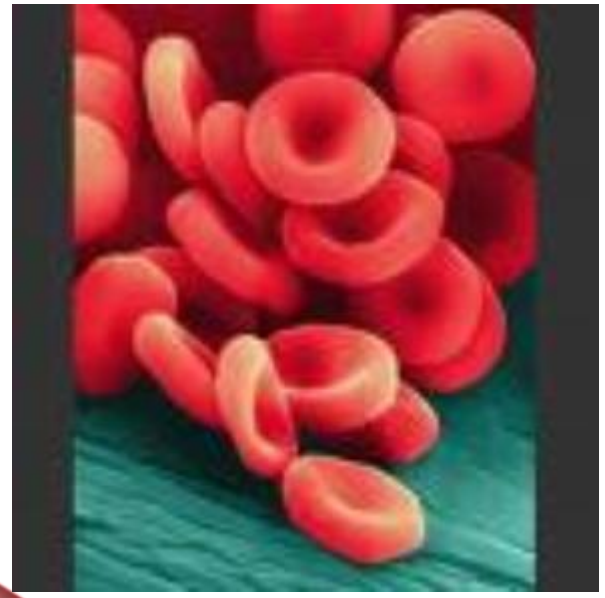
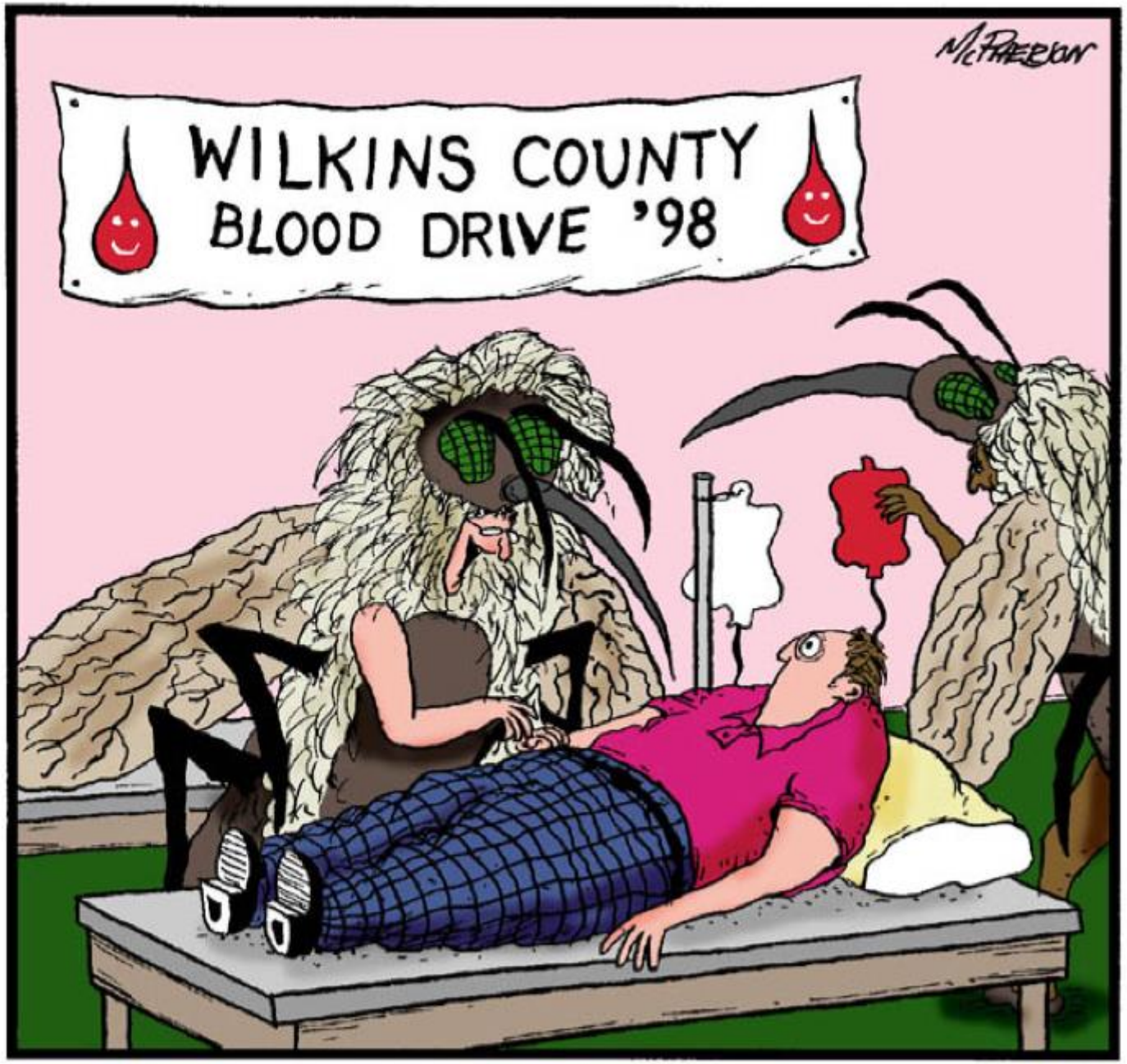
BLOOD AND THE HEART

DAY ONE BLOOD

- What do you know about blood?
  - What does it do?
  - What is it made of?
  - Where is it made?

BLOOD





"It's just a way of maintaining a sense of humor around here. Now if you'll just clench your fist ..."

MAIN FUNCTIONS OF BLOOD

- Transports gases
  - Brings in oxygen
  - Removes carbon dioxide
- Moves substances around the body
  - Gases
  - Nutrients and waste
  - Hormones
  - White blood cells

GENERAL CHARACTERISTICS OF BLOOD

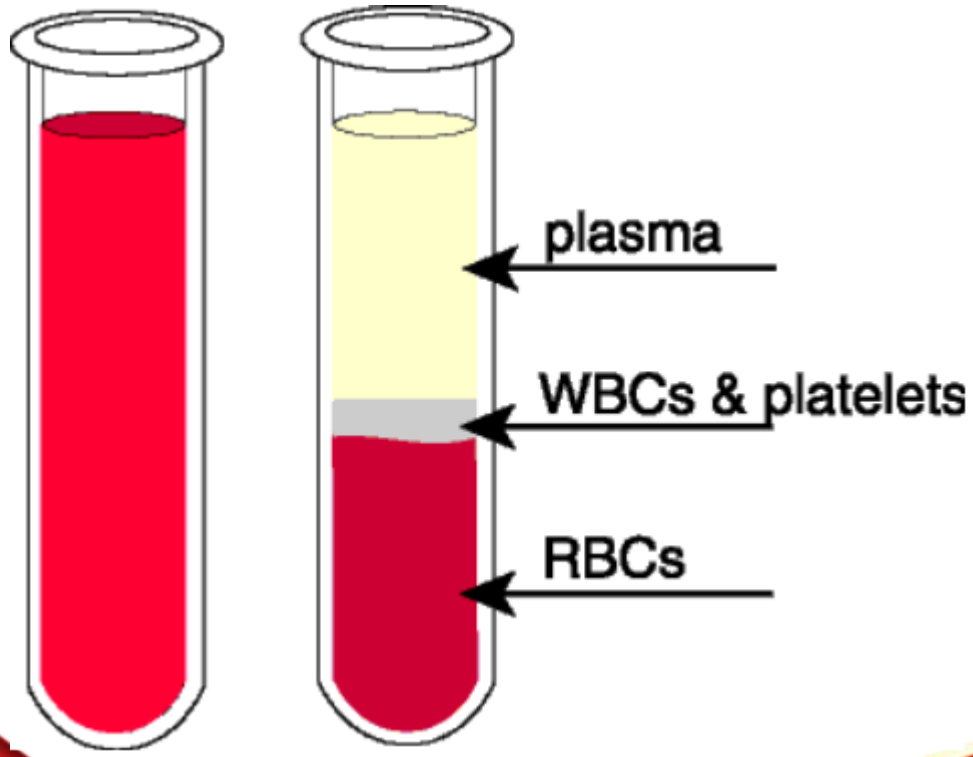
Blood is a type of CONNECTIVE TISSUE

It has two basic components:

CELLS = 45%

PLASMA = 55%

PLASMA



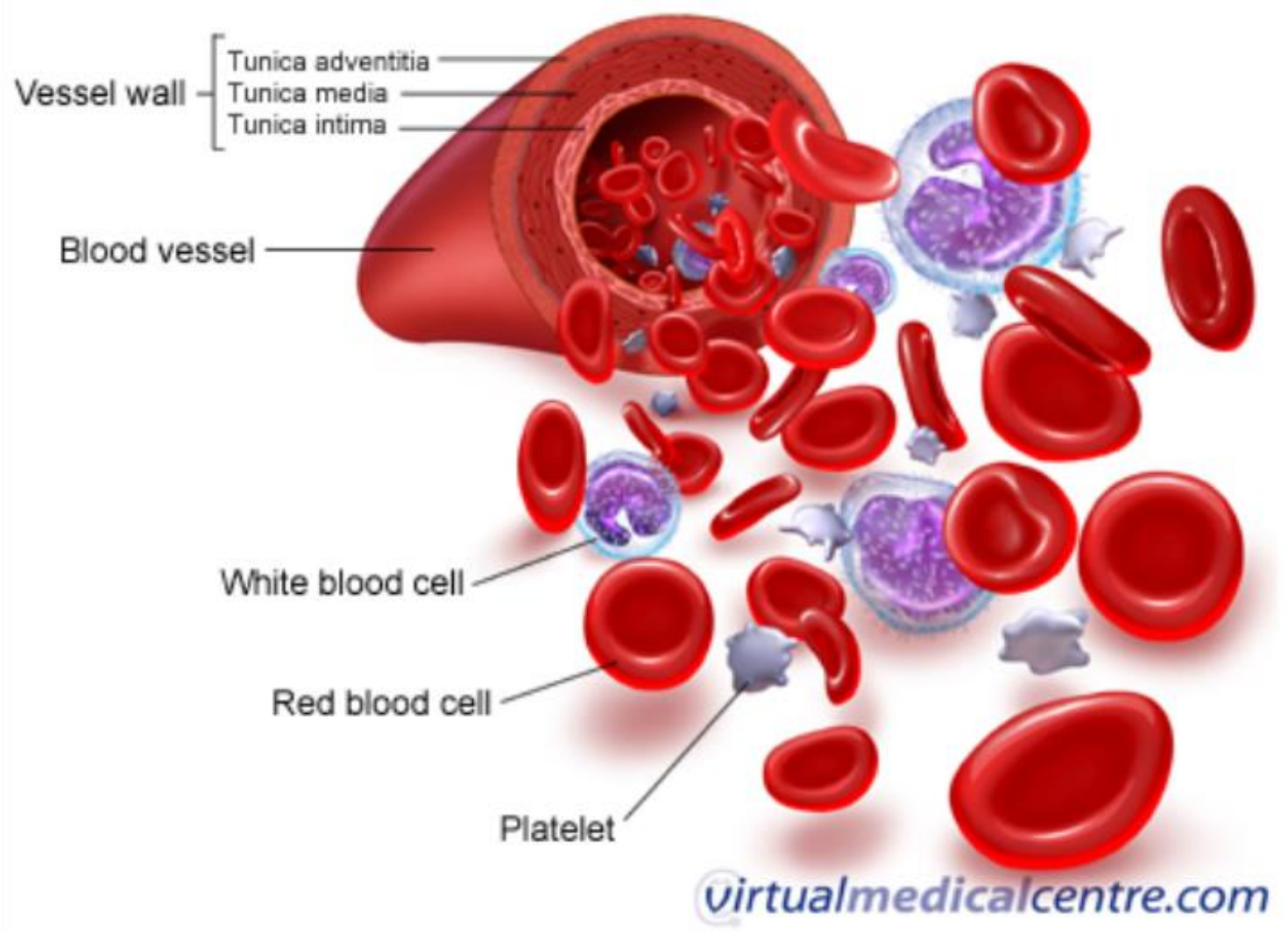
The liquid portion of blood.

92% water

Also contains nutrients, carbon dioxide, vitamins and plasma proteins

WHAT ARE THE DIFFERENT TYPES OF BLOOD CELLS?

- Red blood cells (RBC)
  - Erythrocyte
- White blood cells (WBC)
  - Leukocyte
- Platelets
  - thrombocyte


Vessel wall
Tunica adventitia
Tunica media
Tunica intima
Blood vessel
White blood cell
Red blood cell
Platelet
virtualmedicalcentre.com

RED BLOOD CELLS (ERYTHROCYTES)

Shape

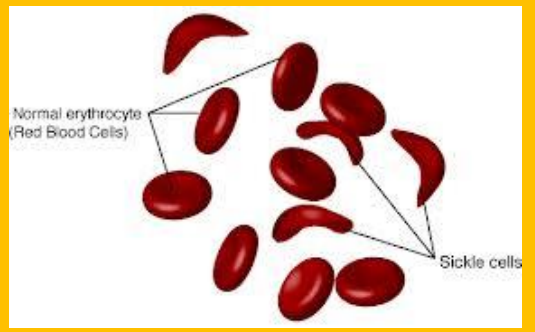
- Flat

Quantity

5 million/ml

- Has no nucleus
  - More room to carry oxygen
- Outnumber white blood cells 1000:1

RED BLOOD CELLS (ERYTHROCYTES)

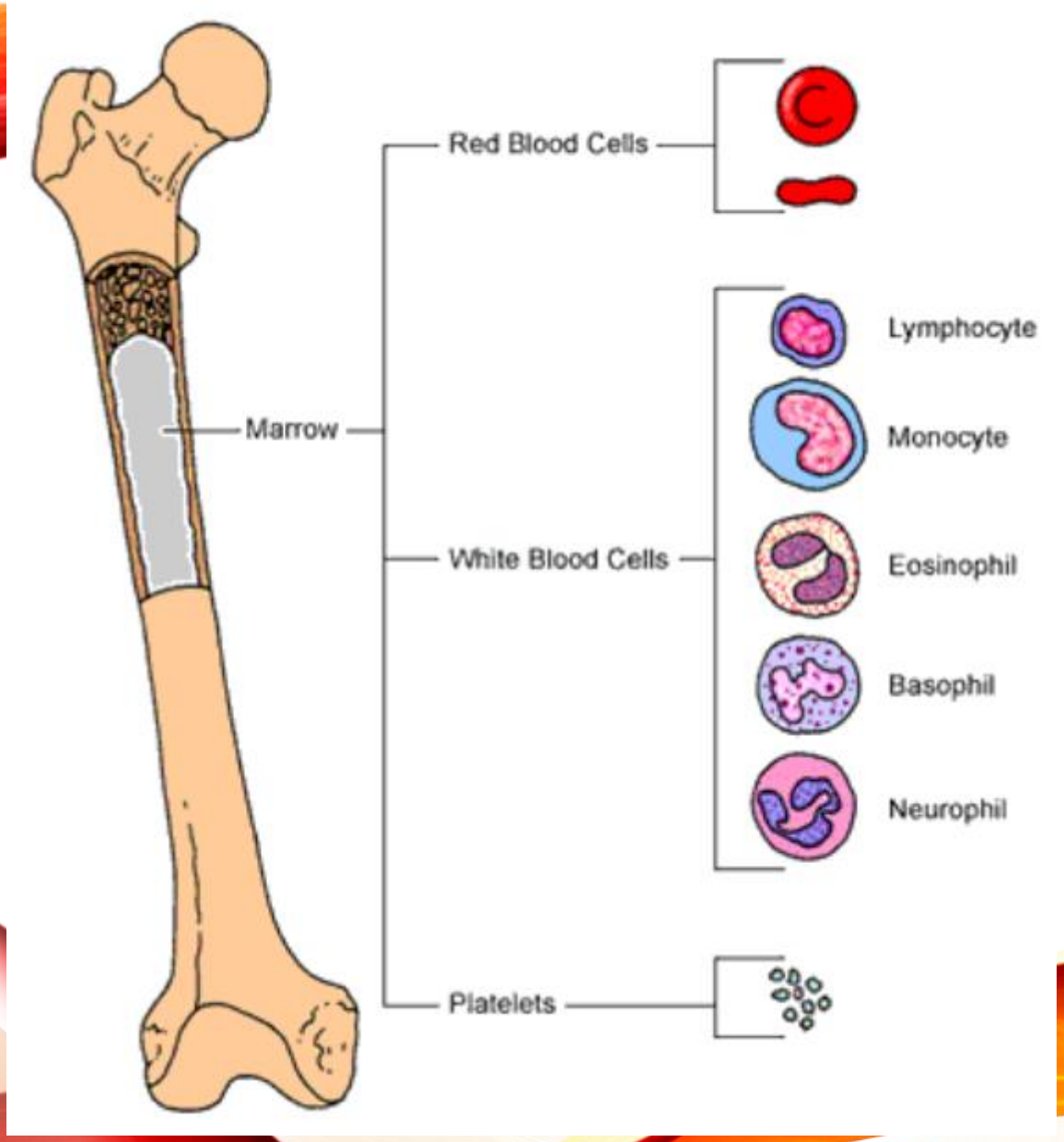


Filled with Hemoglobin –

- Protein in blood
- Fe (iron) atom in the middle of it
- Binds to oxygen and CO2
- Each erythrocyte has 250 million hemoglobin molecules

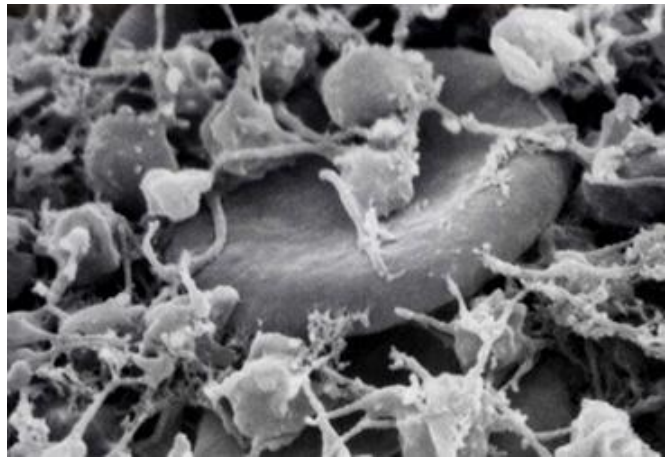
WHITE BLOOD CELLS (LEUKOCYTES)

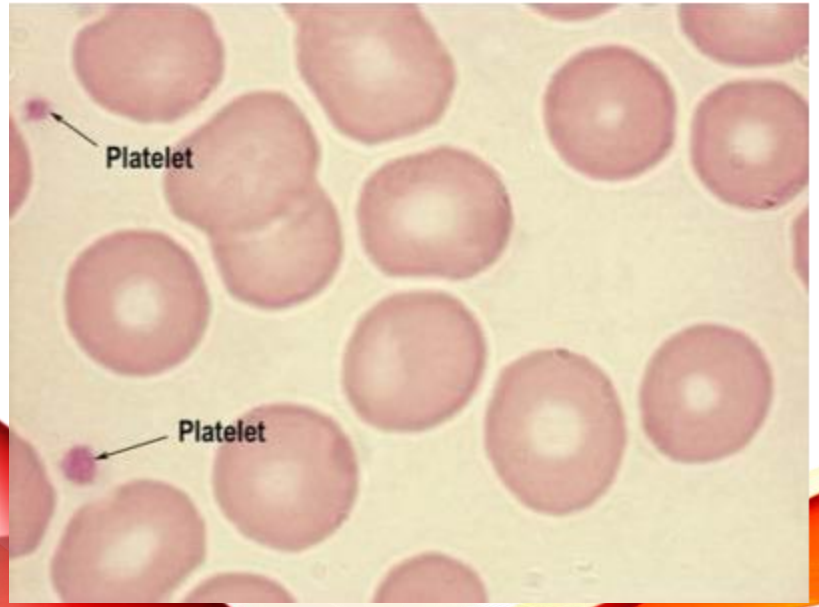
- General function is to protect the body against disease
- There are a lot of types of WBC, but we will save that for the immune system unit


Red Blood Cells
Marrow
White Blood Cells
Lymphocyte
Monocyte
Eosinophil
Basophil
Neurophil
Platelets

PLATELETS (THROMBOCYTES)

- Parts of a cell
- Blood clots and vessel repair



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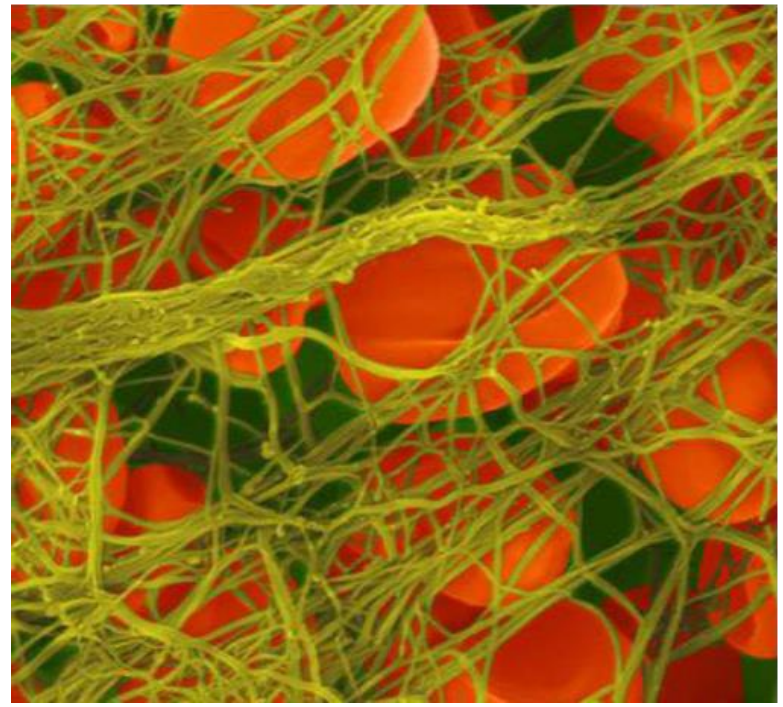
"Ah, I see you've taken an interest in our blood plasma TV."

(HEMOSTASIS)

The process of stopping bleeding
Involves the coagulation and clotting of the blood to seal the site of damage

THREE EVENTS IN HEMOSTASIS



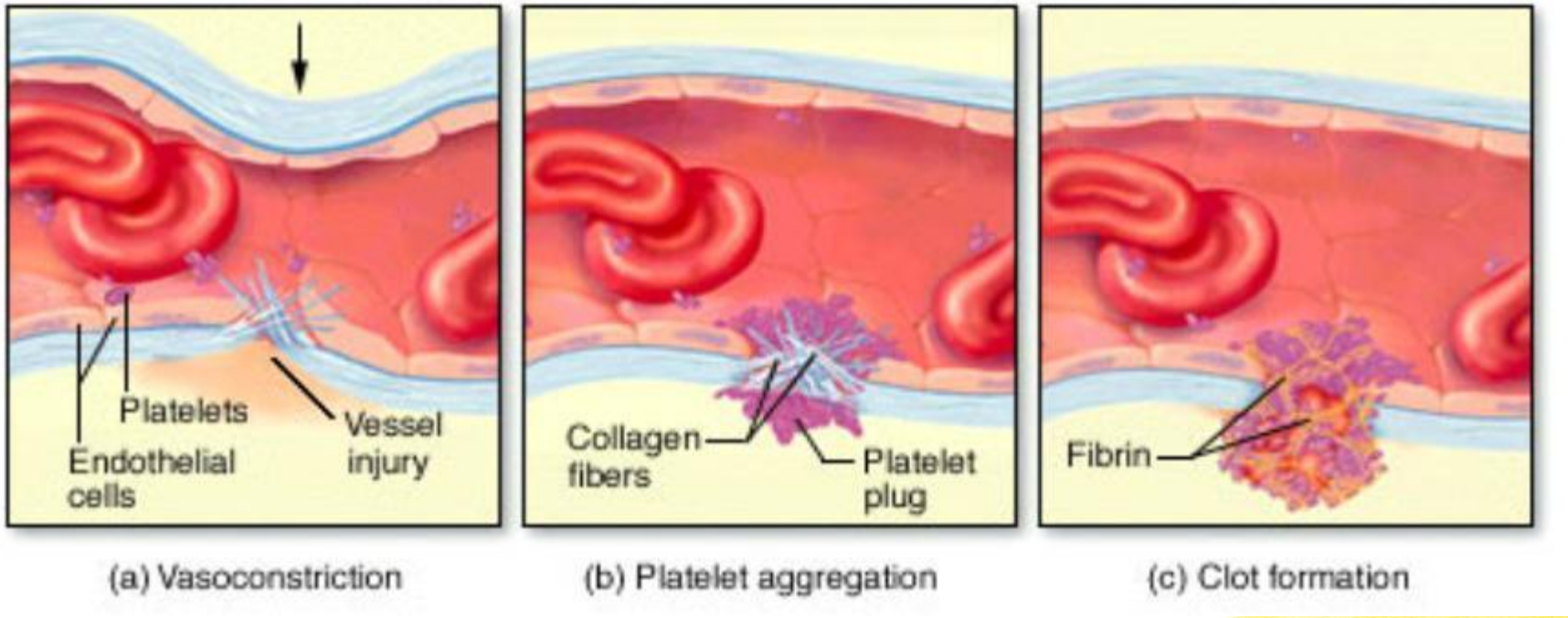
1. Blood Vessel Spasm

   Seratonin = vasoconstrictor

2. Platelet plug formation

3. Blood coagulation

HEMOSTASIS

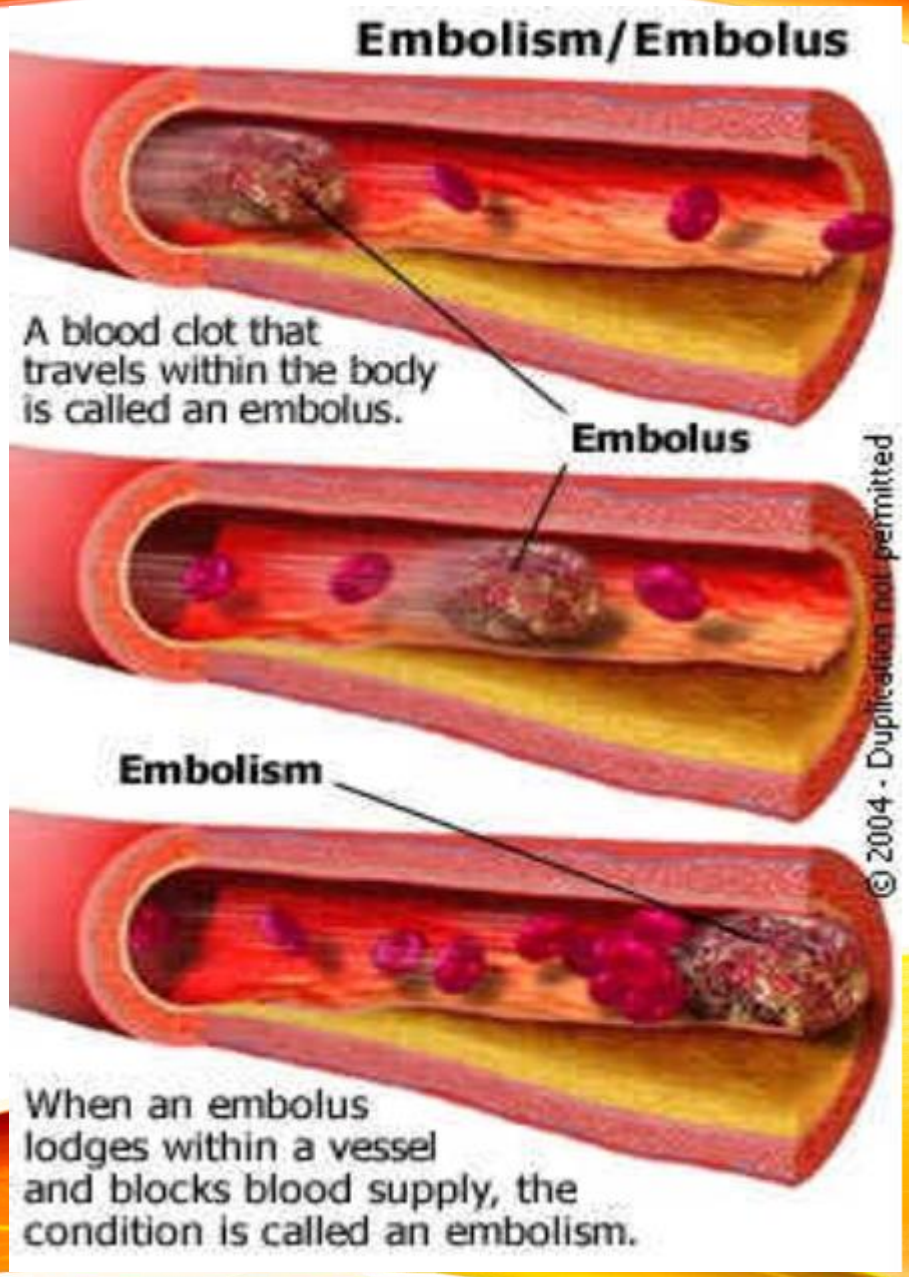

Platelets
Endothelial cells
Vessel injury
Collagen fibers
Platelet plug
Fibrin
(a) Vasoconstriction
(b) Platelet aggregation
(c) Clot formation

Video: Hemostasis with Balloons

Video: blood clot formation

DISEASE/DISORDER

- THROMBUS – blood clot
- EMBOLUS – when the clot moves to another place.



Nanobots in the blood

https://www.youtube.com/watch?v=P7zw9fvfBZI

A FEW OTHER COMMON BLOOD DISORDERS

- Anemia
  - Not enough rbc
  - Leads to oxygen deficiency
- Sickle cell anemia
  - Funny shaped rbc
  - Leads to oxygen deficiency
  - Poor circulation
  - Positive: Malaria

DAY TWO

Blood typing

- What do you know about blood types?
- How many different blood types are there?
- What causes different blood types?

ANTIGENS AND ANTIBODIES

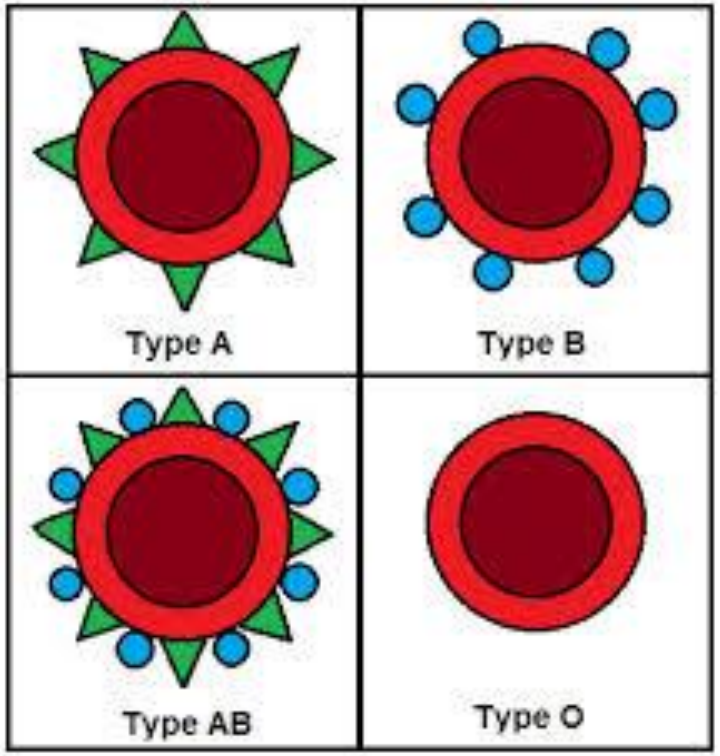
- On the outside of our cells we have proteins and sugars that identify our cells (about 30 of them) **= antigens**

- In our blood we have floating proteins that react to foreign substances in the body - **antibodies**

ABO BLOOD TYPING

- The A, and B refer to antigens
- You can have
  - all A
  - all B
  - A and B
  - none (O)

HOW THIS LOOKS - ANTIGENS



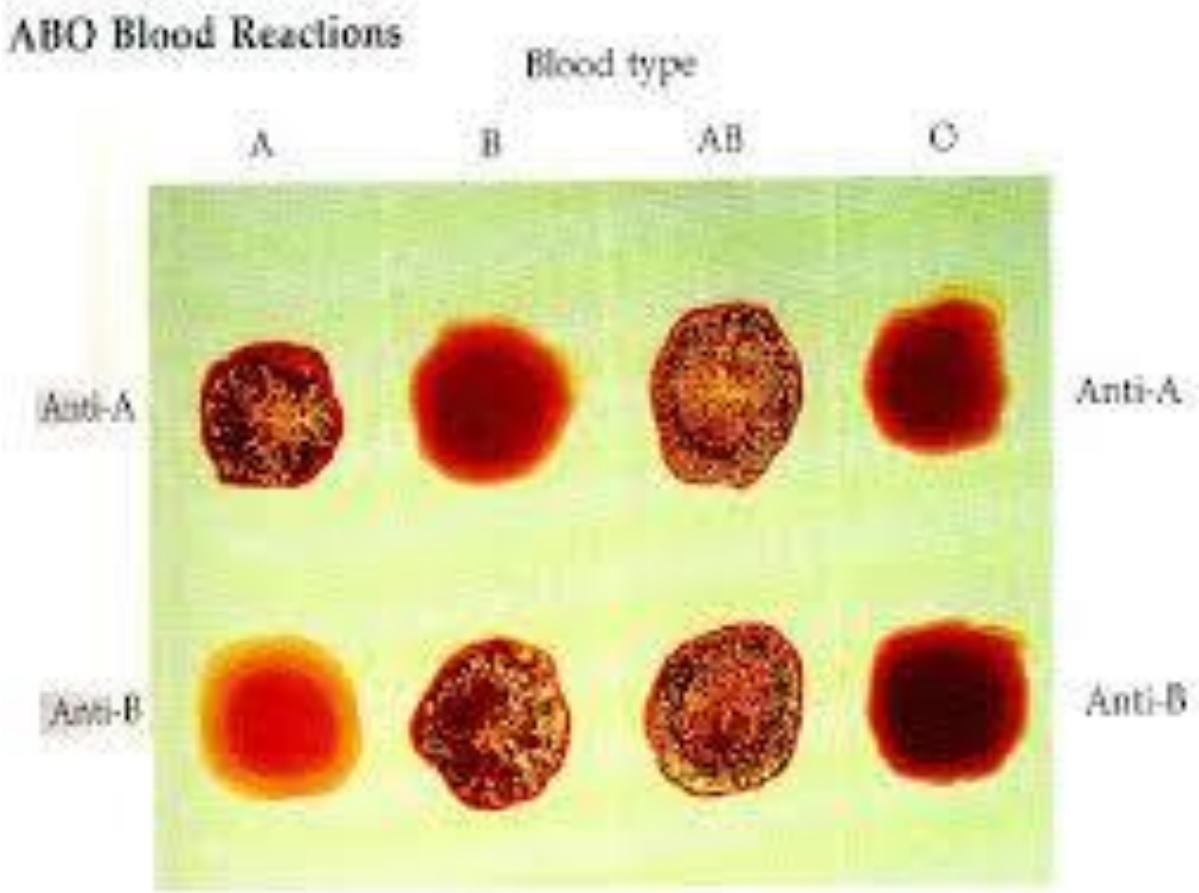
ANTIBODIES

- Proteins that float in your plasma
- React to FOREIGN THINGS
- Type A blood has B antibodies
  - B is “foreign”
- Type B blood has
  - A antibodies
- Type AB blood has
  - No antibodies
- Type O blood has
  - Both antibodies

ANTIGENS AND ANTIBODIES

Blood Type (genotype)	Type A (AA, AO)	Type B (BB, BO)	Type AB (AB)	Type O (OO)
Red Blood Cell Surface Proteins (phenotype)	 A agglutinogens only	 B agglutinogens only	 A and B agglutinogens	 No agglutinogens
Plasma Antibodies (phenotype)	 b agglutinin only	 a agglutinin only	 No agglutinin	 a and b agglutinin

IN THE LAB


ABO Blood Reactions
Blood type
A
B
AB
O
Anti-A
Anti-B
Anti-A
Anti-B

RH FACTOR

- Just like ABO

- Only two choices
  - Rh + (has protein)
  - Rh - (no Protein)

QUIZ

1. If I take a persons blood, add A antibodies and it clumps what type of blood do they have?
2. If I take a persons blood and add B antibodies if it never clumps what blood type are they?
3. If a person's blood clumps in all wells what type do they have?
4. If you are type A + who can donate to you?

BLOOD TYPING WARM UP

1. What antigens does a person with type A- have?
2. What antibodies does this person have?
3. Who can they donate blood to?
4. Who can they receive blood from?
5. If you were to test their blood, which antibodies would cause it to clump?

POST LAB QUESTIONS

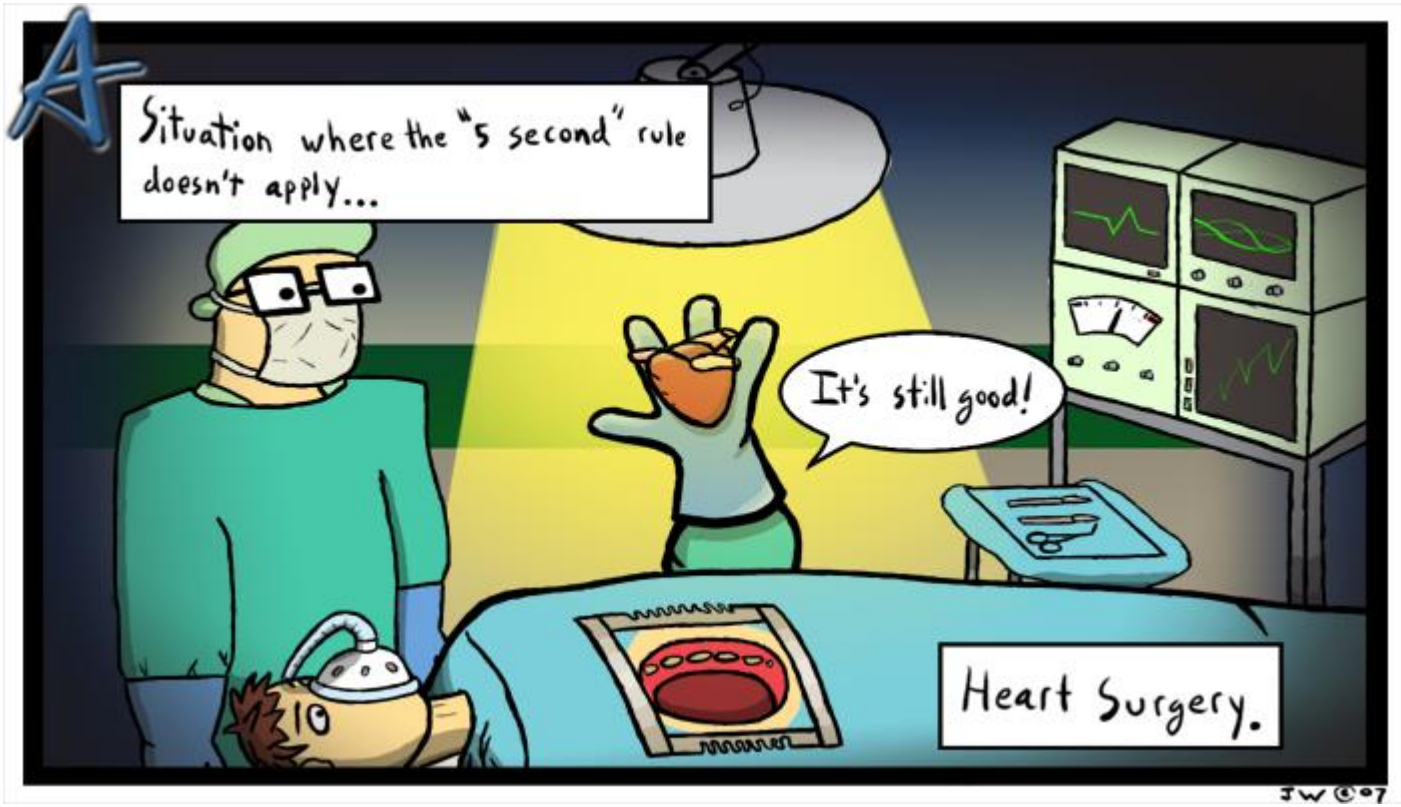
1. Does a positive phenolphthalein test prove that a stain is caused by blood? Human blood? Explain
2. For samples #3, 4, 5 list which ANTIGENS and ANTIBODIES are present.
3. Based on the cloth testing who is the main suspect? Why?
4. Did the chief suspect have a nose bleed or was this probably a lie?
5. Do your lab results prove that the main suspect is innocent or guilty? Explain
6. Can you ever prove innocence or guilt completely with lab testing? Explain

POST LAB QUESTIONS

A thief breaks a window of a car parked in a shopping center and steals a purse. You are called to the crime scene. You discover that the thief cut him/herself on the broken window glass. You test the blood in the car and it is O+. A suspect is arrested with a recently bandaged arm wound. You test her blood with the Anti-A and know immediately she is not the person who cut themselves on the window. How do you know this?

DAY 3

- Cardiovascular system
  - Intro
  - Organs and functions

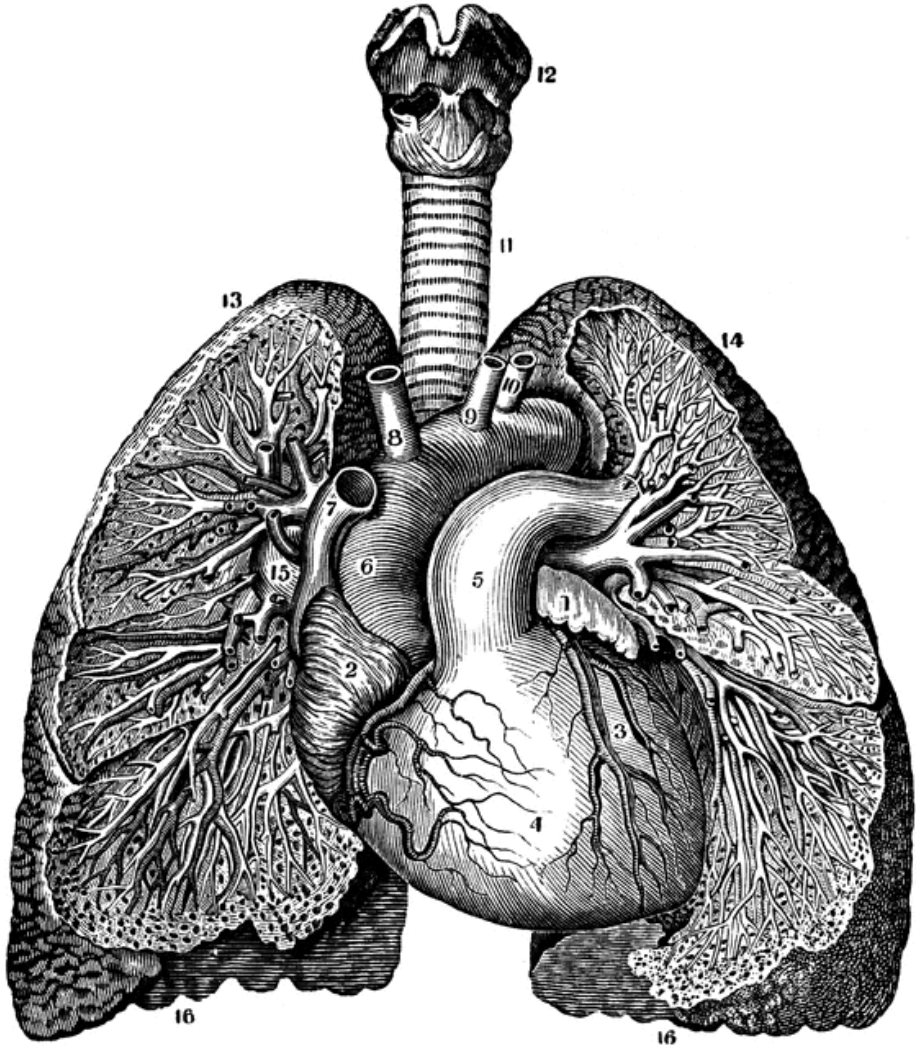


FUNCTION OF CARDIOVASCULAR SYSTEM

- **CIRCULATE BLOOD**
  - Nutrients
  - Gases
  - Waste
  - Hormones
  - Fluids/water

STRUCTURES OF THE CARDIOVASCULAR SYSTEM

- HEART
- BLOOD
- VESSELS –
  - Arteries
  - Veins
  - Capillaries
- VALVES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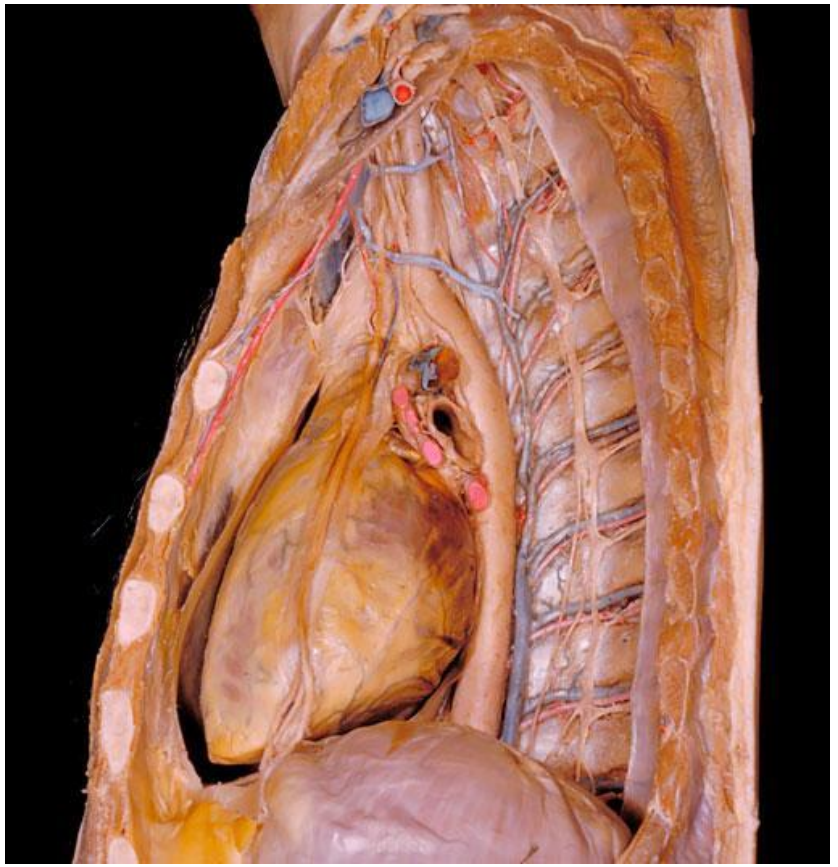
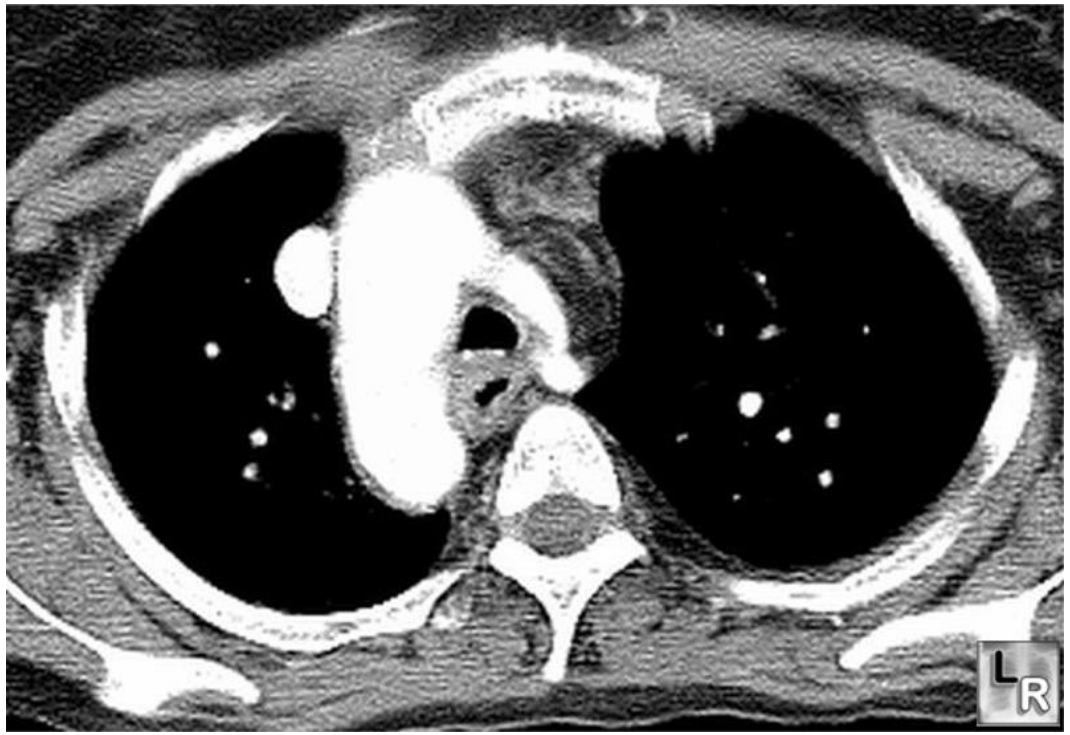


LOCATION OF THE HEART

Heart Size – about 14 cm x 9 cm (the size of a fist).

Located in the space between lungs, backbone, sternum, and ribs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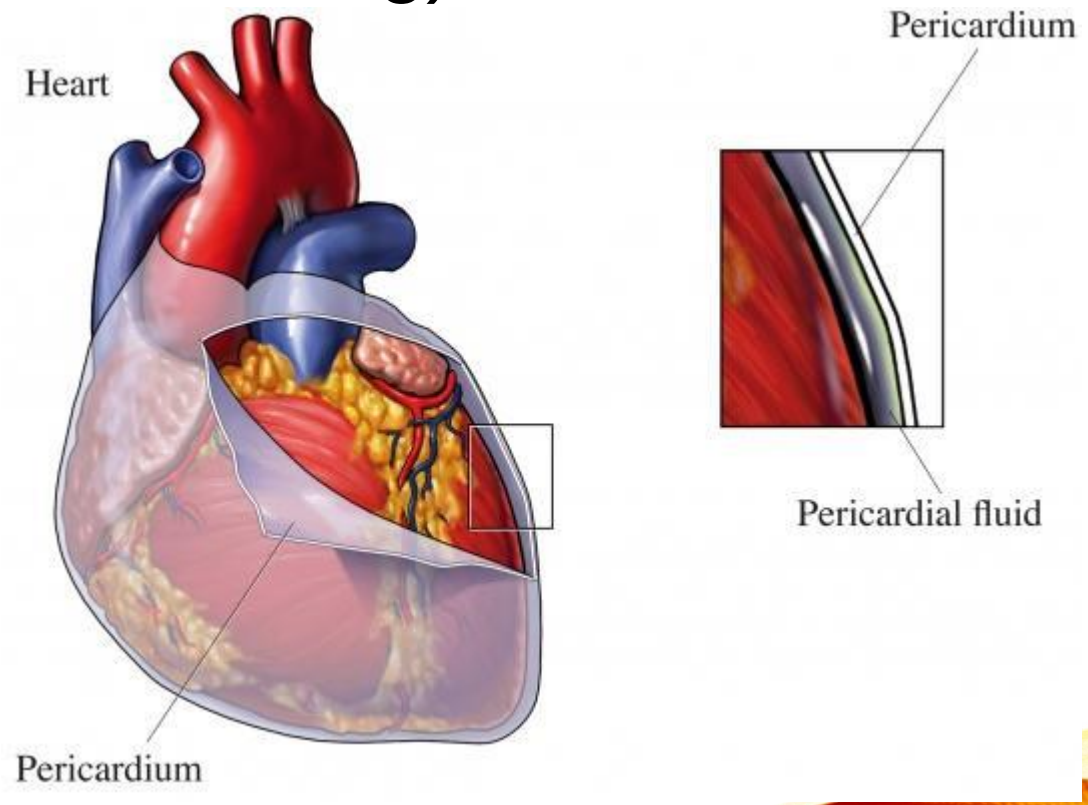
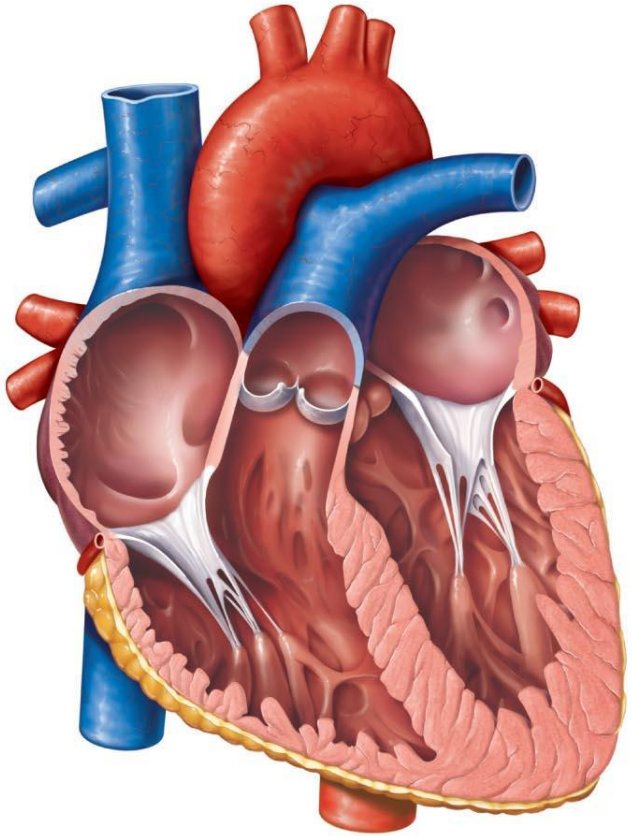
Pericardium encloses the heart (like a bag)



HEART CHAMBERS & VALVES

- **Your heart is a double pump.**
  - Pulmonary (lungs)
  - systemic (body)



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STRUCTURES OF THE HEART

Heart has 4 chambers:

2 Atria (right and left)

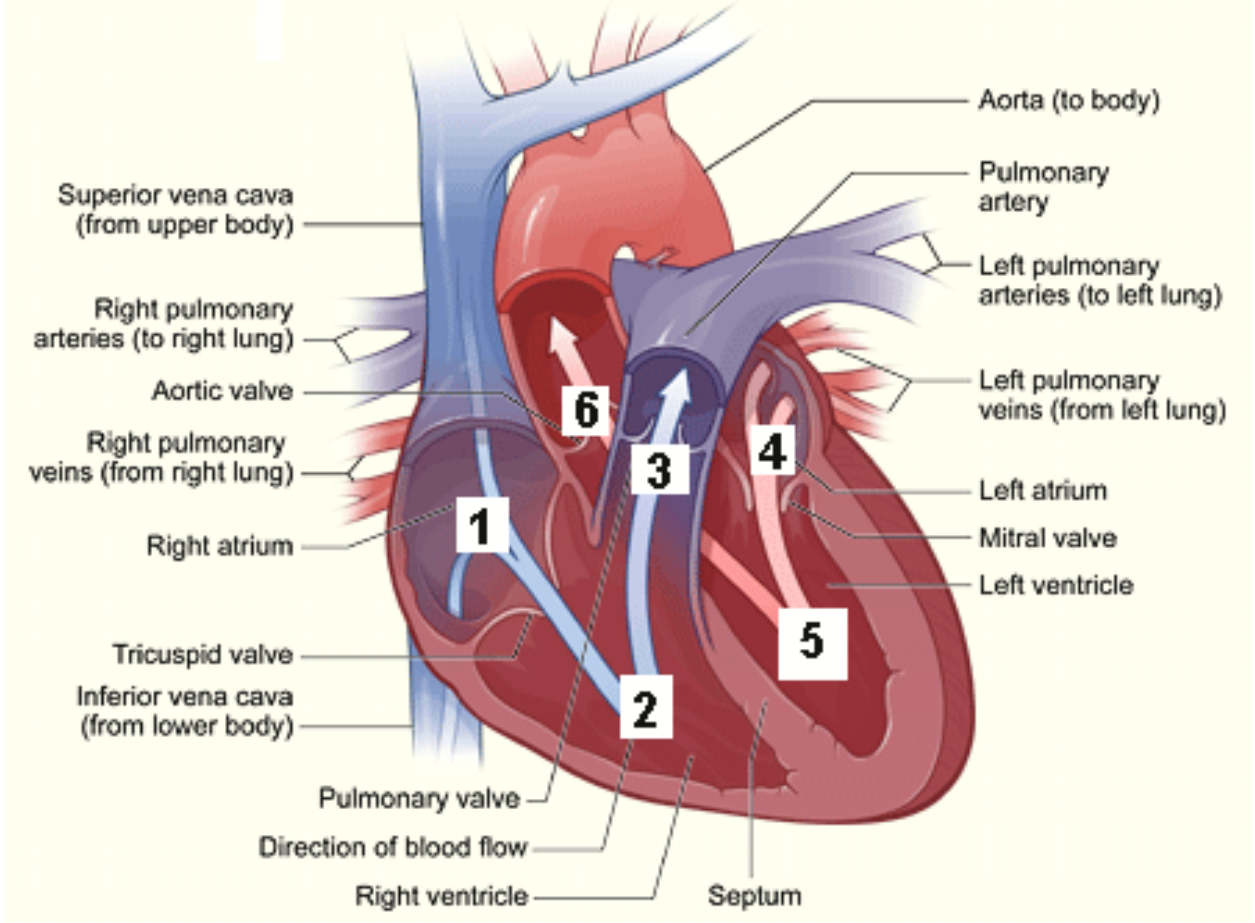
- Small chambers
- Thin muscle
- Blood enters from veins

2 Ventricles (right and left)

- Large chambers
- thick, muscular walls.
- Blood enters from atria
- THESE ARE THE PUMPS OF THE HEART

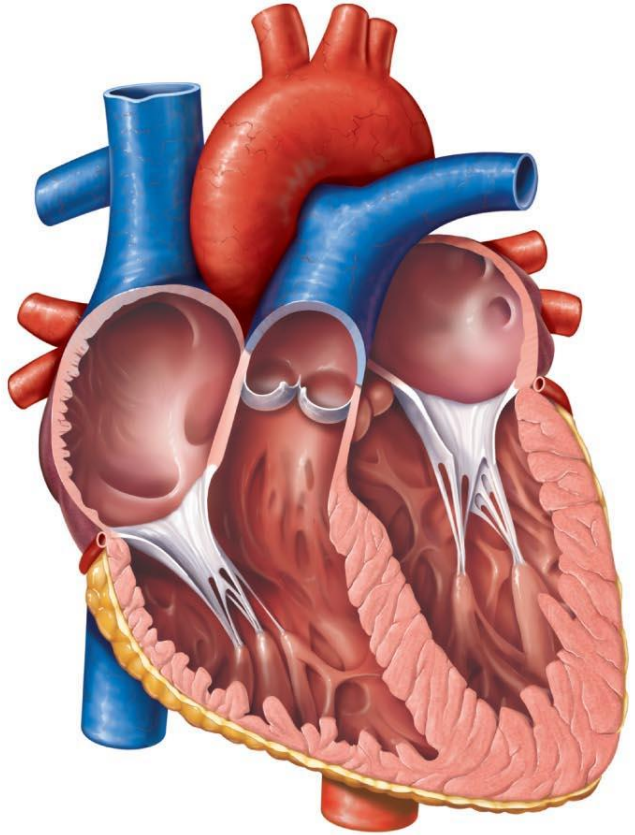
BLOOD FLOW THROUGH THE HEART

- **IT'S A CIRCLE!!**
- FROM BODY
- RIGHT ATRIA
- RIGHT VENTRICLE
- LUNGS
- LEFT ATRIA
- LEFT VENTRICLE
- AORTA
- BODY



HEART VALVES

- Prevent backflow
- HEART VALVES
  - Between atria and ventricle (AV Valves)
  - Between ventricle and artery (semilunar valves)



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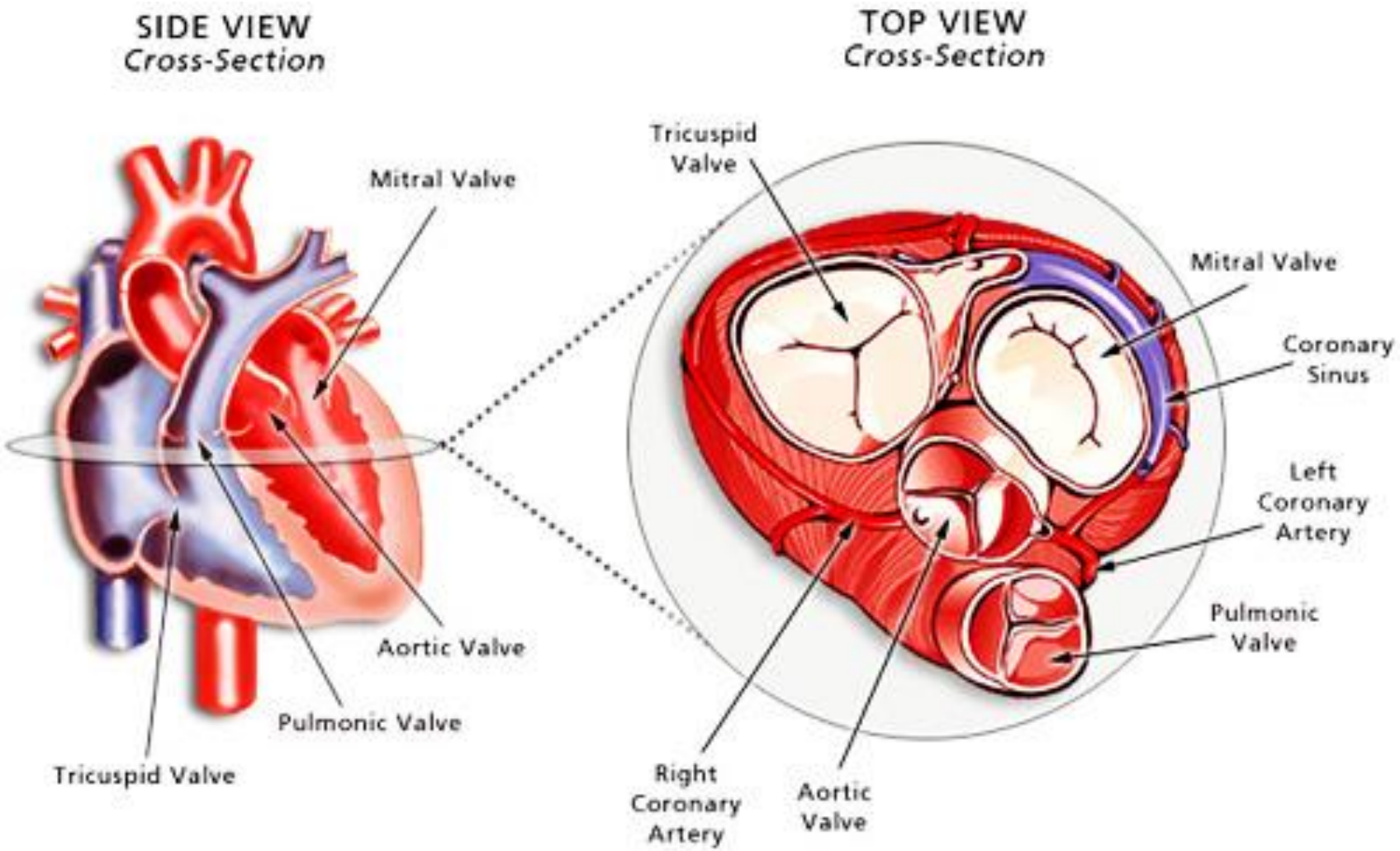
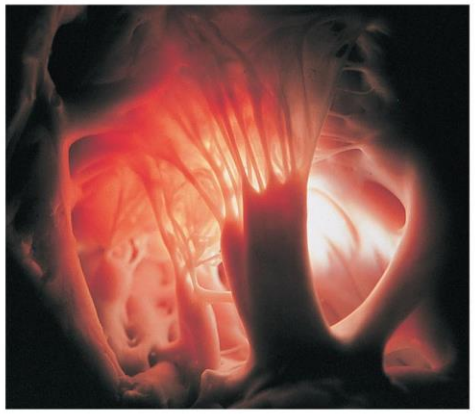
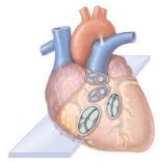

SIDE VIEW
Cross-Section
TOP VIEW
Cross-Section
Mitral Valve
Aortic Valve
Pulmonic Valve
Tricuspid Valve
Tricuspid Valve
Mitral Valve
Coronary Sinus
Left Coronary Artery
Pulmonic Valve
Right Coronary Artery
Aortic Valve





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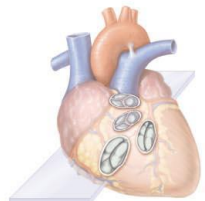

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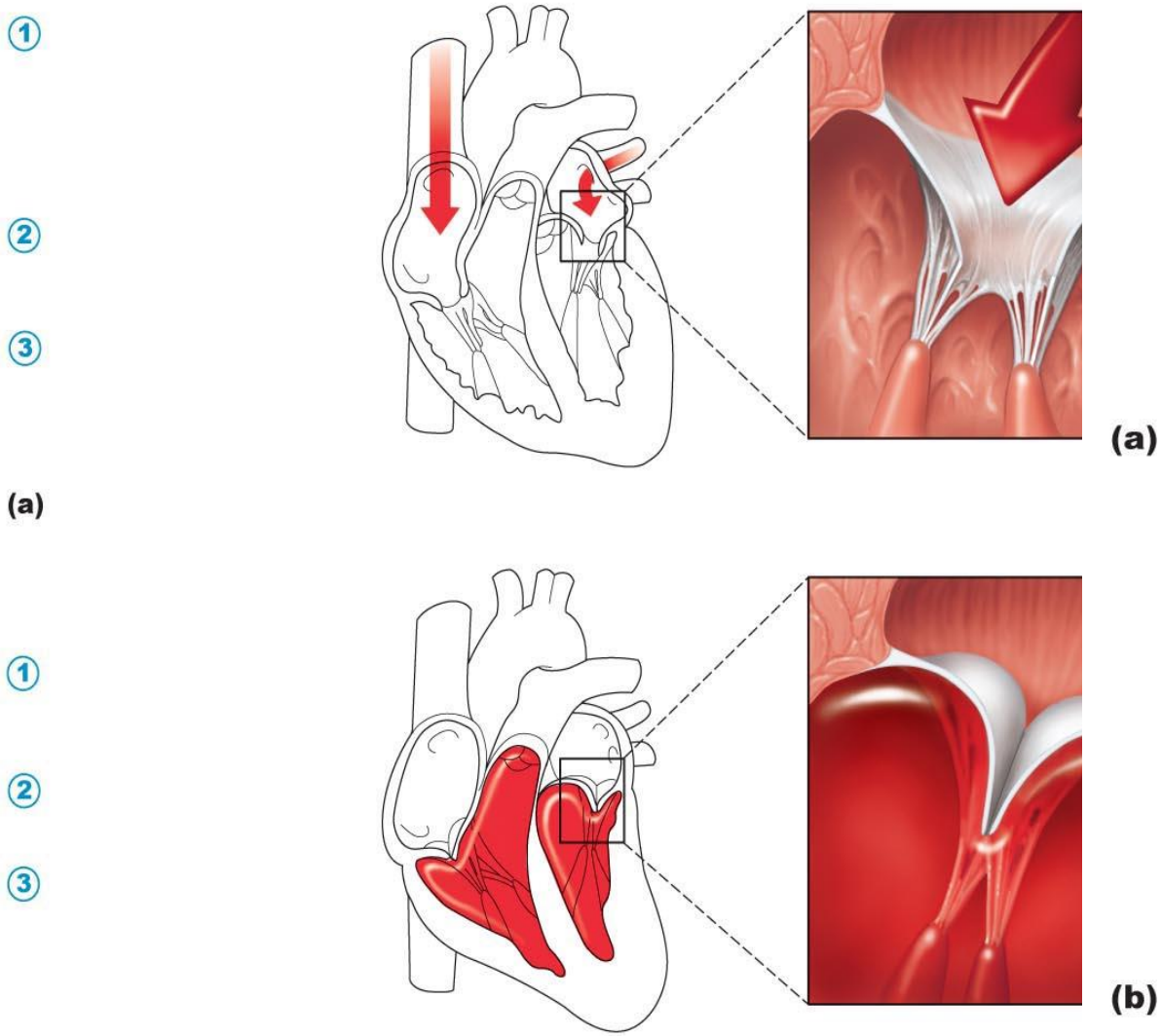

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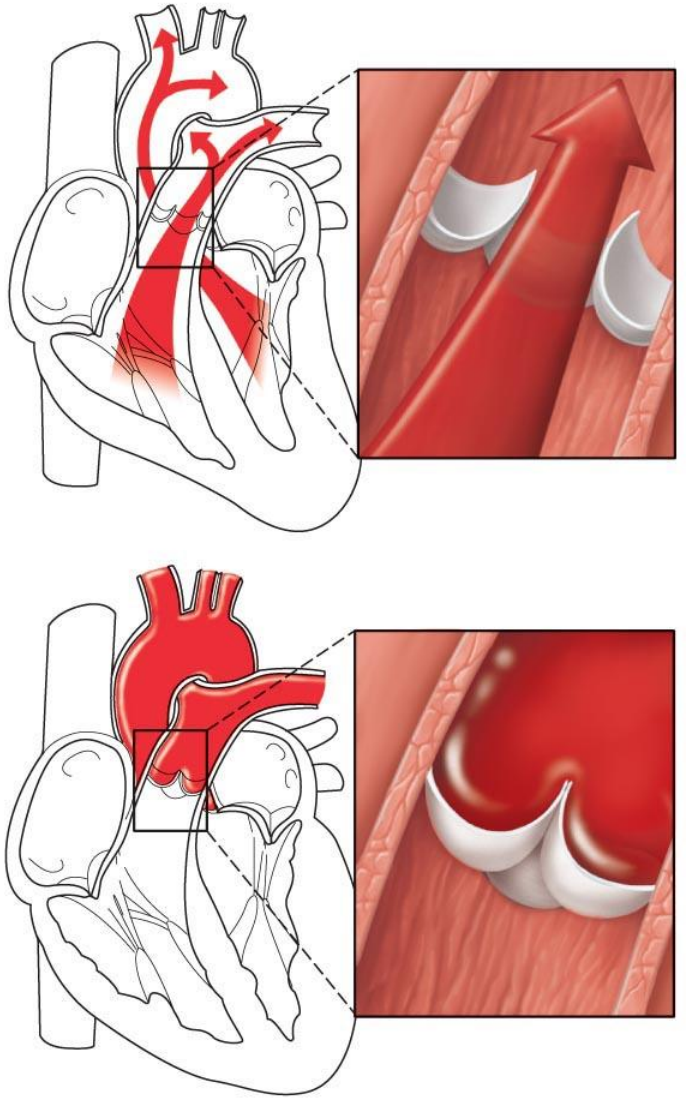

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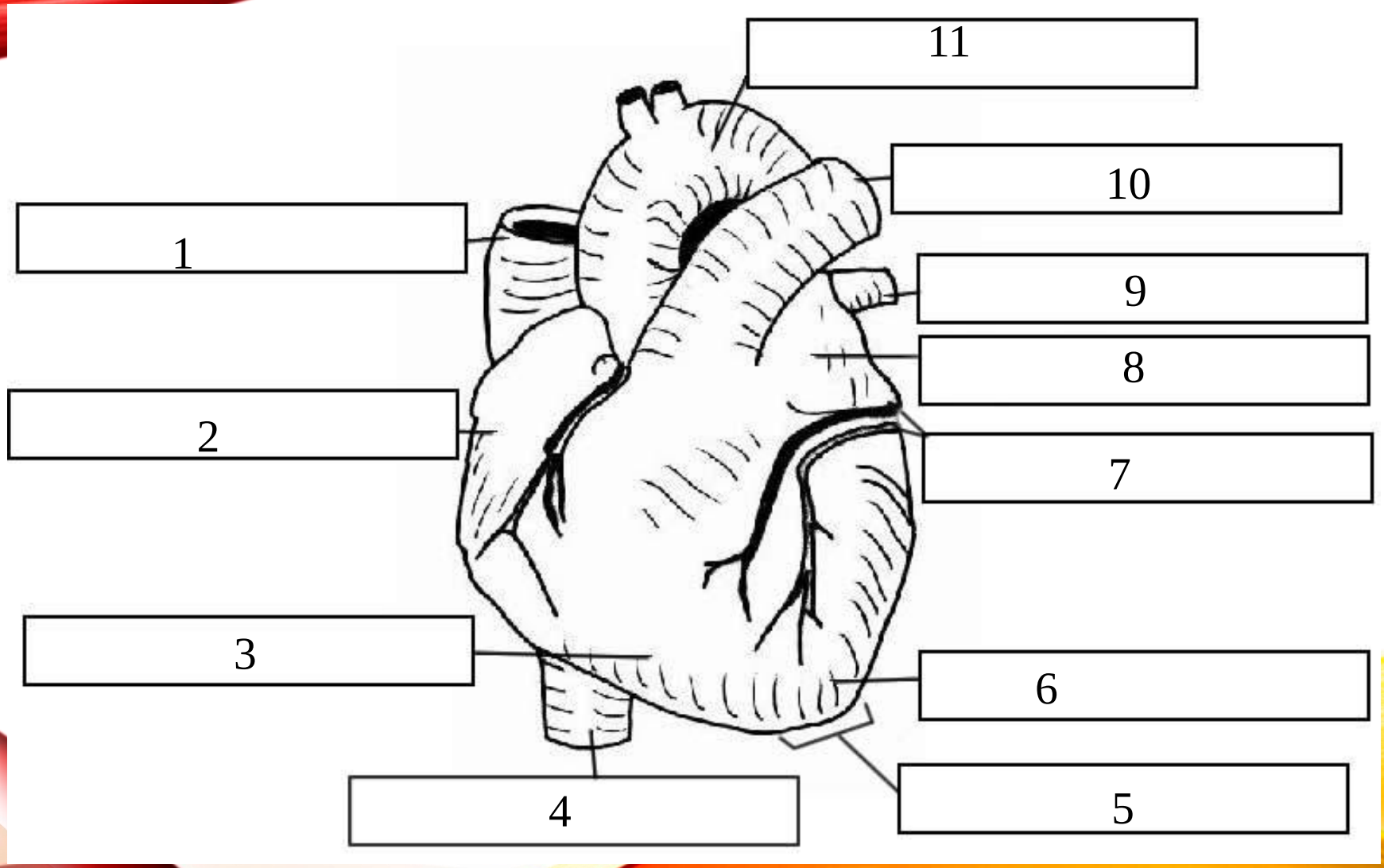
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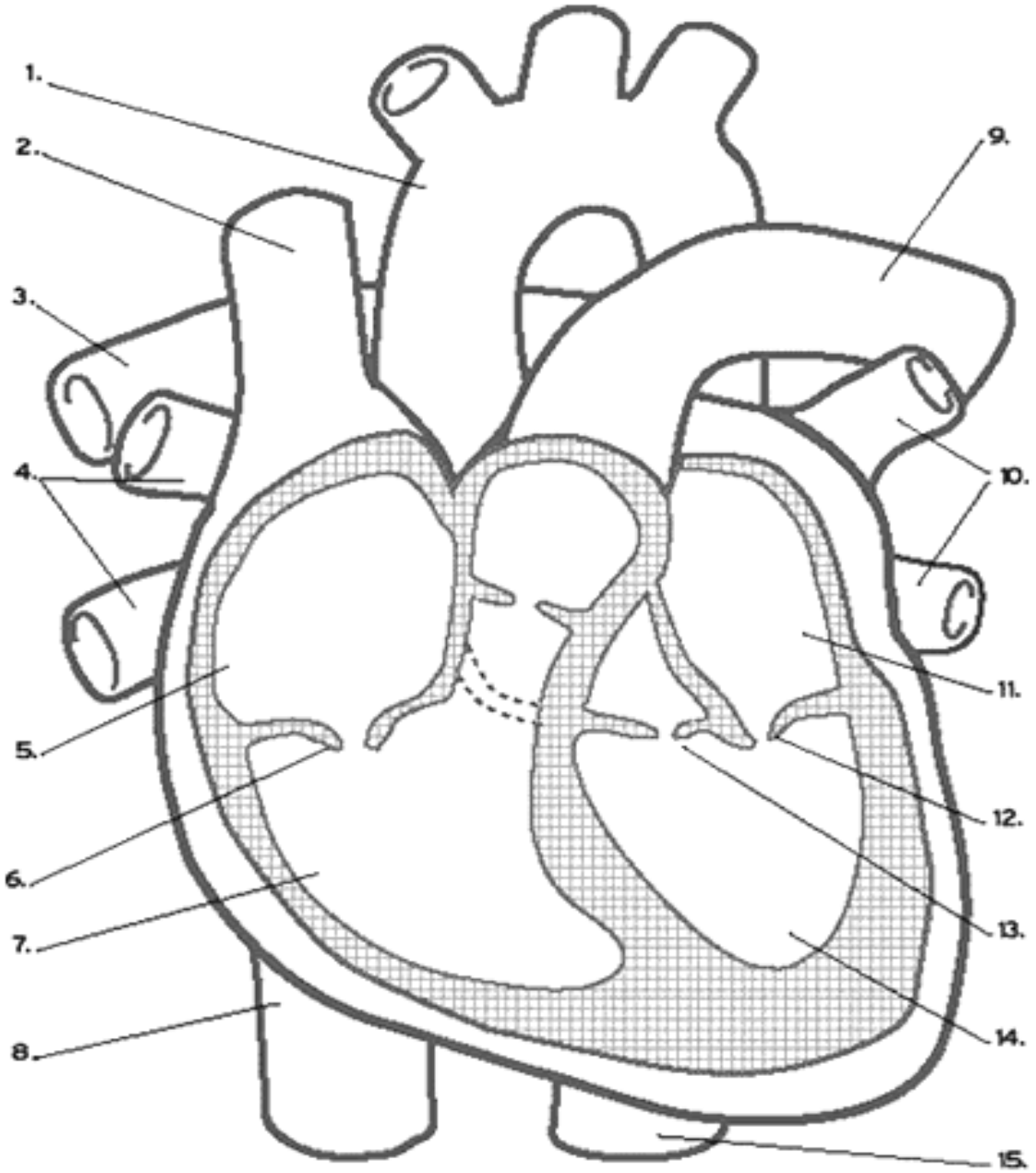
1. Superior vena cava
2. Right atria
3. Right ventricle
4. Inferior vena cava
5. Apex
6. Left ventricle
7. Cardiac artery/vein
8. Left atria
9. Pulmonary vein
10. Pulmonary artery
11. Aorta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ANSWERS

1. Aorta
2. Sup vena cava
3. R Pulmonary artery
4. R. pulmonary vein
5. R atrium
6. AV Valve
7. R ventricle
8. Inf vena cava
9. L Pulmonary artery
10. L pumonary vein
11. L atrium
12. AV Valve
13. Semilunar valve
14. L ventricle
15. Aortic branch