Aim: SWBAT talk about the functions of the heart and how it affects our athletic ability

Do Now: Why do players cheat in sports?
Hand in homework.

Discussion

1. Test Questions
2. What is blood doping?
3. What are some of the dangers in blood doping?
4. Why would someone want to cheat?
5. Should it be legal as an adult?
6. If they eliminate the health risk of blood doping should it be legal?
7. Should pot be legal to use as a pain reliever in states where recreation use is legal?
8. Should pot be legal to use as a pain reliever in states where medical use is legal?

Facts

- Approximately the size of your fist
- Location
  - Left of the midline
  - In front of the vertebral column, behind the sternum

Overview

Two pumps located within a single organ

1) (right side of heart) - blood comes back from body and pass it on to the lungs where it picks up oxygen and loses carbon dioxide
   - This is the ***pulmonary*** circulatory system (blood vessels that carry blood to and from the lungs)
2) (left side of heart) the blood returns from the pulmonary system and is pumped through the bigger pump of the heart (Left); where it is pumped to the tissues of the body.
   - This is the ***systemic*** circulatory system (vessels that carry blood to and from the body cells)

Pericardium

- a double-walled sac around the heart
- Protects and anchors the heart
- Prevents overfilling of the heart with blood
- Allows for the heart to work in a relatively friction-free environment

Parts of the heart

The heart is divided into four parts:

- ***Right atria***: receives blood from body via superior and inferior vena cava; pumps blood into RV
- ***Right ventricle***: receives blood from RA; pumps blood to lungs for oxygenation (Eg. Pulmonary loop)
- ***Left atria***: receives blood from the lungs; pumps blood into LV
- ***Left ventricle***: receives blood LA, left AV or bicuspid, pumps blood to body tissues (Eg. Systemic loop)

Heart

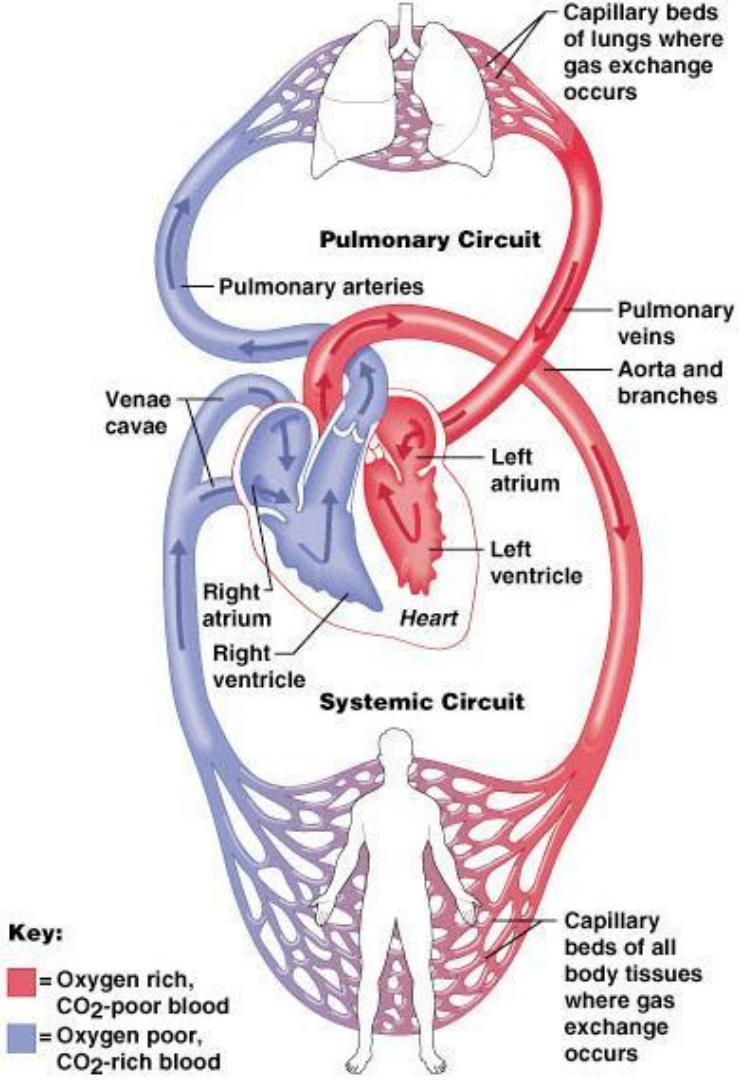
- The ***atria*** are smaller and on top, ***ventricles*** are larger and on bottom. (Eg. A on top of V)
  - **Atria** have thinner walls than ventricles
- Three major routes of circulation:
  - **Systemic** (body) loop,
  - **Pulmonary** (lungs) loop,
  - **Coronary** (heart) loop.

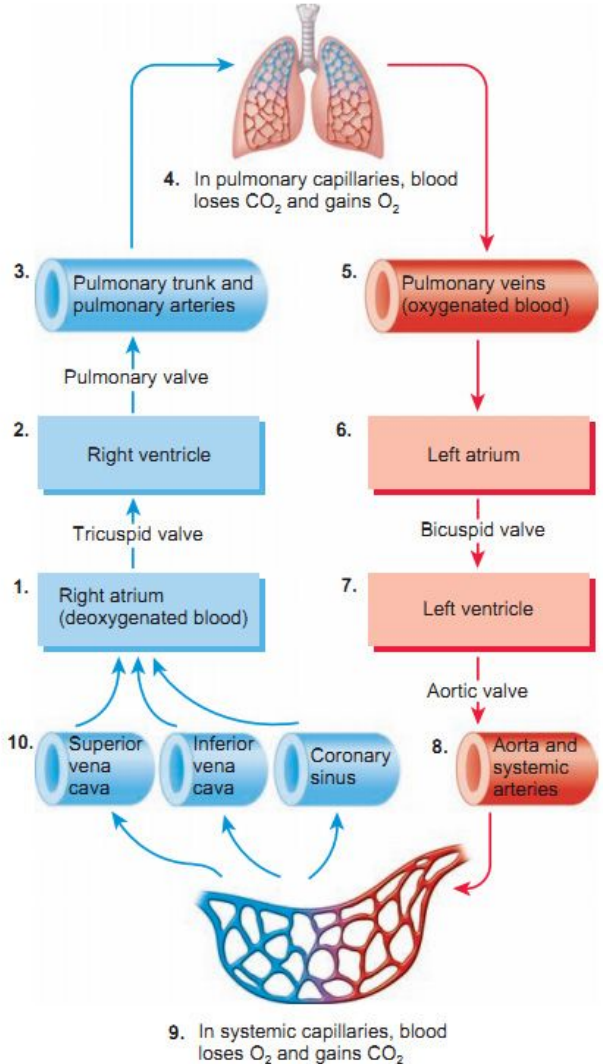
Heart

- **Superior vena cava:** carries deoxygenated blood from the head to the right atrium (return)
- **Inferior vena cava:** carries blood from the tissues of the body to the right atrium
- **Right atrioventricular (AV) valve: (tricuspid)** separates the atria from the ventricles. The AVs prevent blood from flowing from the ventricles back to the atria

Heart

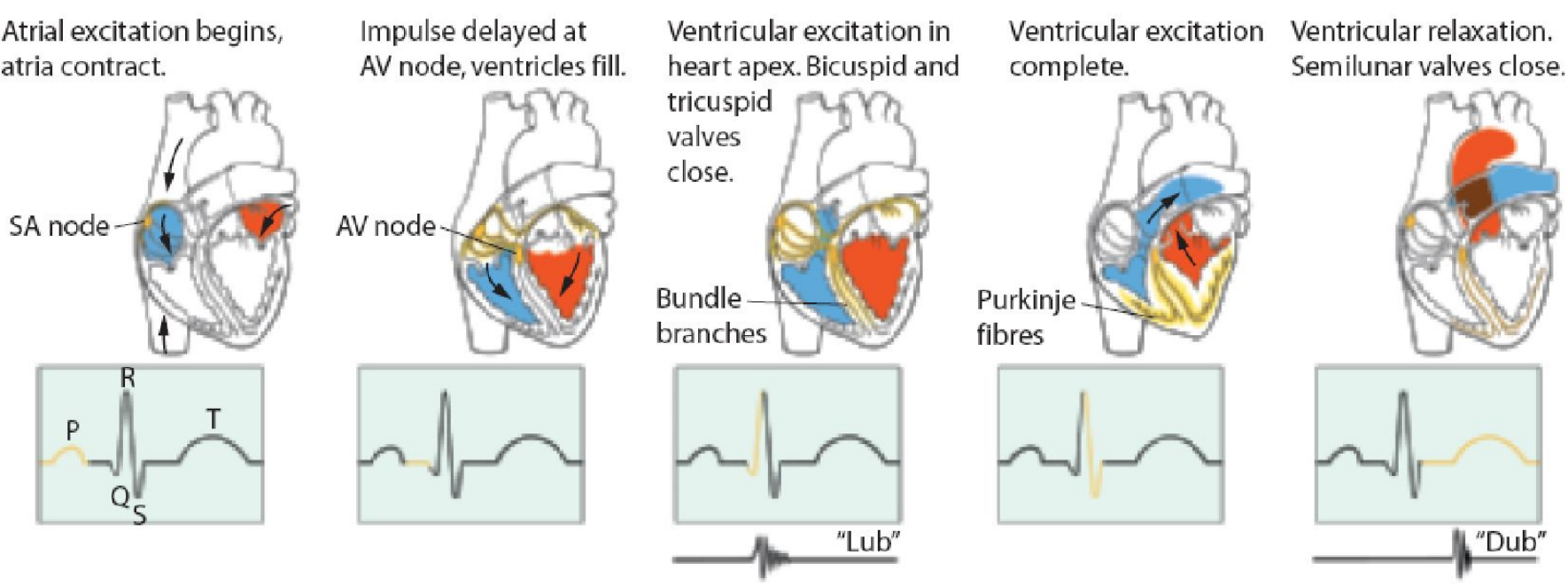
- **Pulmonary artery:** carries deoxygenated blood from the heart to the lungs (odd)
- **Semilunar valves (Pulmonary valve and Aortic valve:):** prevents the back flow of blood from the arteries into the ventricles (leaving the ventricles)
- **Pulmonary veins:** oxygenated blood from the lungs enters the left atrium (LA) through the pulmonary veins
- **Left Atrioventricular (AV) valve: (bicuspid)** separates the atria from the ventricles. The AVs prevent blood from flowing from the ventricles back to the atria


Capillary beds of lungs where gas exchange occurs
Pulmonary Circuit
Pulmonary arteries
Pulmonary veins
Aorta and branches
Venae cavae
Left atrium
Left ventricle
Right atrium
Heart
Right ventricle
Systemic Circuit
Capillary beds of all body tissues where gas exchange occurs
Key:
= Oxygen rich, CO_2-poor blood
= Oxygen poor, CO_2-rich blood


4. In pulmonary capillaries, blood loses CO_2 and gains O_2
3. Pulmonary trunk and pulmonary arteries
5. Pulmonary veins (oxygenated blood)
Pulmonary valve
2. Right ventricle
6. Left atrium
Tricuspid valve
Bicuspid valve
1. Right atrium (deoxygenated blood)
7. Left ventricle
Aortic valve
10. Superior vena cava
Inferior vena cava
Coronary sinus
8. Aorta and systemic arteries
9. In systemic capillaries, blood loses O_2 and gains CO_2

Heart Beat

- **Heart sounds** (heard using a stethoscope)
  a. "lubb" AV valves close, ventricles contract
  b. "dupp" semilunar valves close, ventricles fill
  c. ejection of blood
- **Contraction:**
  - The stage when ventricles are contracting this stage is called **systole**
  - The period during which the heart is relaxed and the ventricles are filling with blood is the **diastole.**


Atrial excitation begins, atria contract.
SA node
R
P
T
Q
S
Impulse delayed at AV node, ventricles fill.
AV node
Ventricular excitation in heart apex. Bicuspid and tricuspid valves close.
Bundle branches
"Lub"
Ventricular excitation complete.
Purkinje fibres
Ventricular relaxation. Semilunar valves close.
"Dub"

Heart Rate

- Changes in heart rate are caused by
  - Parasympathetic and sympathetic impulses reaching the pacemaker
  - By hormones (Epinephrine, Norepinephrine (Adrenaline))
  - Increased oxygen demand from exercise

EKG

- **Electrocardiogram -** Electrical fields within the heart can be mapped by this device
  - The electrocardiogram can be used to detect both normal and abnormal events in the cardiac cycle
  - (ECG or EKG): record of electrical activity of the heart
  - Problems that can be discovered
    - tachycardia: > 100 beats/min.
    - bradycardia: < 50 beats/min.

Heart Muscle

- Is stimulated by nerves and is self-excitable (**automaticity**)
- Contracts as a unit
- Cardiac muscle contraction is similar to skeletal muscle contraction

Things to know

1. Autonomic nervous system: (innervation of the heart)
    a. sympathetic: stimulates through cardiac nerve
    b. parasympathetic: relaxes through vagus nerve
2. changes in body temperature:
    a. warm: increases heart rate
    b. cool: decreases heart rate

Name	Resting Rate		Walking Rate		Running Rate	
xxxxxxxxx	Beats 10 s	Beats 60 s	Beats 10 s	Beats 60 s	Beats 10 s	Beats 60 s

1. Find your heart beat by placing two fingers on your wrist. Ask for assistance if you experience any difficulty with this task.
2. Count each thump as one beat.
3. Sit in your chair. Have your partner time you for ten seconds as you count the number of beats.
4. Multiply the number of beats by six. This is how much your heart beats in a minute while you are resting (your resting heart rate).
5. Record the number of beats in the data table.
6. Stand up and have your partner time you for one minute as you walk around the class. At the end of a minute count the number of beats for ten seconds. Multiply the number of beats by six to determine the number of heart beats in a minute while walking (your walking heart rate). Record the data in the data table.
7. Repeat all aspects of step number six, this time while running in place (your running heart rate). Record your data.
8. Repeat steps one through seven with all members of the group and record all data.
9. Find the average heart rate for each category (resting, walking, and running)