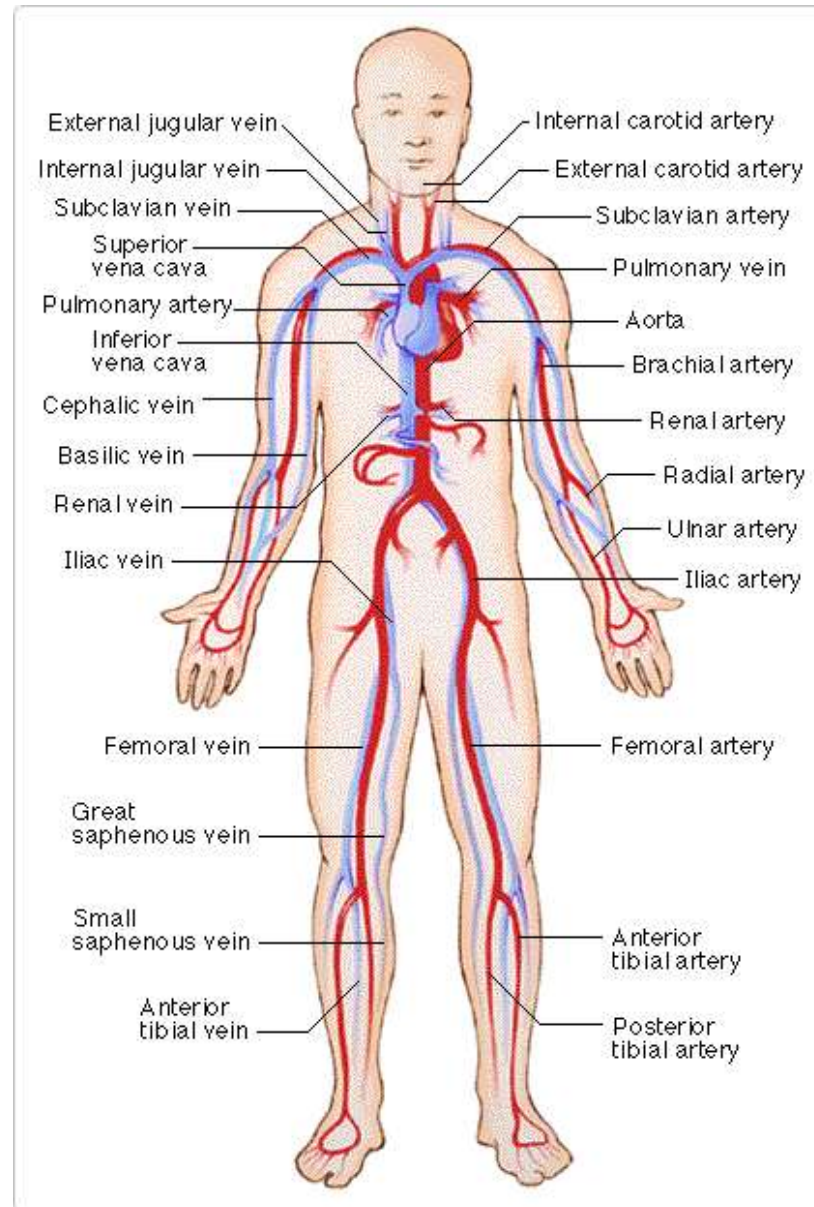


HUMAN Circulatory System



What's the purpose of the circulatory system?



Students, write your response!

WHAT'S THE PURPOSE?



- To transport nutrients and wastes
- Pieces and parts
 - blood
 - blood vessels
 - heart

4 Parts of the Blood

1. Plasma =

- a. Liquid part
- b. Contains H₂O, CO₂, salts, nutrients, hormones, proteins...

2. Red blood cells =

- a. Contain hemoglobin → carry oxygen

3. White blood cells =

- a. fight disease
- b. Engulf, make antibodies, travel in blood and lymph

4. Platelets =

- a. Clotting factors



CIRCULATORY SYSTEM

THE FOUR KINGDOMS



All animals have blood

True



False



Students choose an option

Pear Deck Interactive Slide
Do not remove this bar



Circulatory Systems in Animals

Heart = Cardio = Coronary

All animals have circulatory systems

True



False



Students choose an option

Pear Deck Interactive Slide
Do not remove this bar

WHAT do the letters DKPCOFGS stand for?



Students, write your response!

Animal Kingdom

- Many invertebrates DO NOT have a circulatory system
 - Rely on just diffusion
 - Ex: flatworms
- 2 types of circulatory systems:
 - Open
 - Closed

OPEN CIRCULATORY



Based on the video what are some aspects of an OPEN circulatory system that you see?



Students, write your response!

OPEN Circulatory Systems

- No true heart
- Organs are bathed in a fluid that is collected and pumped into the open cavity through vessels

Drag your dot to the creature that you think is most likely to have an OPEN circulatory system



Scorpion



Frog



Earthworm



Students, drag the icon!



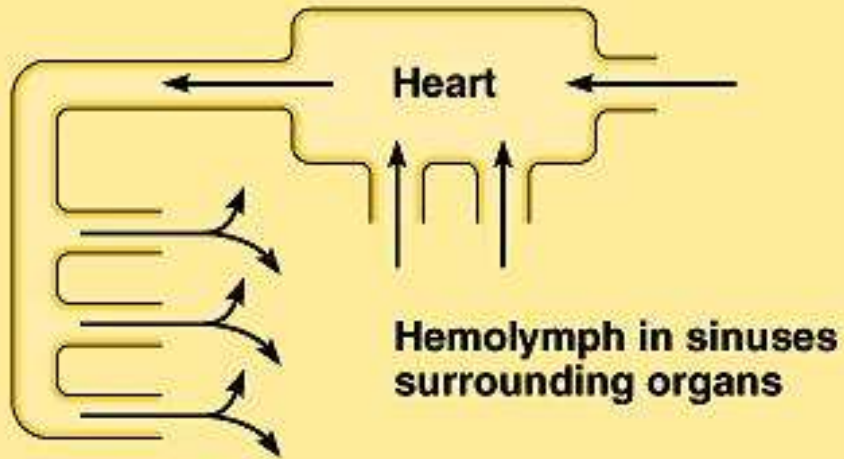
Pear Deck Interactive Slide
Do not remove this bar

Creatures with OPEN circulatory system

1. Arthropods (insects)
2. Mollusks (clams)

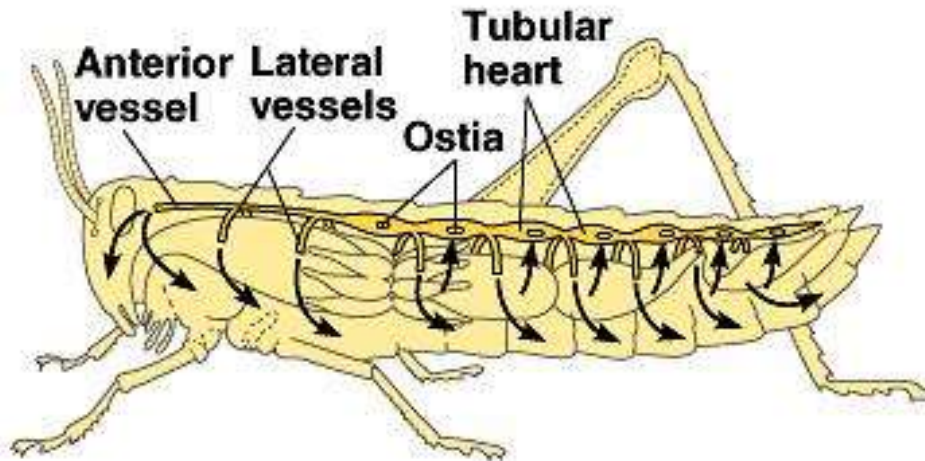


Grasshoppers



Hemolymph is the circulating fluid of insects

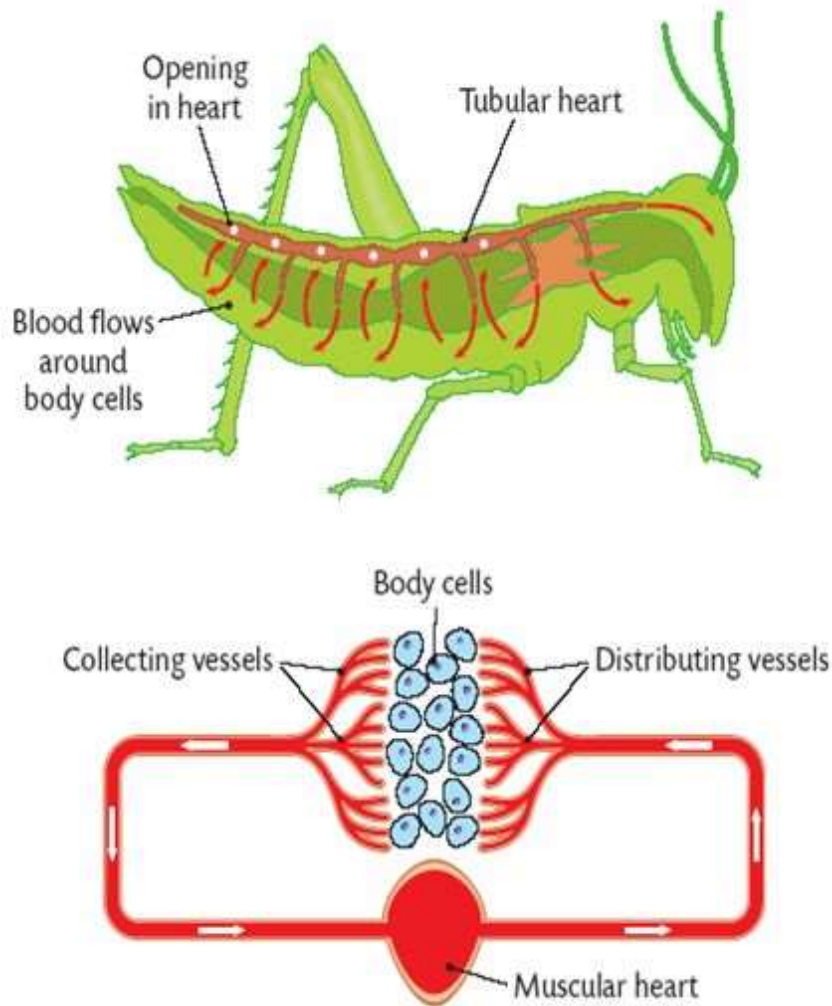
- No red blood cells
- High concentration of free amino acids



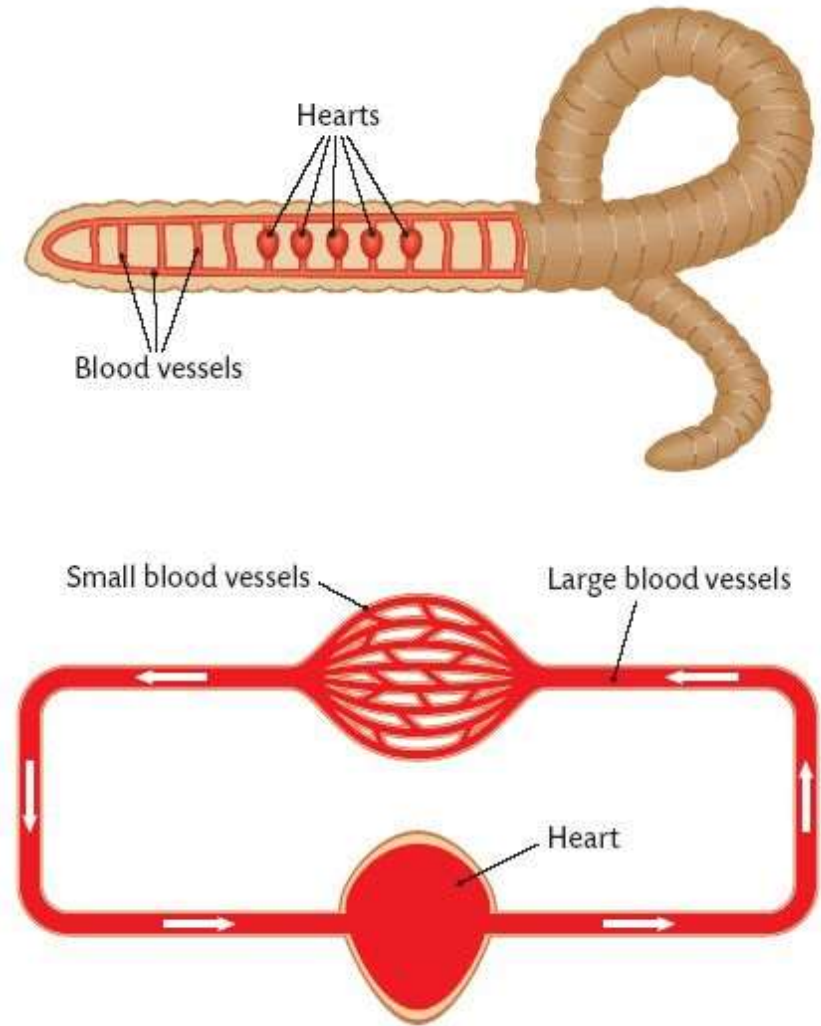
(a) Open circulatory system

Open Vs Closed Circulatory System

27.1 An open circulatory system (insect)



27.2 A closed circulatory system (earthworm)



Closed circulatory system

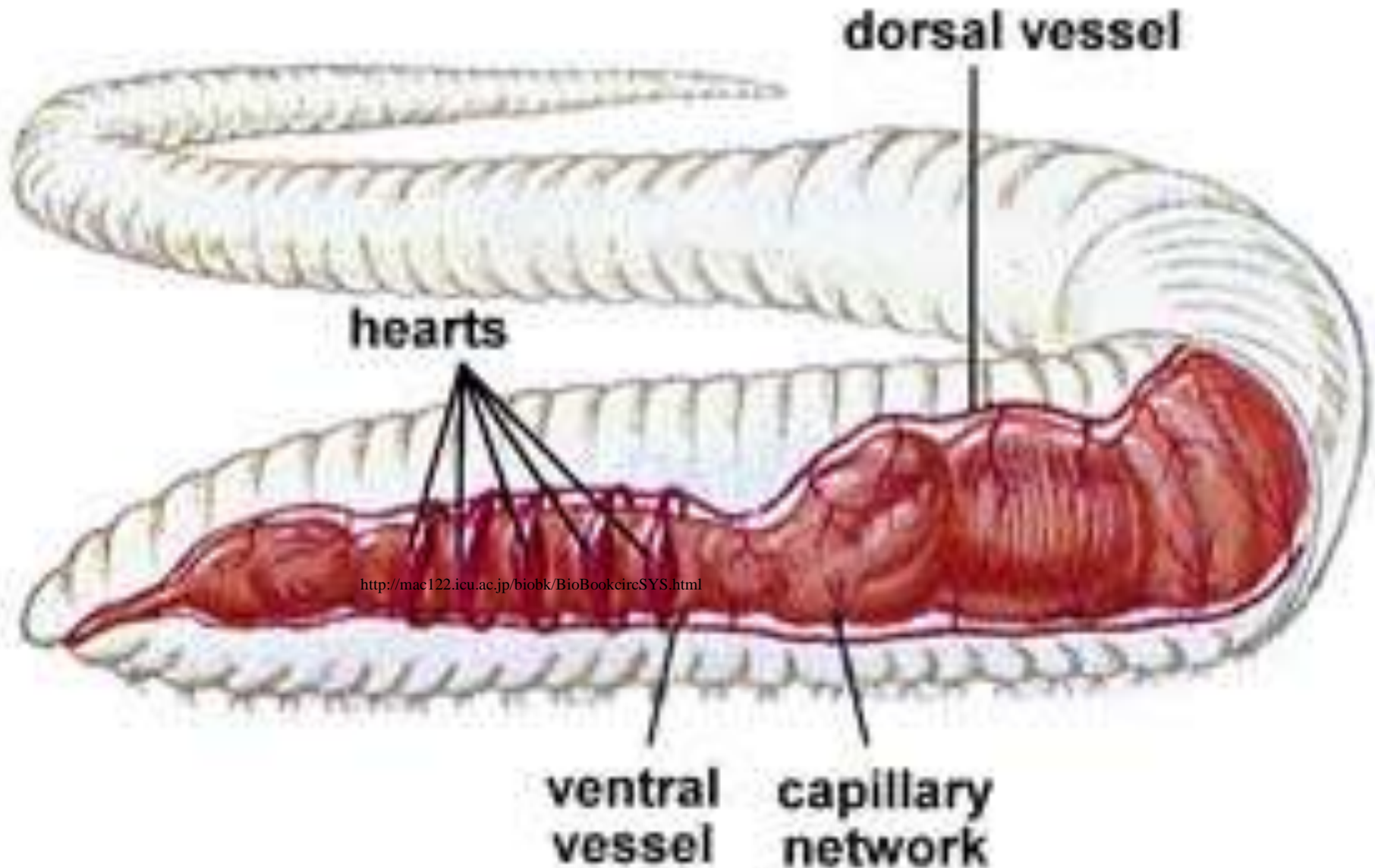
Contains:

- Vessels
- Heart

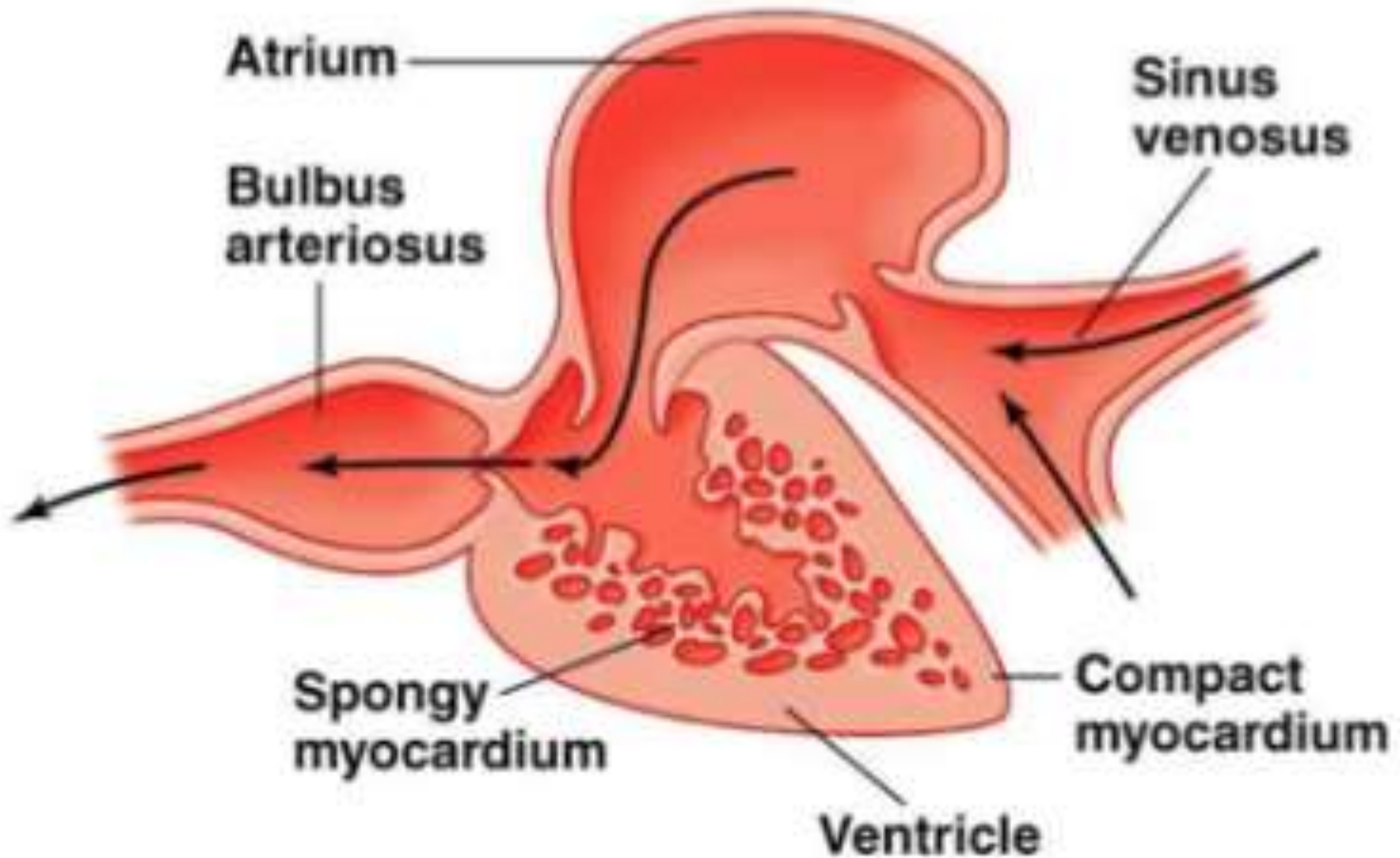
CREATURES with CLOSED

- Earthworms =
 - simplest form (2 vessels with 5 aortic arches (hearts))

Earthworms

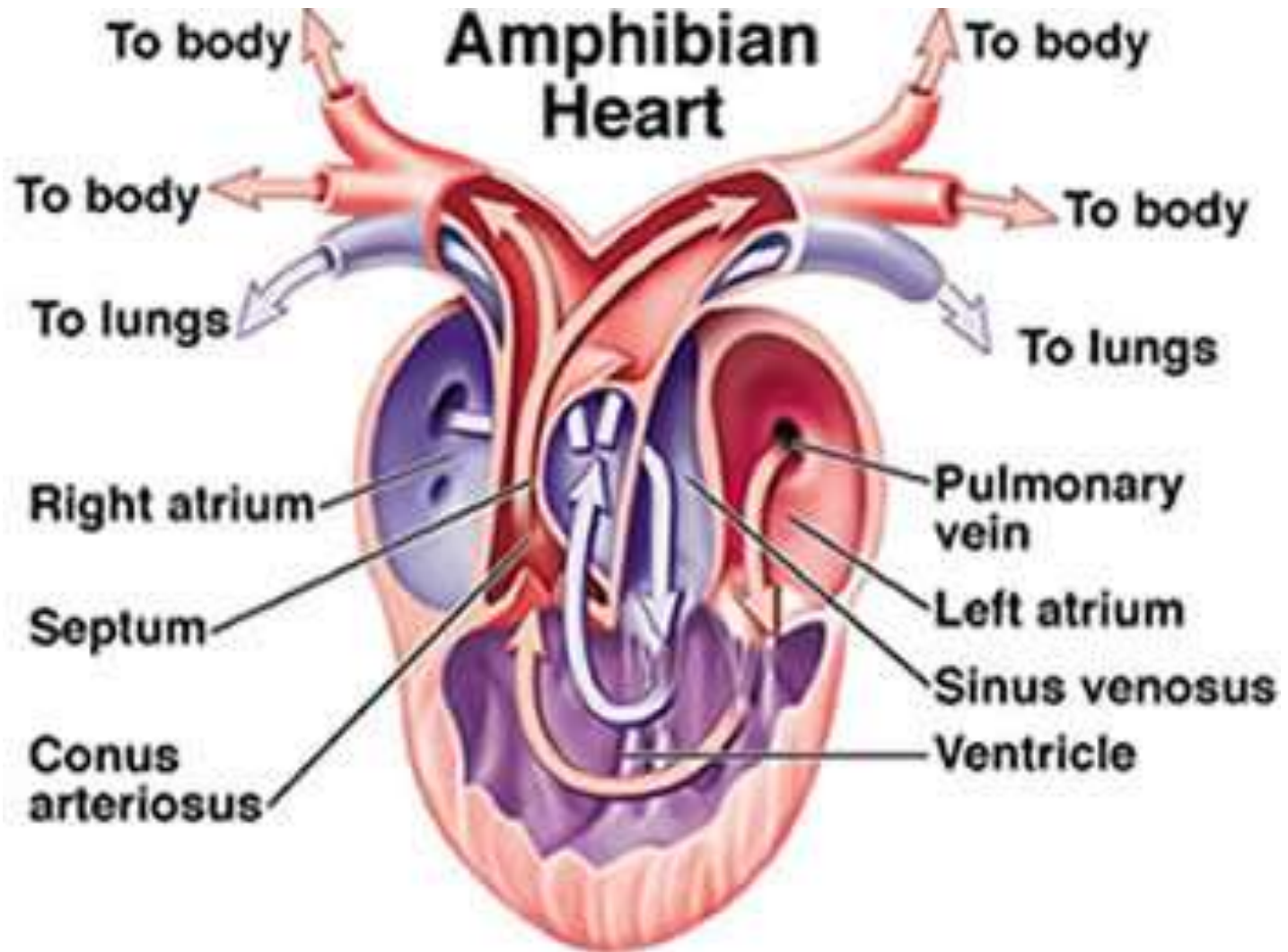


Fish have a 2 chambered heart



(a) Bony fish heart

Amphibians and most reptiles = 3
chambered hearts



Would you rather eat a jar of mayonnaise or eat the still beating heart of a snake?



Students, drag the icon!



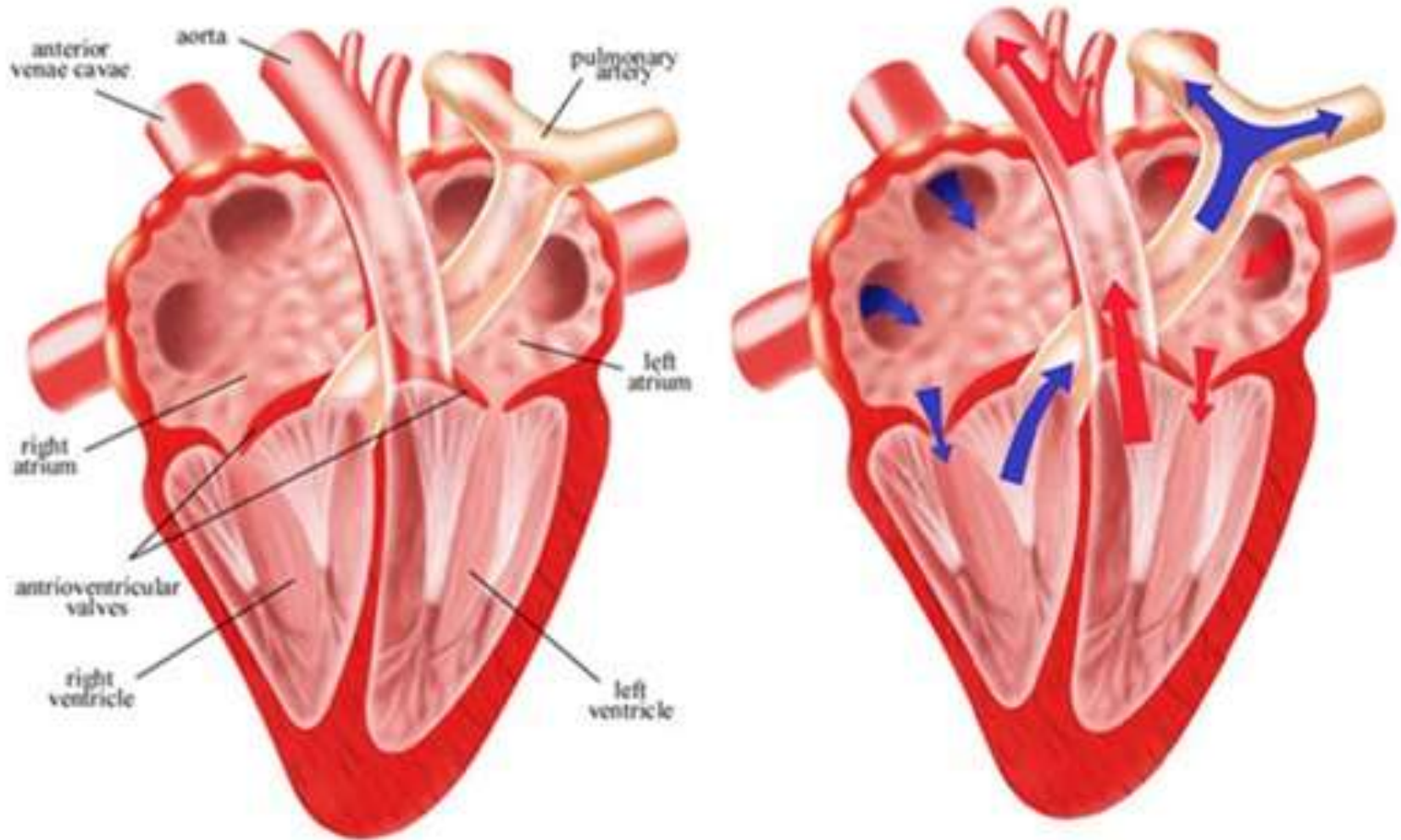


NAT GEO
WILD

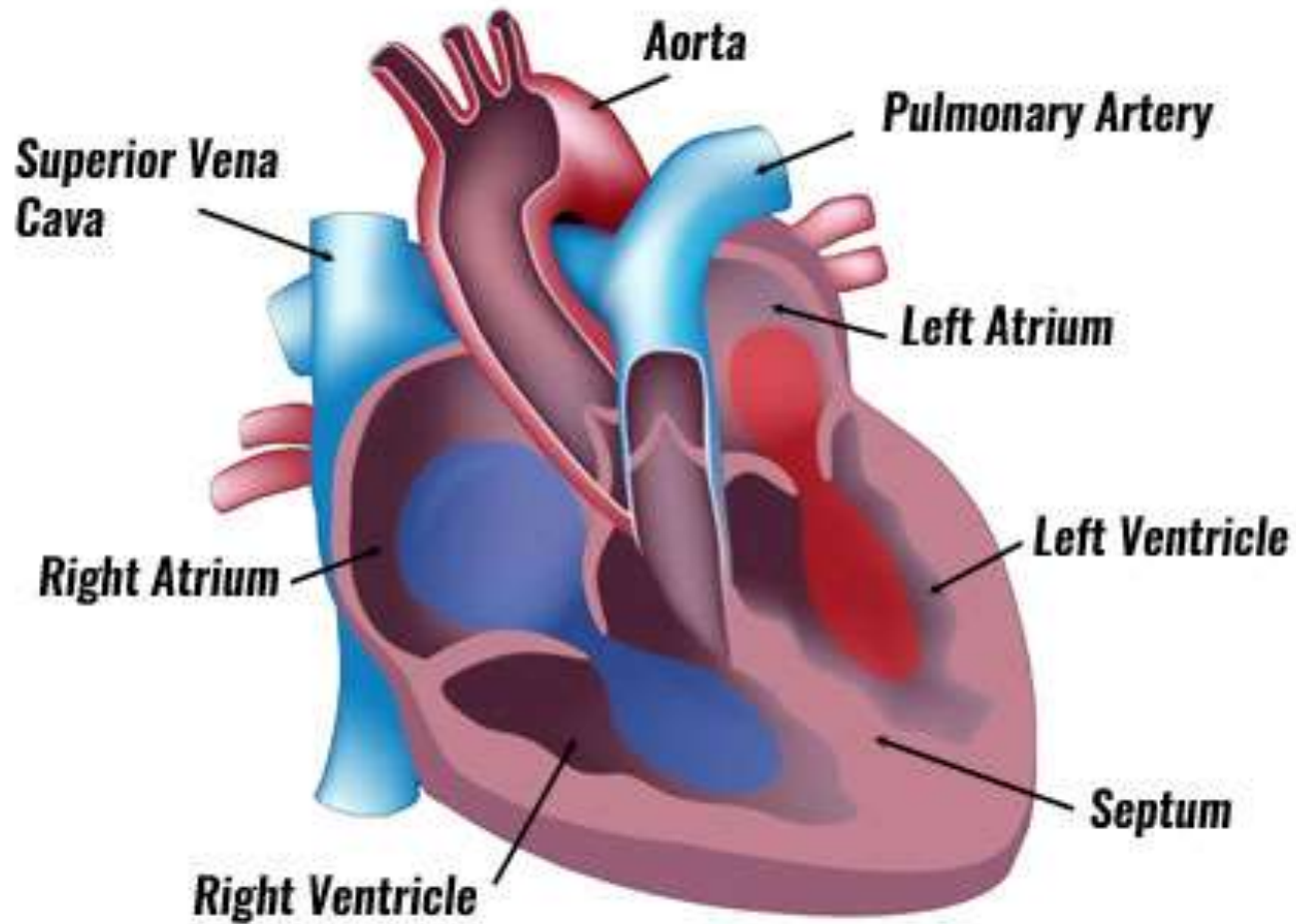


NAT GEO
WILD

Birds and mammals = 4 chambered hearts



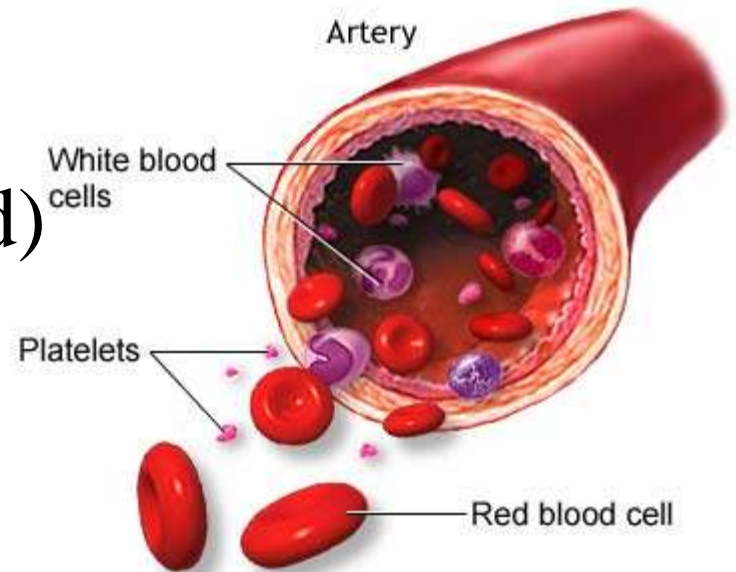
Blood Flow in Humans



**PIECES AND
PARTS
OF THE HUMAN
CIRCUCLATORY
SYSTEM**

ARTERIES

- Thick walls
- Muscles contract to move blood
- Transport O₂ rich blood (red) from the heart to body cells

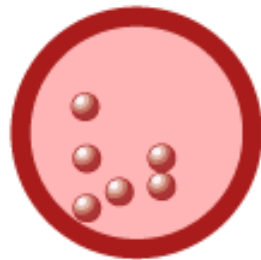




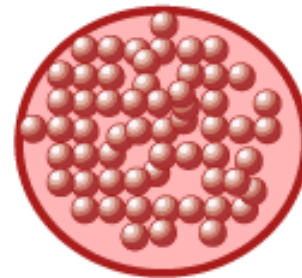
Arterial Pressure → Blood pressure (2 parts)

- Systole = heart and arteries contract → pressure
- Diastole = heart and arteries relax
- Blood pressure = systole/diastole
 - Normal = 120/80 or lower is normal blood pressure
 - 140/90 or higher is high blood pressure

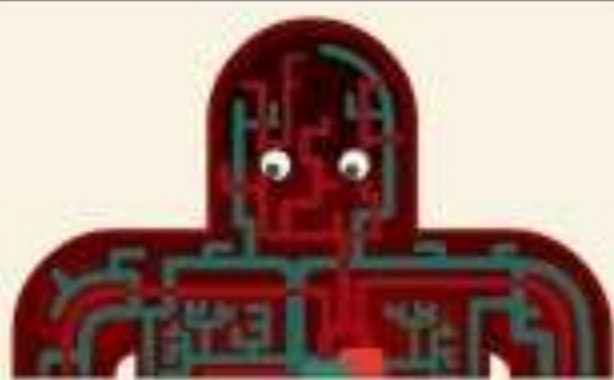
Young Heart With Normal Arterial Walls



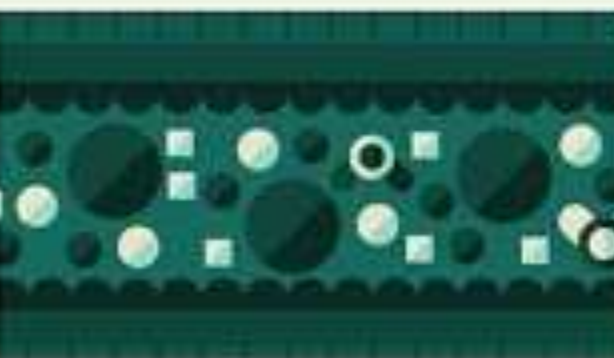
During Diastole



During Systole

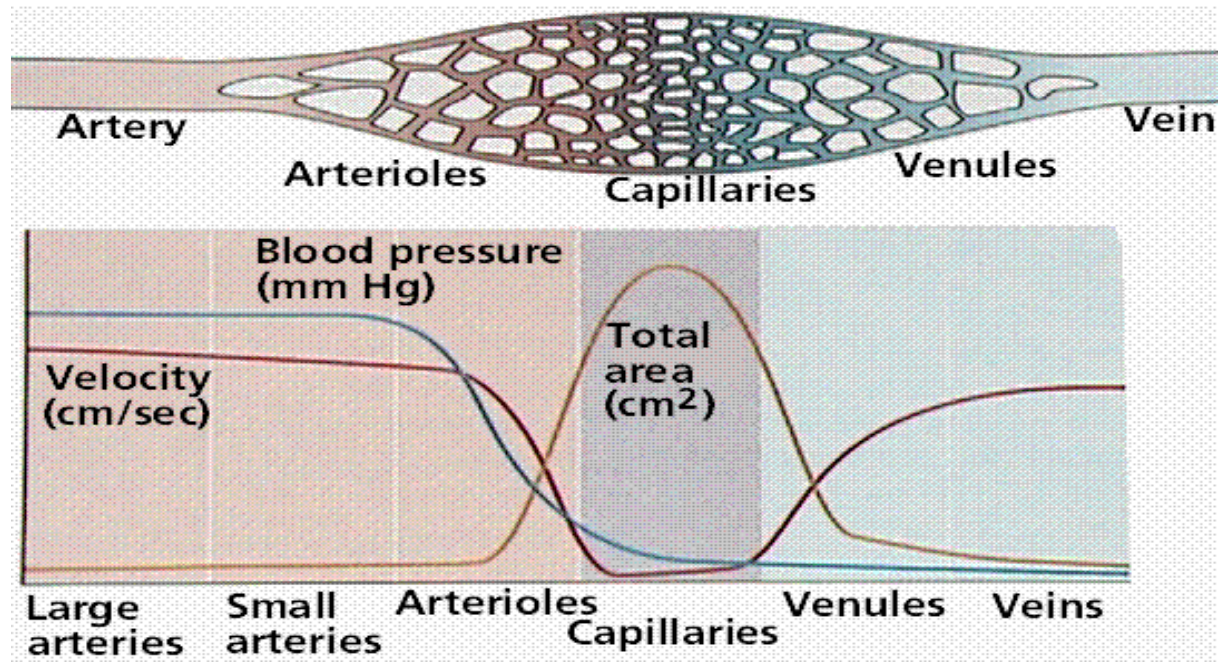


HOW BLOOD PRESSURE WORKS



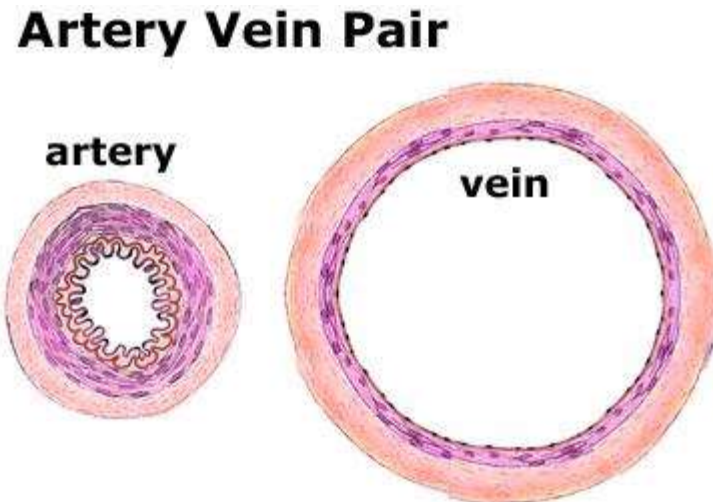
CAPILLARIES

- Tiny 1-cell thick
- Exchange blood between vessels
- Surround air sacs in lungs
 - gases exchange here
- Surround villi of small intestines
 - nutrients absorbed



VEINS

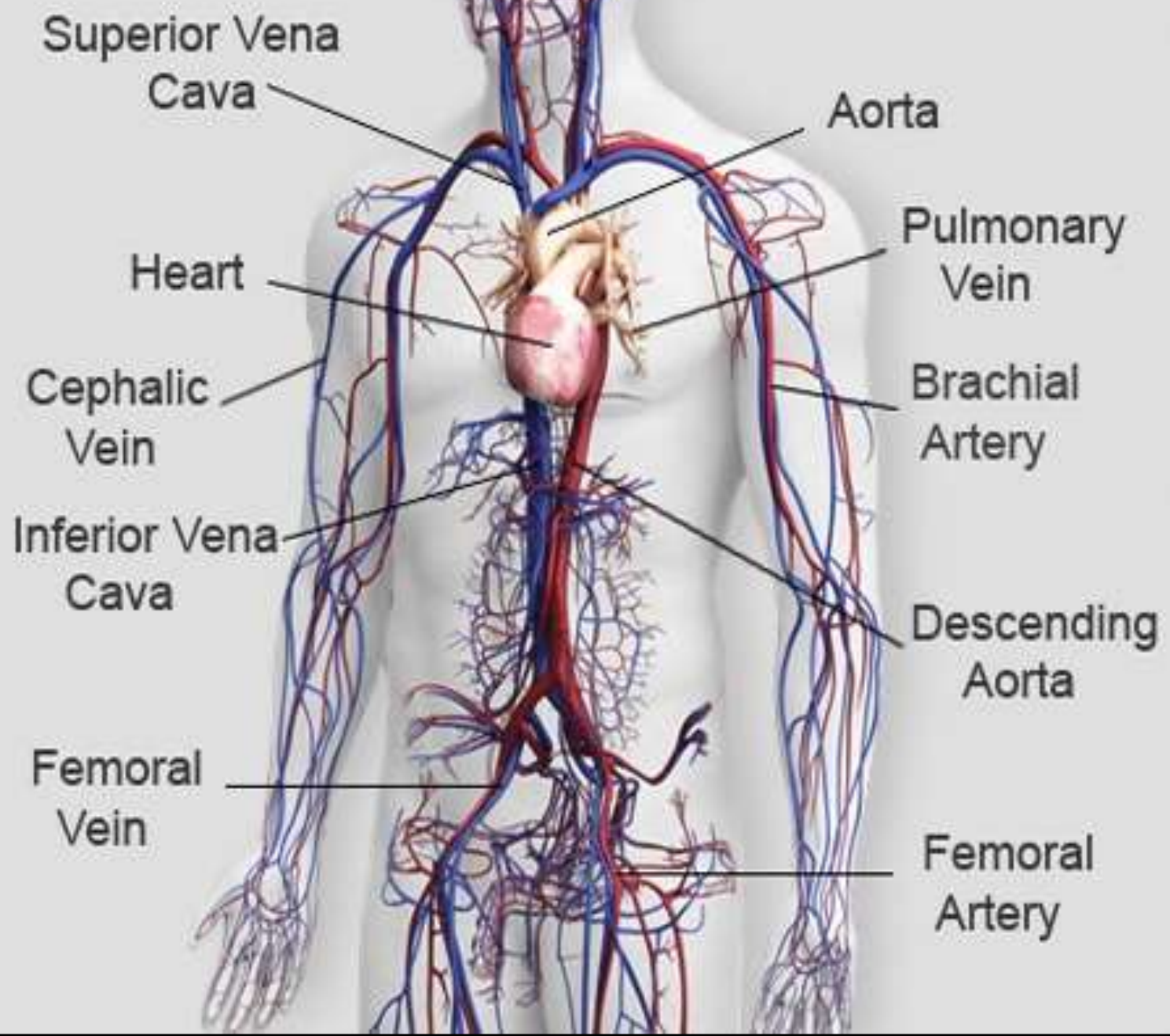
- Thinner than arteries
- Valves prevent backflow
- Take O₂ poor blood (blue) back to heart then lungs



INSIDER



Vein viewer lets you see veins with light

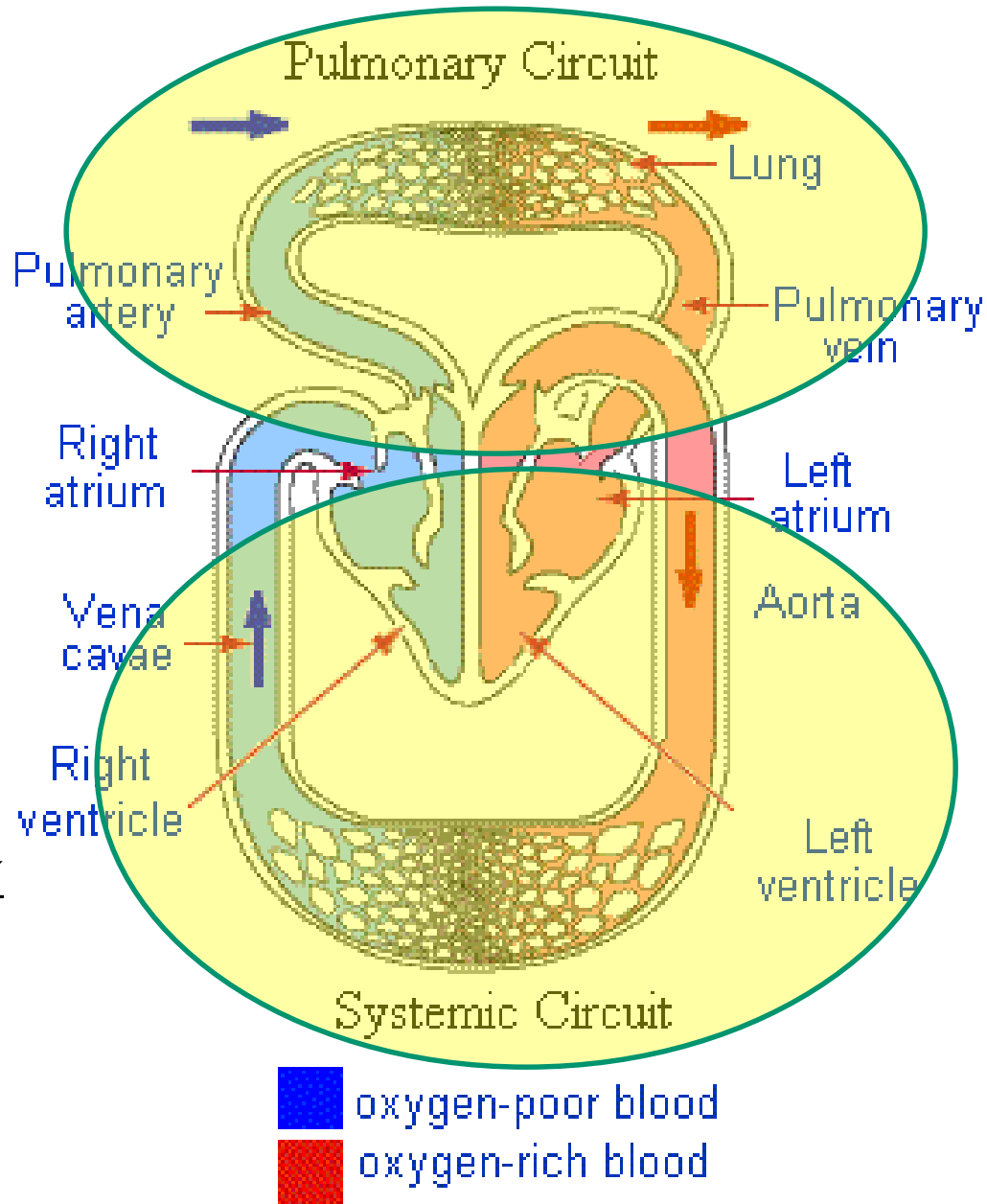


Blood flows along 2 pathways

- Pulmonary circuit = heart and lungs
 - Deoxygenated blood goes from heart to lungs (O_2 diffuses in) then back to heart
- Systemic circuit = heart and body
 - Oxygenated blood goes from heart to body (O_2 used for respiration) and back to heart

Pulmonary =
heart and lung

Systemic =
heart and body



HEART ANATOMY

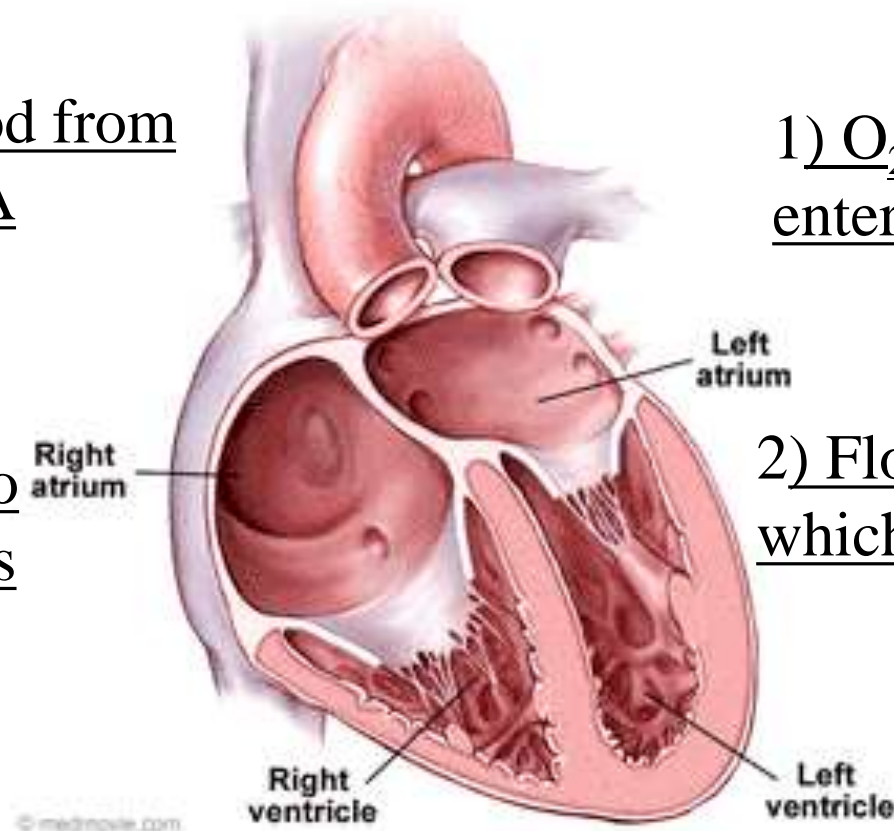
- 4 chambers
 - 2 upper chambers = Atria (atrium = 1) receive blood
 - 2 lower chambers = ventricles = pump blood

3) O₂ poor blood from Body enters RA

1) O₂ rich blood enters LA

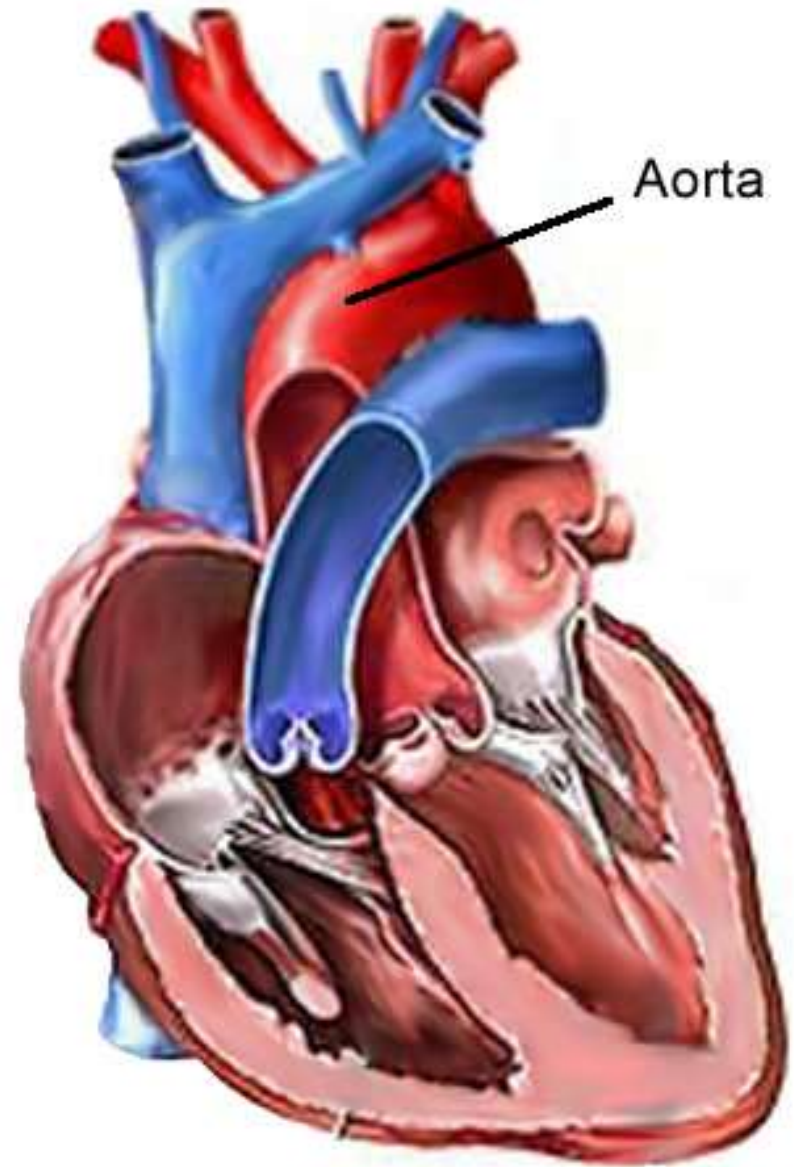
4) Flows down to RV which pumps to the lungs

2) Flows down to LV which pumps to body



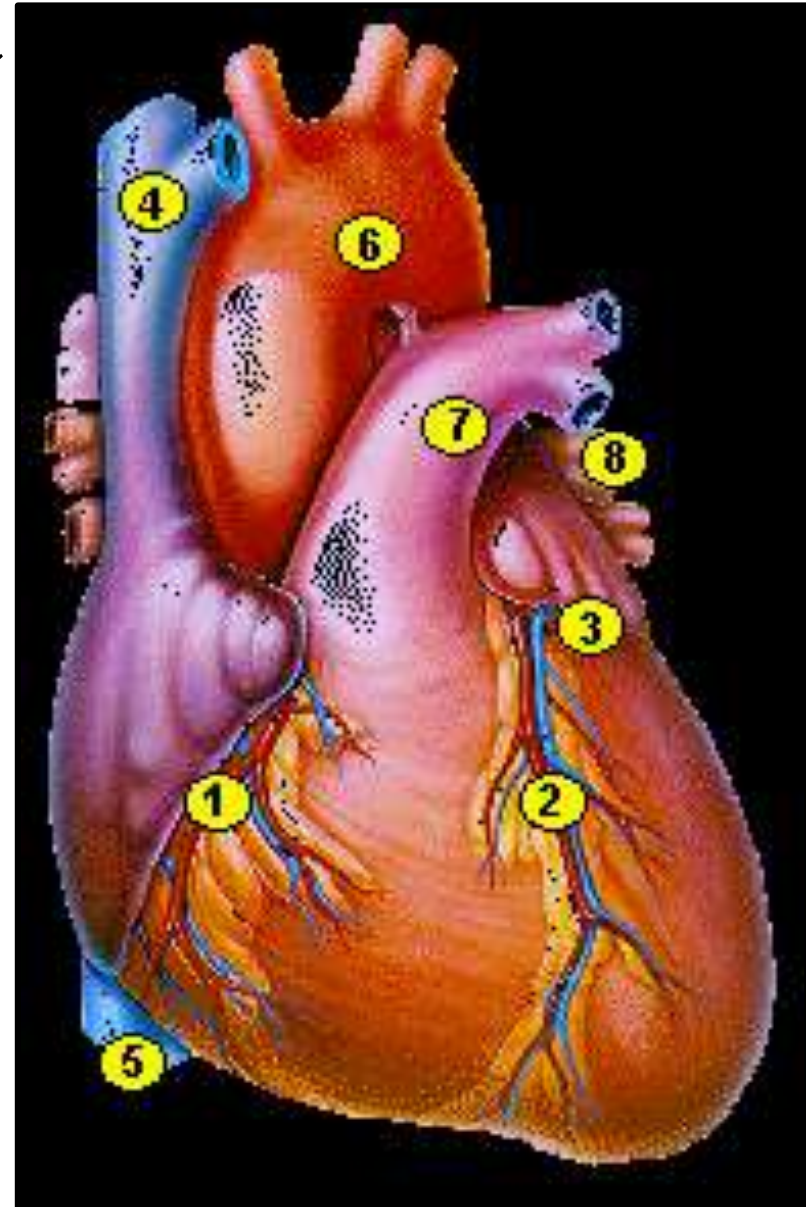
AORTA

- Largest artery in the body
- Carries O₂ rich blood from left ventricle to the body



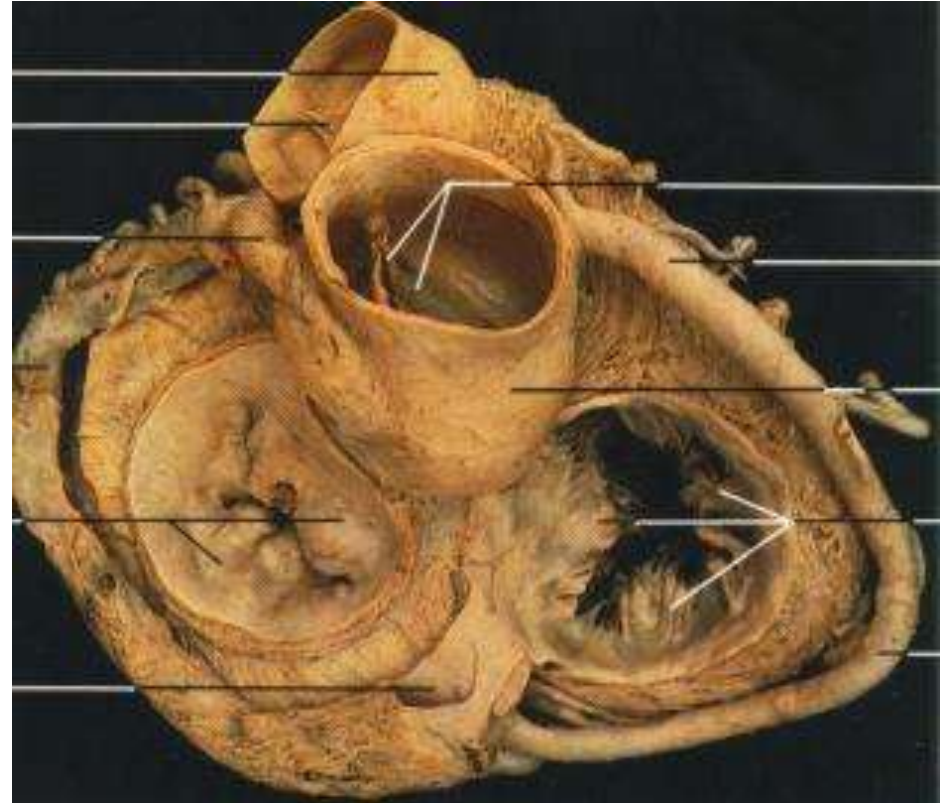
Superior and Inferior Vena Cava

- (#4) Superior vena cava brings deoxygenated blood from head and upper body back to heart →
- (#5) Inferior vena cava brings deoxygenated blood back to heart from legs and torso →



HEART ANATOMY continued

- Atria and ventricles are separated by valves (*note veins also have valves to prevent backflow*)
- Atria receive blood
- Ventricles pump blood



<http://www.esg.montana.edu/esg/kla/ta/hrtvalvs.jpg>

HEARTBEAT

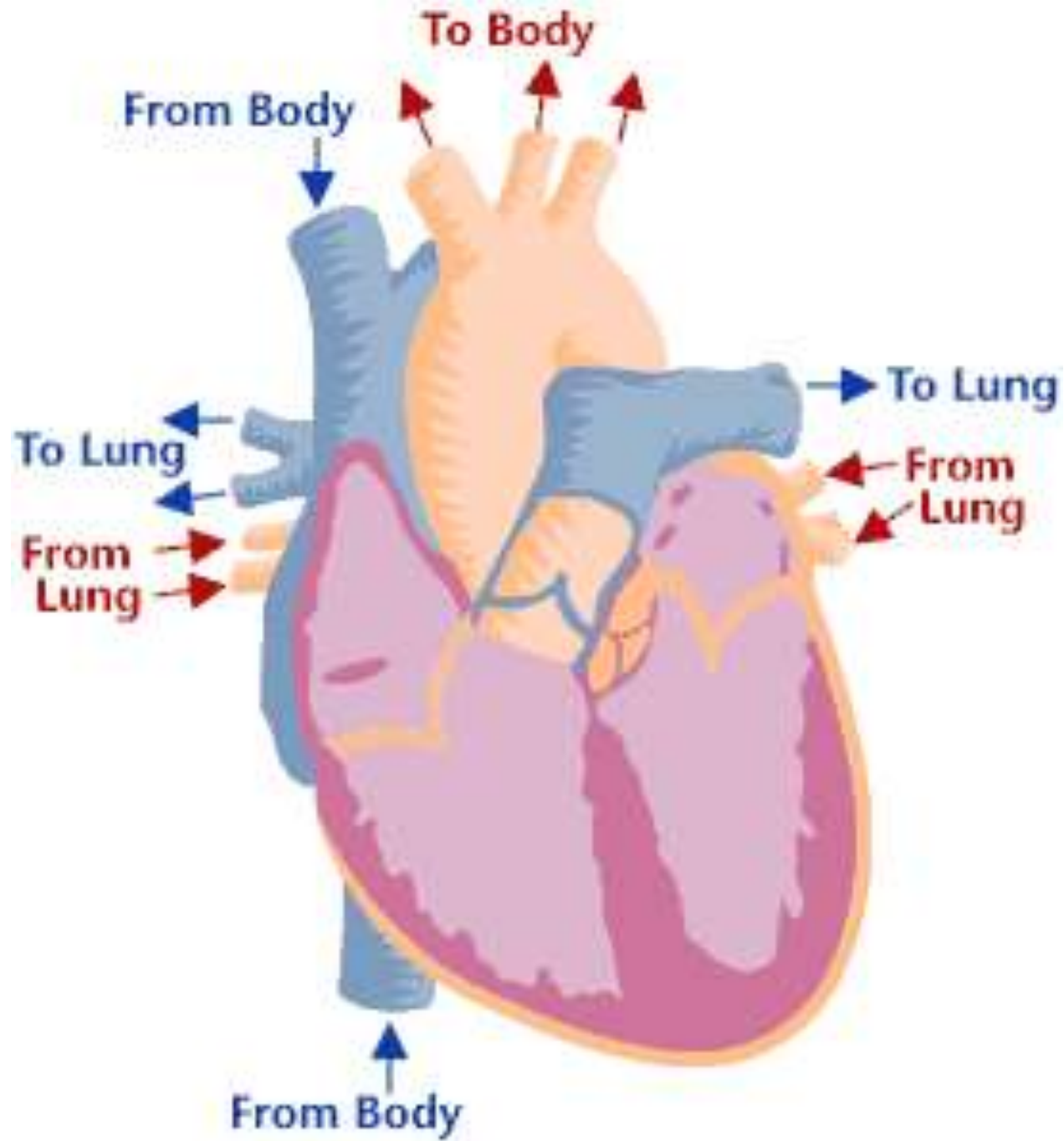
=

opening and closing of
valves

- 2 phases of a heartbeat
 - Resting = diastole (ventricles relax blood enters atria)
 - Contracting = systole (ventricles contracts blood pumps away from heart)

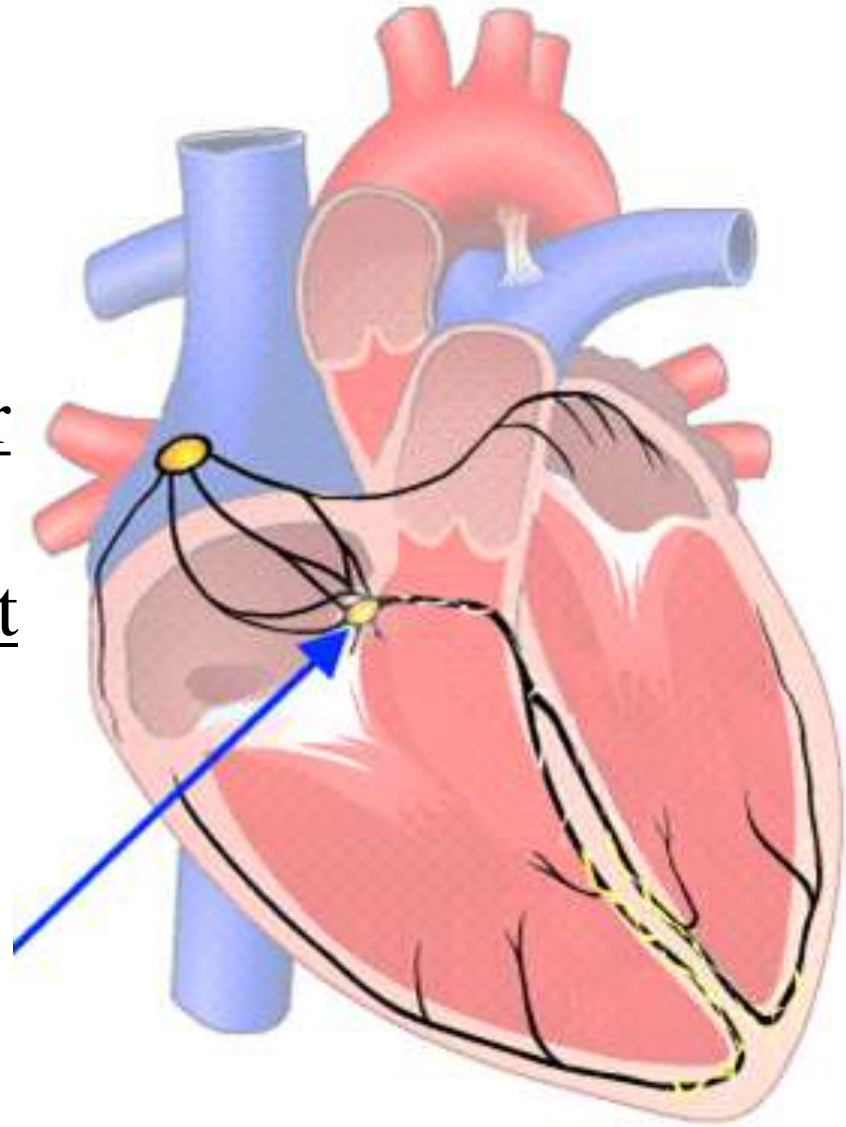
CHOICE

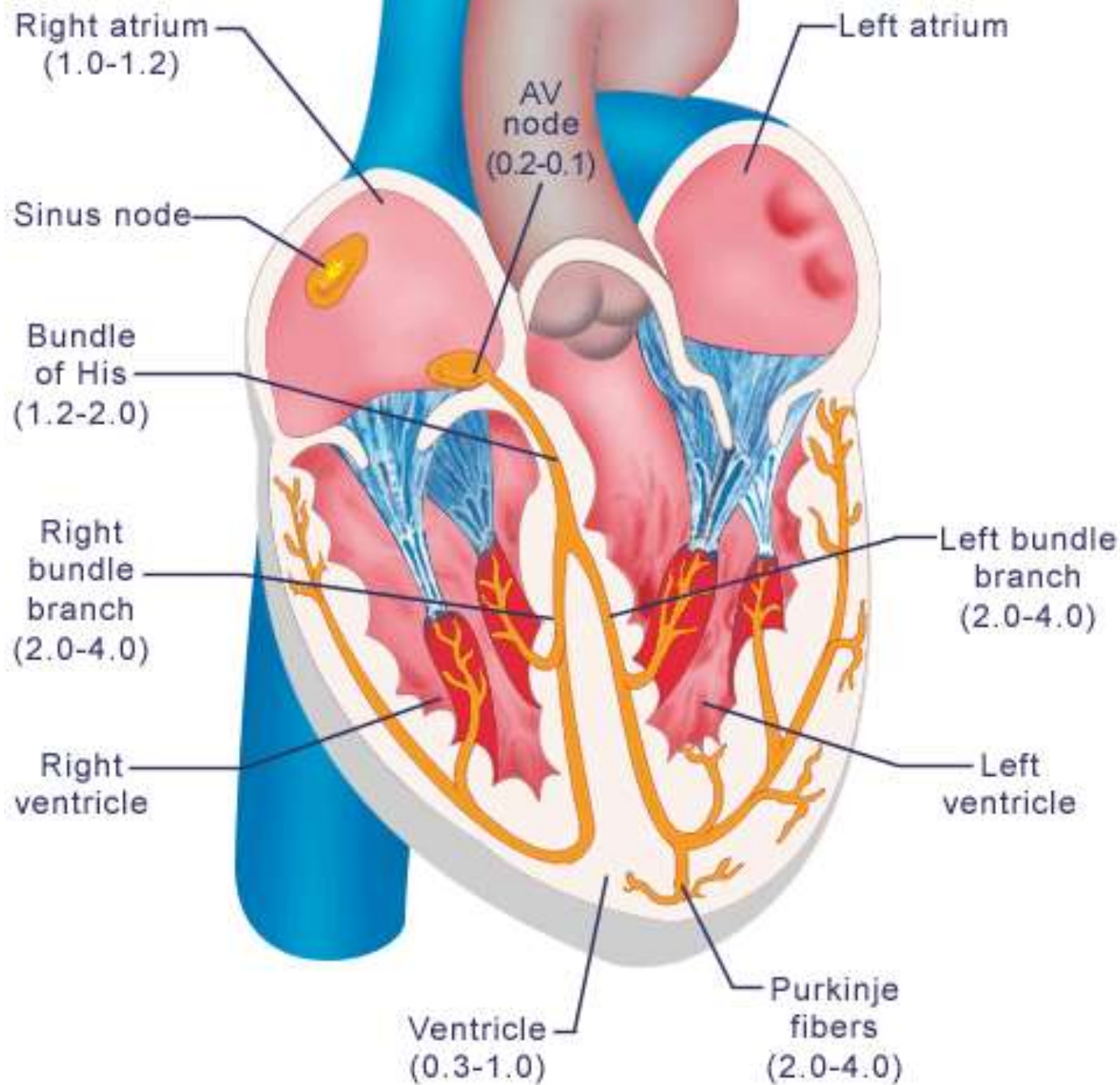
1. Make a [Circulatory System Board Game](#)
2. Create a [comic strip](#) (or short story) detailing the life of a red blood cell
3. [Do open heart surgery](#) and a TEST
 - a. If you want to see it first before you do it [CLICK HERE](#)
 - b. In addition this option will include a test as the “summary grade”



Electrical impulse flows from sinoatrial node (SA node)

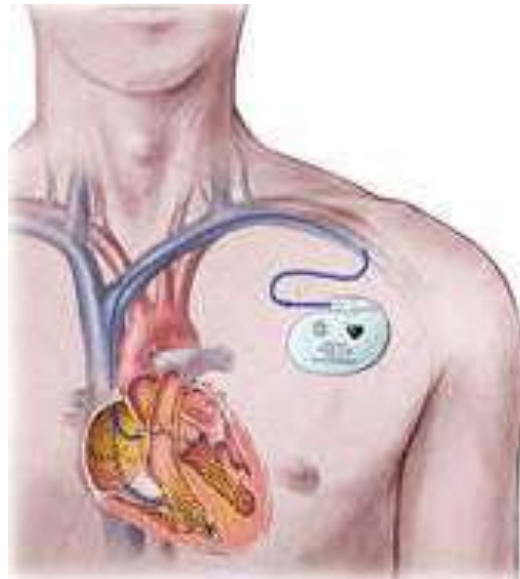
- Through electrical fibers
- To the atrioventricular node or AV node
- To the rest of the heart



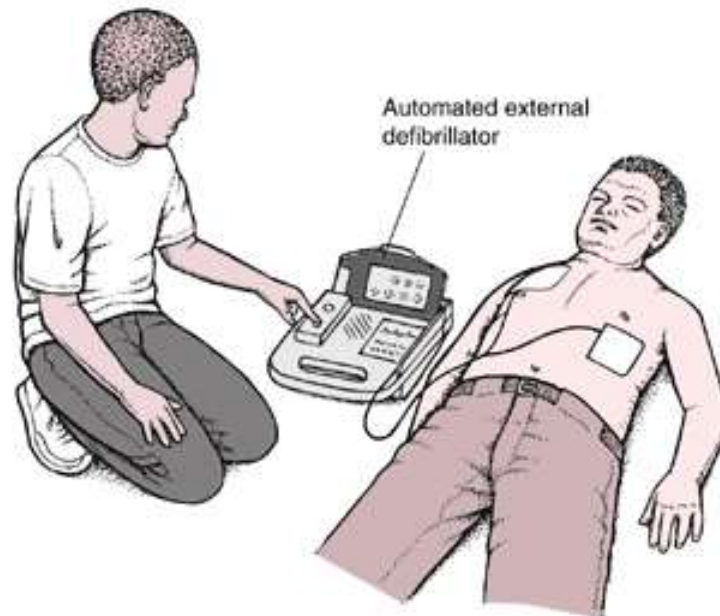


Regulation of heartbeat **NOT** by your body

- PACEMAKER = controls the rate at which your heart beats by producing electrical impulses



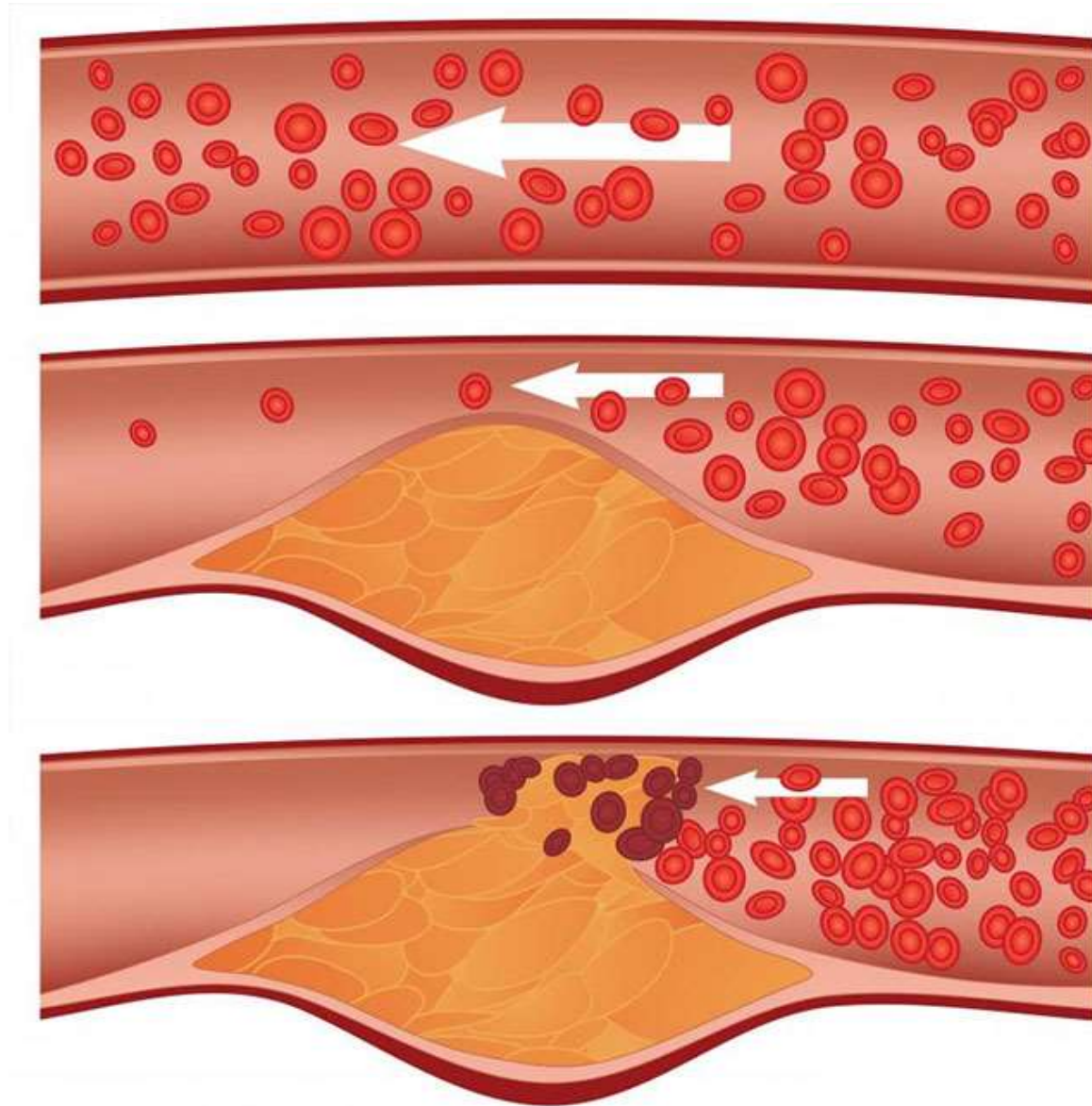
- DEFIBRILLATOR →
 - electric shock → stimulate heart
- EPINEPHRINE =
 - drug → stimulate heartbeat
 - possible issues with the brain



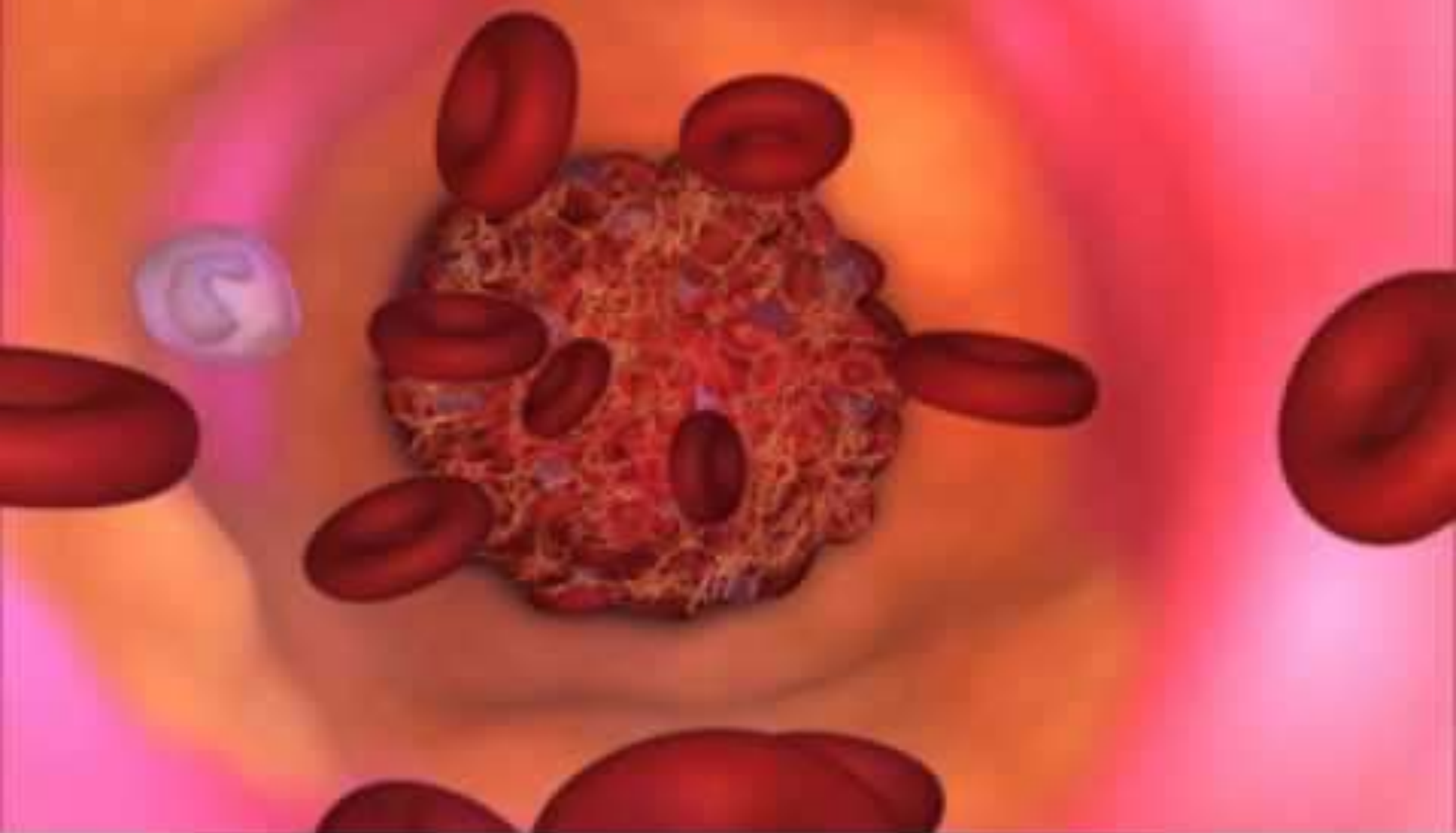
FAILURE TO MAINTAIN HOMEOSTASIS can look like...

- Cardiovascular diseases =
 - Illness of heart or blood vessels
- Plaque =
 - cholesterol, calcium and fat deposits that stick to the walls of blood vessels

PLAQUE BUILDUP

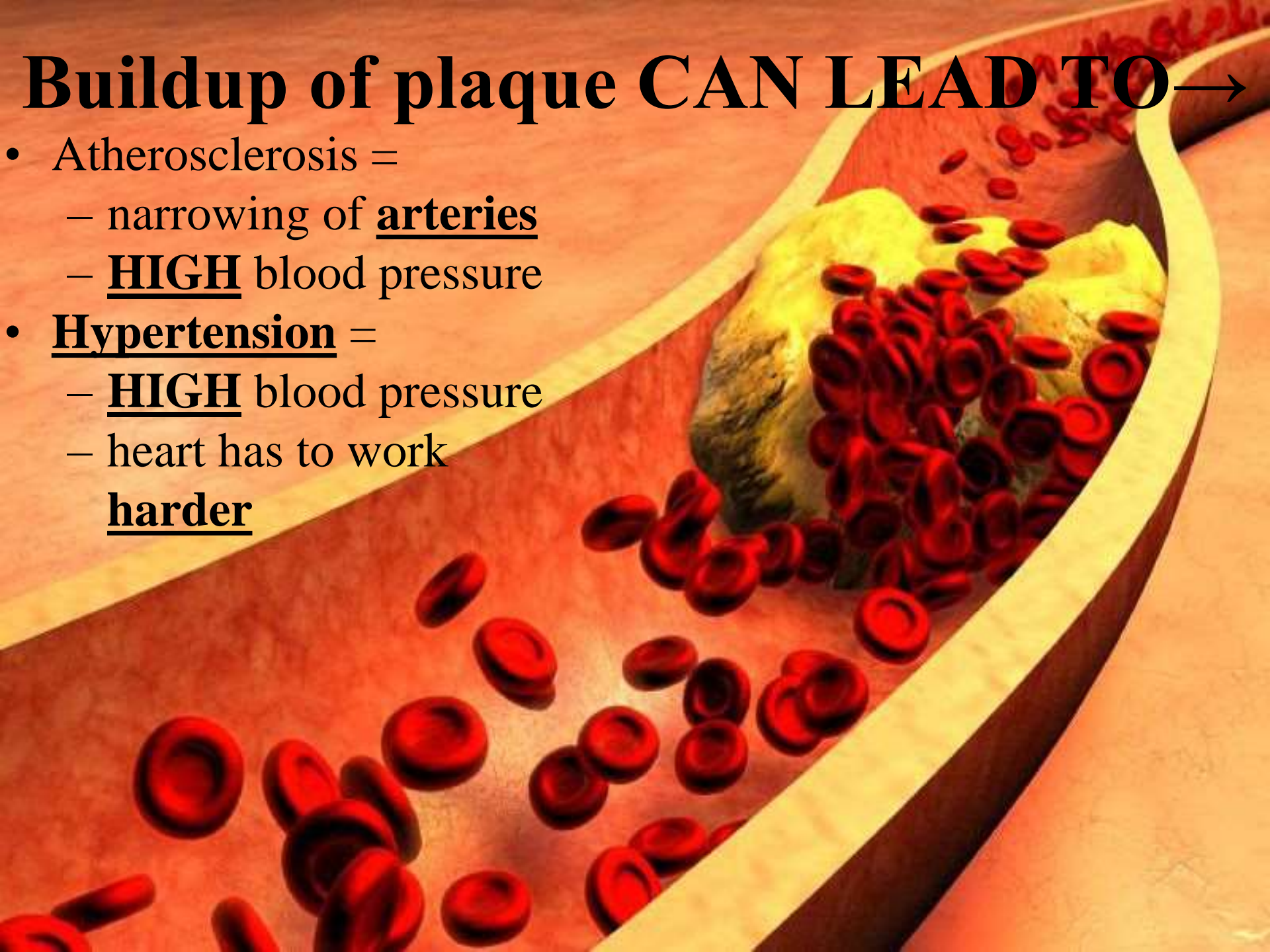


American Heart Association.



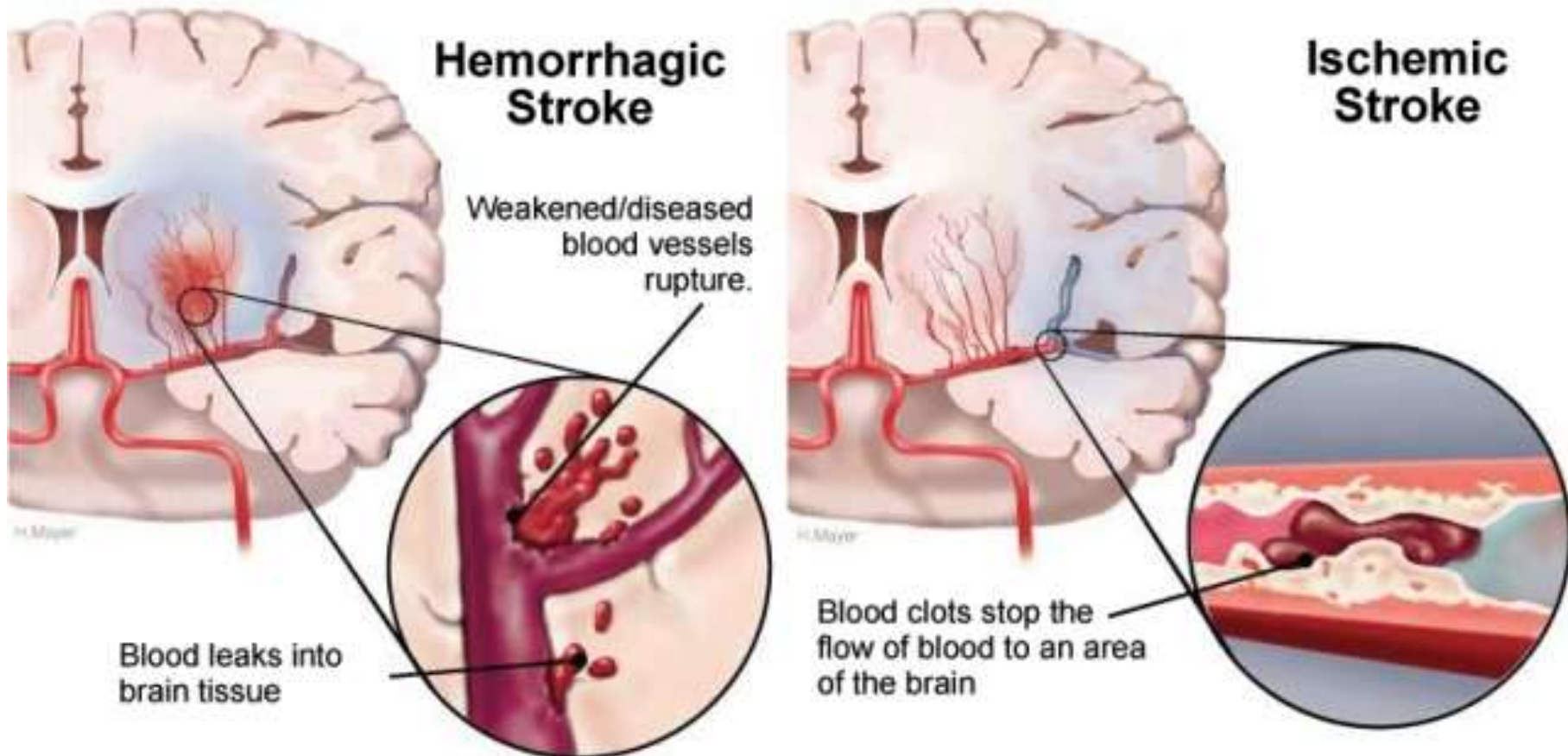
Buildup of plaque CAN LEAD TO →

- Atherosclerosis =
 - narrowing of arteries
 - HIGH blood pressure
- Hypertension =
 - HIGH blood pressure
 - heart has to work harder

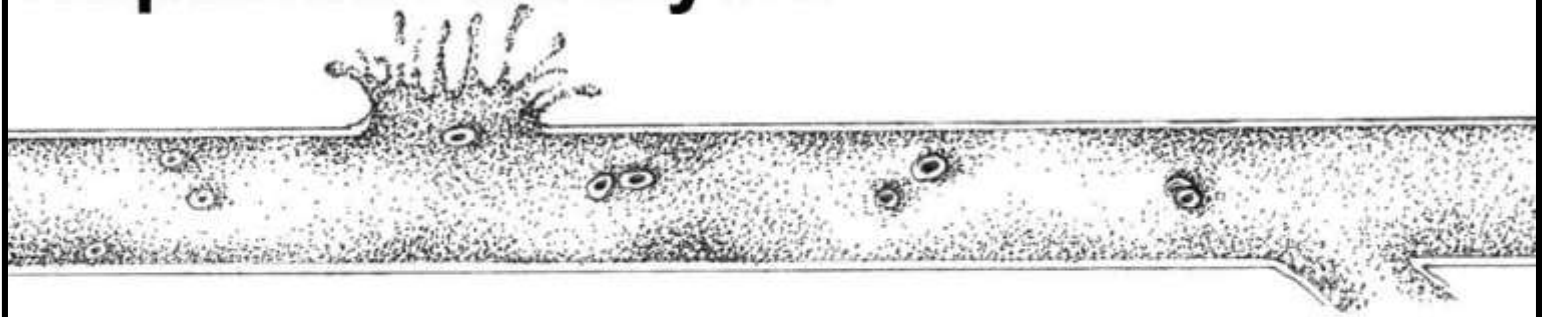


STROKE =

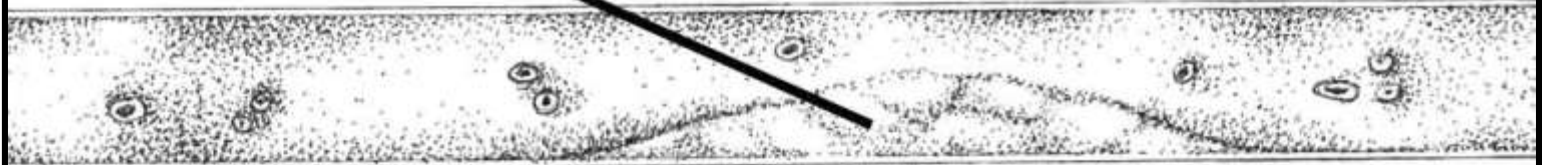
- blood clot in an artery going to the brain →
- oxygen deprived tissues die LEADS TO→
 - slurred speech
 - loss of mobility



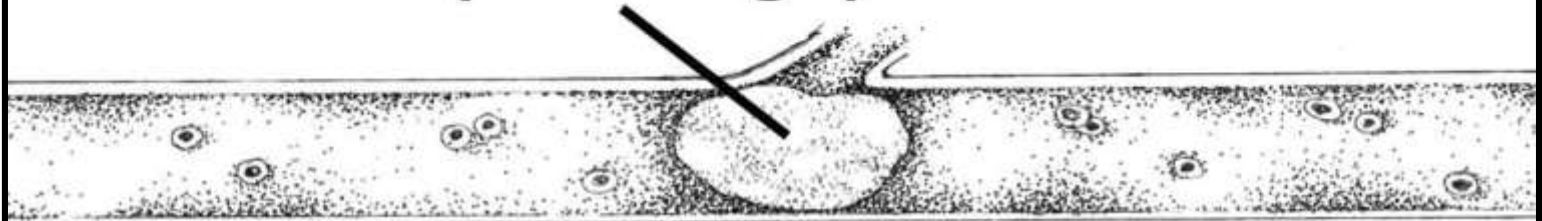
Ruptured Aneurysm



Thrombus

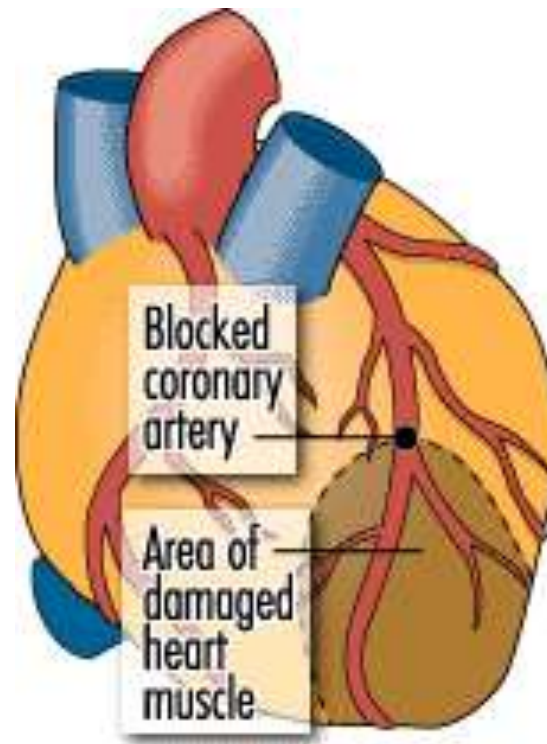


Embolism (blockage)



HEART ATTACKS

- Occur when a blocked artery prevents blood flow to the heart



HEART ATTACK



PREVENTATIVE ACTIONS

- Avoid smoking
- Eat low fat diet
- Get exercise
- Limit salt
- Avoid cholesterol



Open notes quiz

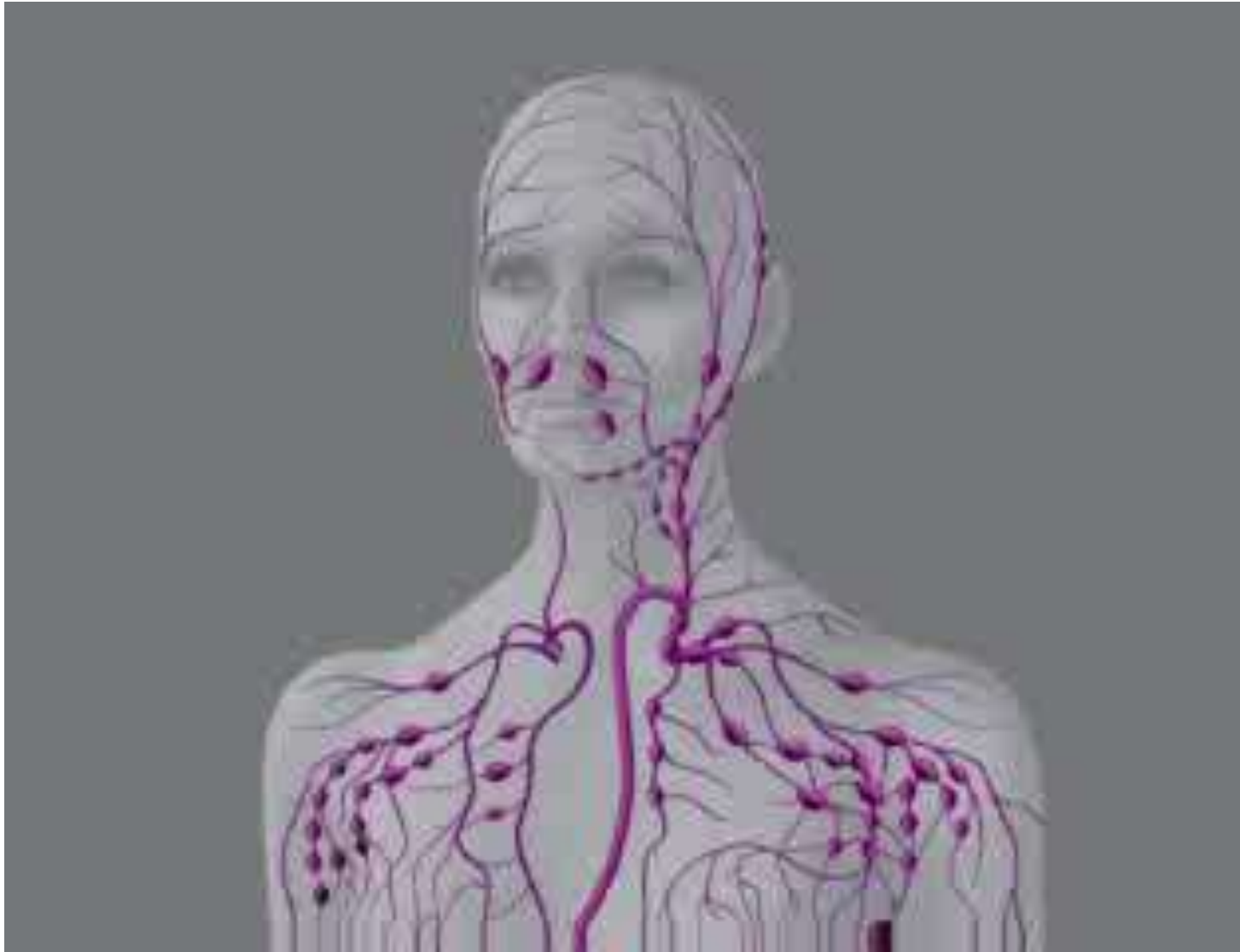
1. List the 4 parts of blood and state the function of each.
2. State the difference between lymph and blood.
3. List the 3 types of blood vessels and the function of each.
4. Upper chambers of the heart are called _____ and they _____ blood
5. Lower chambers of the heart are called _____ and they _____ blood
6. Name an organism with an open circulatory system

7. Birds have a _____ chambered heart
8. Fish have a _____ chambered heart
9. Amphibians have a _____ chambered heart
10. Name the major artery leading from the heart to all parts of the body.

Humans have 2 different transport systems

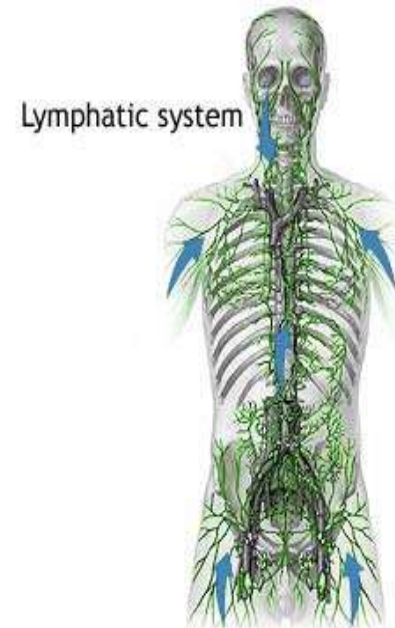
- Circulatory system =
 - blood (red and white cells, platelets, and plasma),
 - arteries, capillaries, and veins,
 - heart
- Lymphatic system =
 - Lymph (white blood cells only),
 - lymph nodes

Lymphatic system



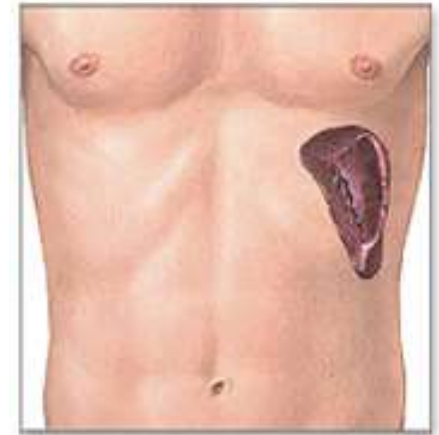
Lymphatic system

- Maintain fluid balance
(drains and filters fluid between all cells)
- Helps fight disease
- Lymph = fluid with WBCs but no RBCs
- Lymph nodes = filter lymph → WBC's check for pathogens here



Spleen

- Part of lymphatic system
- Keeps body fluids in balance
- Contain white blood cells → antibodies
- Can live without but will be immuno-suppressed



Bone marrow

- Place where blood cells are made
- Blood cells start out as stem cells
- Stem cells can turn into other types of cells
(not differentiated)
- Differentiation = environment controls gene expression
- Leukemia = cancer of bone marrow cells

2 ways to get things into and out of cells =

1. Passive transport = diffusion =

no energy

high → low concentration

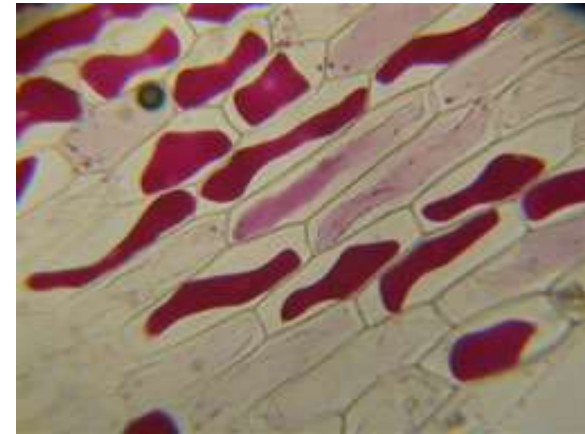
2. Active transport =

requires energy (ATP),

low → high

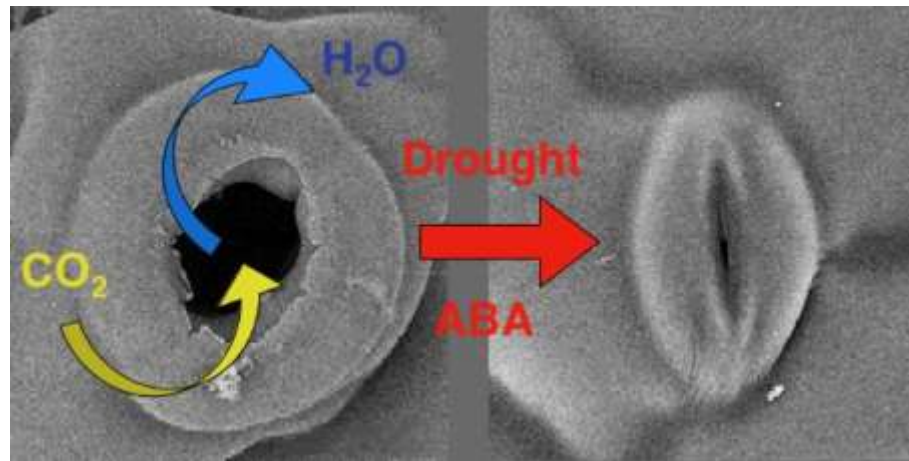
Osmosis in plant cells

- Osmosis = diffusion of water
 - Cell in salt water moves out
 - Cell in water water moves in
- Diffusion = move from high to low until equal
- *Draw a picture of a plant cell in salt water and label the cell membrane and cell wall in your notes*



Osmosis controls guard cells

- Guard cells control water loss and gas exchange



Diffusion in animal cells

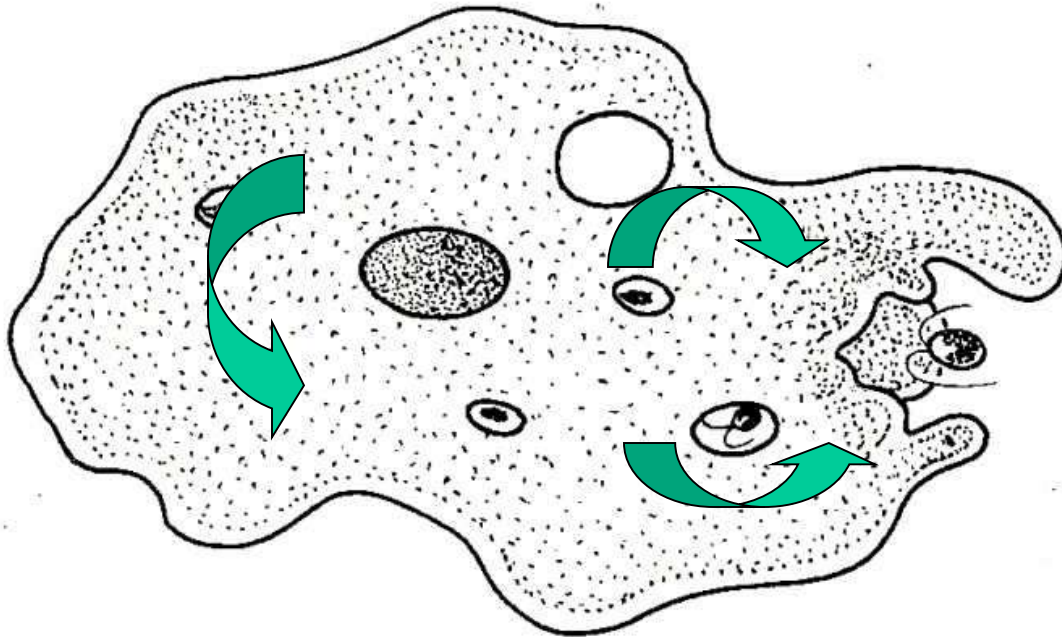
- Small molecules can diffuse across membranes
- Examples:
 - Glucose
 - Water
 - O₂ and CO₂
- Large molecules cannot diffuse
- Examples:
 - Starch
 - Proteins
 - Fats

Transport in living things

Vascular systems → circulation

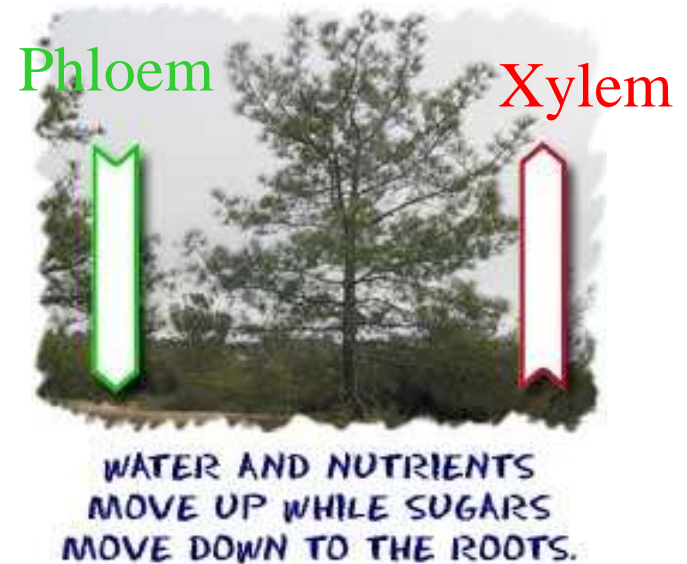
Single celled organisms

- Cytoplasm = liquid → circulates food and wastes



Plants have 2 types of transport tissues

- Xylem = pulls water and minerals up from the roots to leaves
- Phloem = tubes to let food made during photosynthesis to flow down from leaves to roots



Photosynthesis

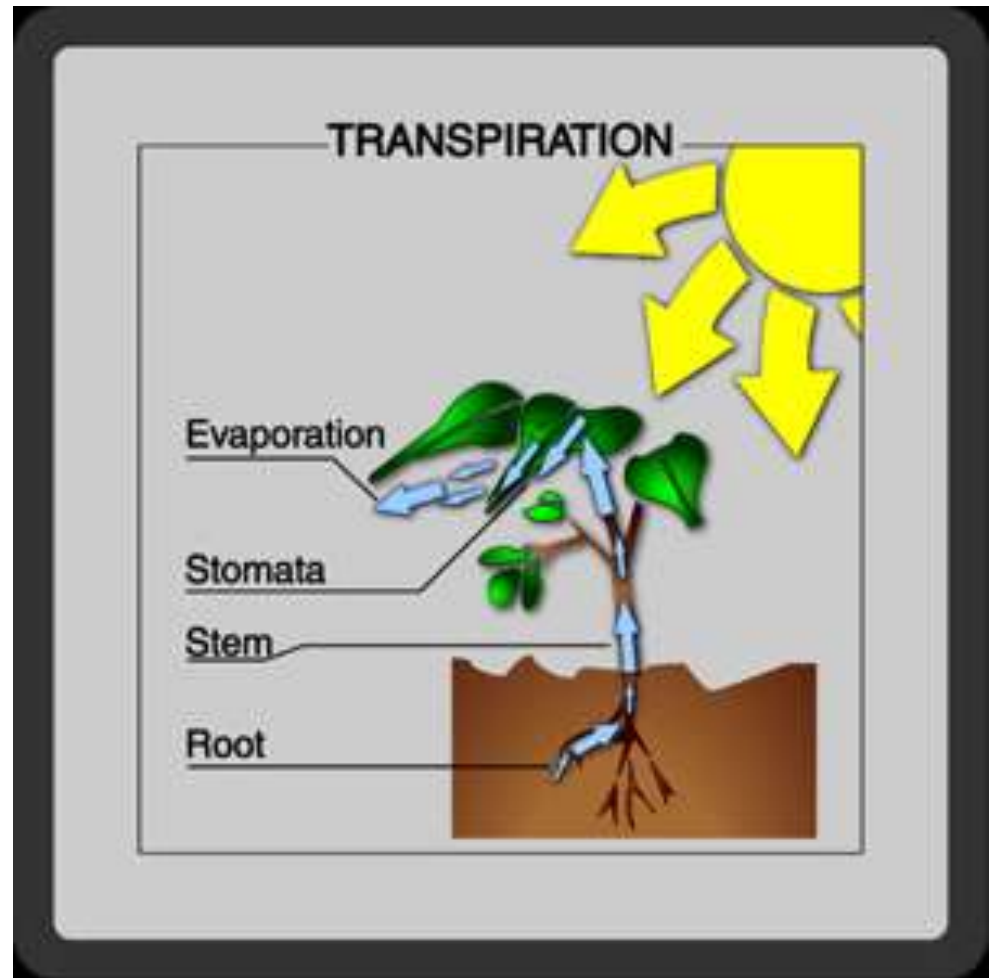
Photosynthesis = autotrophic nutrition

Occurs in chloroplasts in leaves

- Sunlight energy \rightarrow glucose energy
- Formula = $\text{CO}_2 + \text{H}_2\text{O} + \text{light} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2$
- Raw materials \rightarrow products

Transpiration = Water leaves the plant through stomates

- Controlled by guard cells
- As water leaves roots absorb more
- Roots have root hairs → ↑ surface area → ↑ absorption



Cellular respiration → energy

- Aerobic (with oxygen)



- Releases energy
- Organic → inorganic
- Occurs in mitochondria (plants and animals)

- Anaerobic (absence of O₂)

- Less energy
- Produces lactic acid in humans → muscle fatigue

Transport tissues bring raw materials in and remove wastes

- Organelles → cells → tissues
- cytoplasm

Review Quiz

- State 2 differences between active and passive transport
- 2 types of vascular tissues in plants and the difference between them
- Difference between lymph and blood