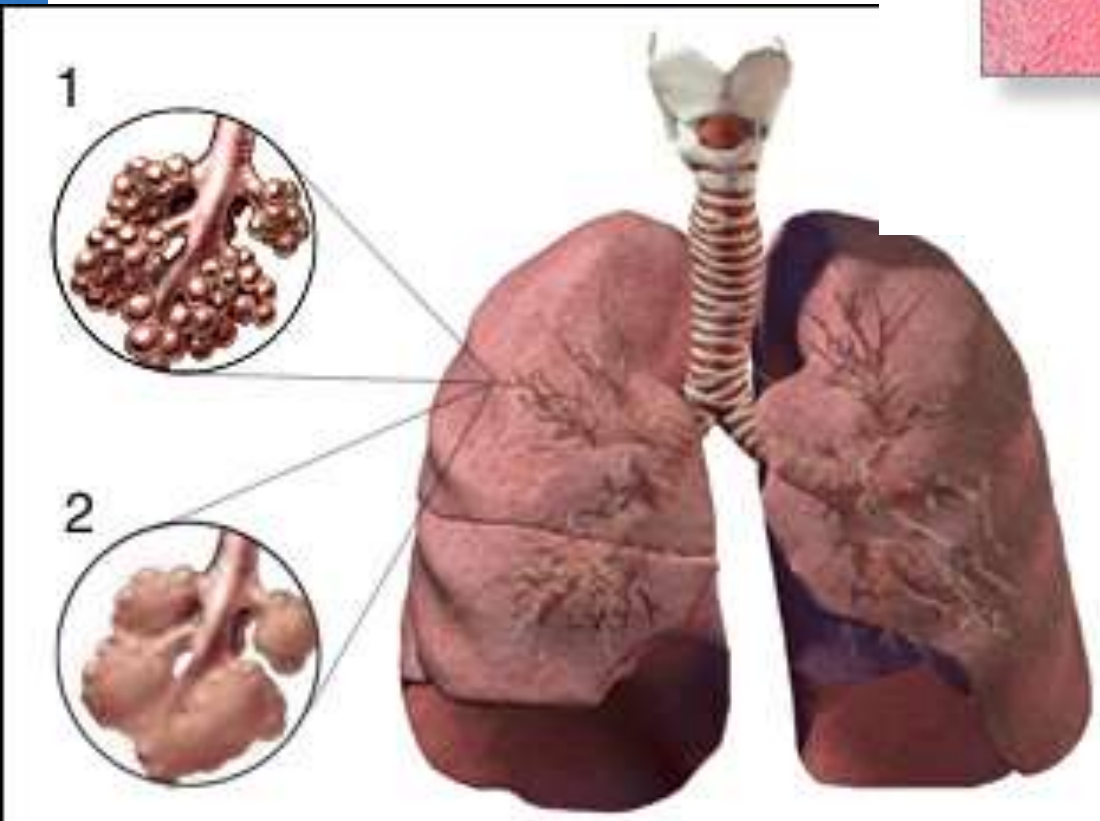
https://www.youtube.com/watch?v=GMP7pkmvgP4

Cilia

Lung Diseases

- Bronchitis
- Emphysema
- Lung Cancer





Factors that affect the digestive system

Stomach Ulcers

Your Assignment

Use pages 159 – 164 to answer C/R questions:

P 164 2-5

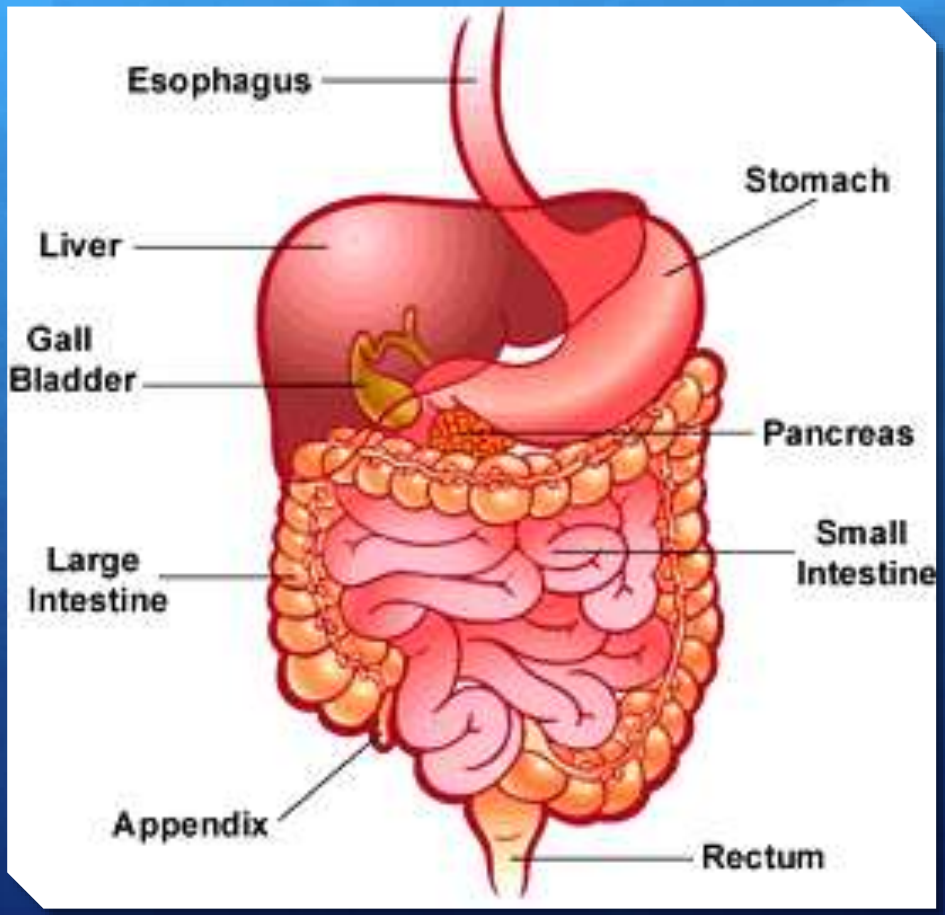
Digestive System

First Point: Mouth

Last point: Anus

What is the difference between Chemical and physical digestion?

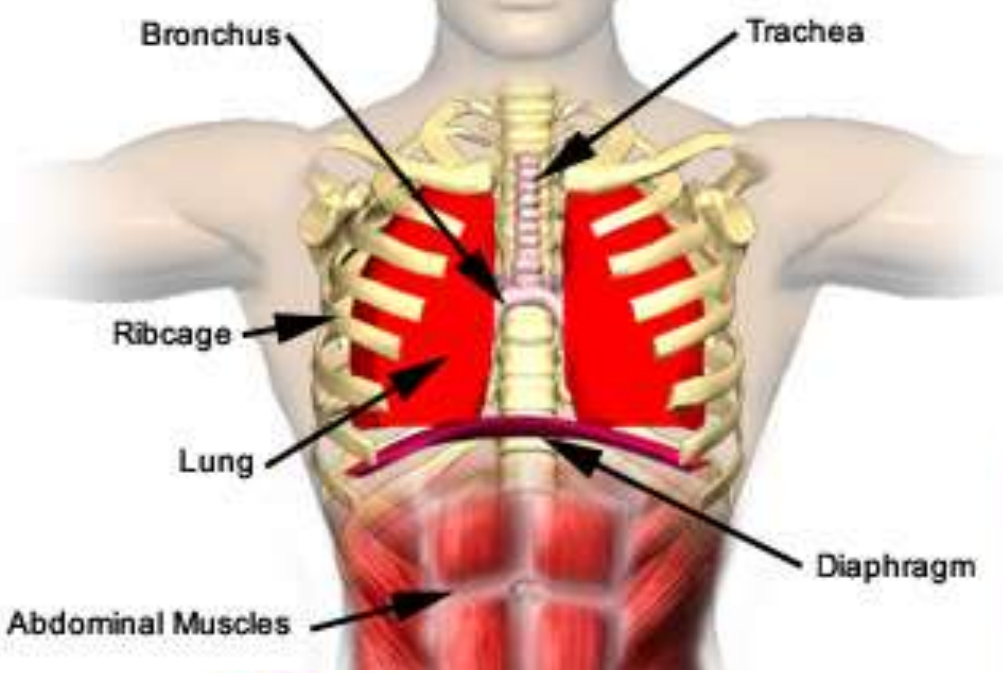
Where are the villi? What do they do?



Respiratory System

What are alveoli?

The diffusion of nutrients and gass occurs in specialized blood vessels called:_____.
This is also called _____
_____

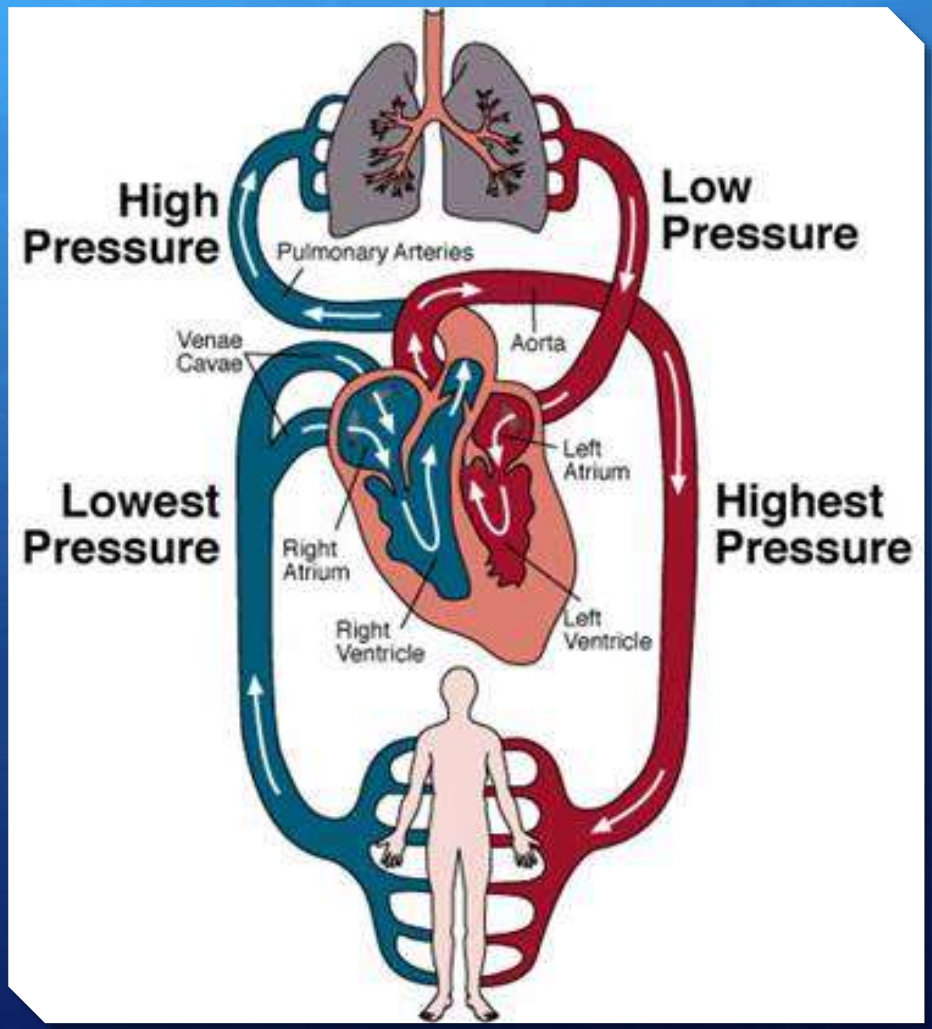


System

Circulatory System

The left side of the heart pumps blood into your_____

The right side of your heart pumps blood into your _____



The Blood

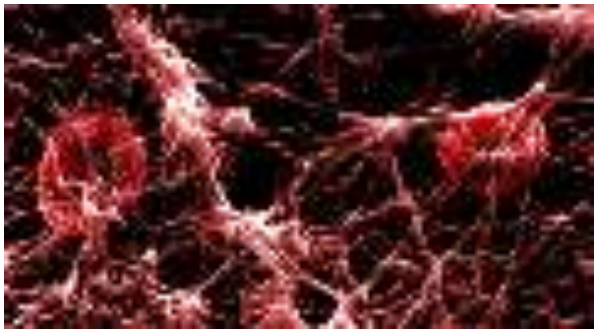
55% plasma

45% red blood cells (carry O_2 and CO_2), white blood cells, and platelets

White Blood Cells: Specialized cells to fight infection

Platelets: Help stop bleeding of cuts

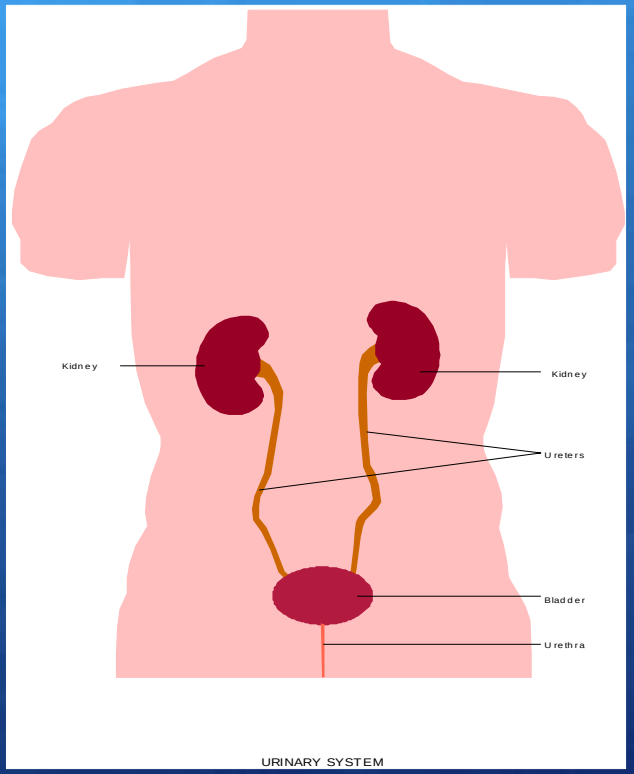
Billy Nye, Heart: 0 – 5:10



Excretory System

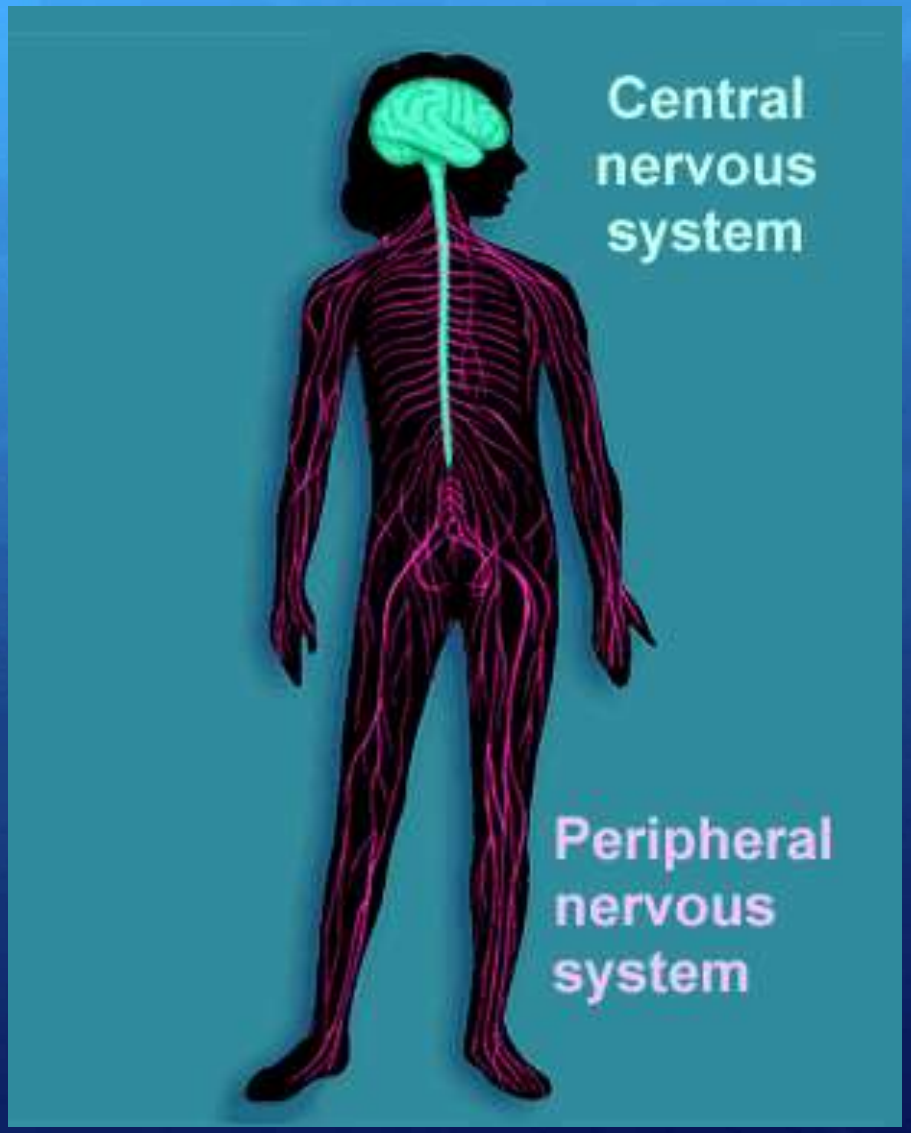
The liver removes _____ from the blood and produces _____

What substance does your skin remove by sweating?



Nervous System

Draw the thought web



Your Assignment

Unit Review: p 170: # 11, 12, 14, 16, 18.