

1. Identify this structure Right Pulmonary Artery
5. Identify this structure Ascending Aorta (aortic arch)
6. Identify this structure Left Pulmonary Artery
7. Identify this structure Pulmonary Trunk
8. Identify this structure Left Atrium
9. Identify this structure Left Pulmonary Veins
10. Identify this structure Aortic Semilunar Valve
11. Identify this structure Bicuspid or Mitral Valve
12. Identify this structure Left Ventricle
13. Identify this structure Myocardium
14. Identify this structure Descending Aorta
15. Identify this structure Inferior Vena Cava
16. Identify this structure Right Ventricle
17. Identify this structure Chordae Tendineae

18. Identify this structure Tricuspid Valve
19. Identify this structure Right Atrium
20. Identify this structure Pulmonary Semilunar Valve
21. Identify this structure Superior Vena Cava
22. Identify this structure Right Pulmonary Veins

What is the function of the cardiovascular system? Transportation of vital nutrients, such as oxygen, to the cells and removal and transport of cellular wastes, such as carbon dioxide.

What organs make up the cardiovascular system? Heart and the Blood Vessels

Discuss how the parasympathetic and the sympathetic nervous systems influence the heart?

Sympathetic Nervous System increases heart rate during fight or flight responses or from stress. The parasympathetic nervous system decrease heart rate back to its normal beat.

**HEART ANATOMY:**

1. Located in the Bony Thorax, 2/3 of it is on the left side of midline, 1/3 is on the right.

2. Size and shape is similar to a Human Fist
3. Weighs approx. 11 oz. and pumps Blood
4. Where is the heart located? Medial to the lungs and anterior to the spine inside of the bony thorax.
5. What are the three main layers of the heart? Describe them.

Epicardium – also called the visceral pericardium, outermost layer of the heart

Myocardium – cardiac muscle layer of the heart, thickest layer

Endocardium – innermost layer of endothelium

#### 4 CHAMBERS:

Right Atrium - receiving chamber (from Vena Cavae, both superior and inferior)

Left Atrium - receiving chamber (from left and right pulmonary veins)

Right Ventricle - discharging chamber (to pulmonary trunk and pulmonary arteries)

Left Ventricle - discharging chamber (to aorta)

Interventricular Septum = the wall between chambers

Myocardium = walls of twisted and whorled cardiac muscle, the layer that actually contracts

Endocardium = smooth lining of heart chambers (inflammation of this is called endocarditis)

Pericardium = covering sac containing lubricating fluid

#### 2 layers of Heart's Protective covering:

1. Visceral pericardium = inner layer (also called epicardium)
2. Parietal pericardium = outer layer

#### HEART VALVES:

1. Tricuspid Valve = between right atrium and ventricle
2. Bicuspid (Mitral Valve) = between left atrium and ventricle
3. Aortic Semilunar valve = at beginning of aorta
4. Pulmonary Semilunar valve = at beginning of pulmonary artery

#### Heart Sounds:

"lub" = closing of AV or atrioventricular valves (ventricles contract)

"dub" = closing of Semilunar valves (heart relaxes)

## VESSELS CONNECTED TO HEART:

Superior Vena Cava - brings blood to right atrium from above

Inferior Vena Cava - brings blood to right atrium from below

Pulmonary Artery - takes blood from right ventricle to Lungs

Pulmonary veins - brings blood from lungs to left atrium

Aorta - takes blood from left ventricle to body

## HEART DISORDERS

Myocardial INFARCTION = Death or damage to the tissue of the myocardium (usually because of a blocked artery)

Angina PECTORIS = Chest pain caused by insufficient oxygen to the heart. (usually occurs during exertion or exercise that increases demand for oxygen)

## CONDUCTION SYSTEM OF HEART

Sinoatrial Node (SA node):

Instability of the nerve membrane generates a nerve impulse by itself. Can be regulated by sympathetic and parasympathetic nervous system. Impulse spreads out over atria causing them to contract.

Atrioventricular Node (AV node):

Transmits impulse from atria to the ventricles along special tract of fibers called the Atrioventricular or branch bundles. These bundles branch out into special conduction fibers called Purkinje Fibers.

If the AV node is destroyed or damaged the atria and ventricles will contract independently.

## ELECTROCARDIOGRAMS

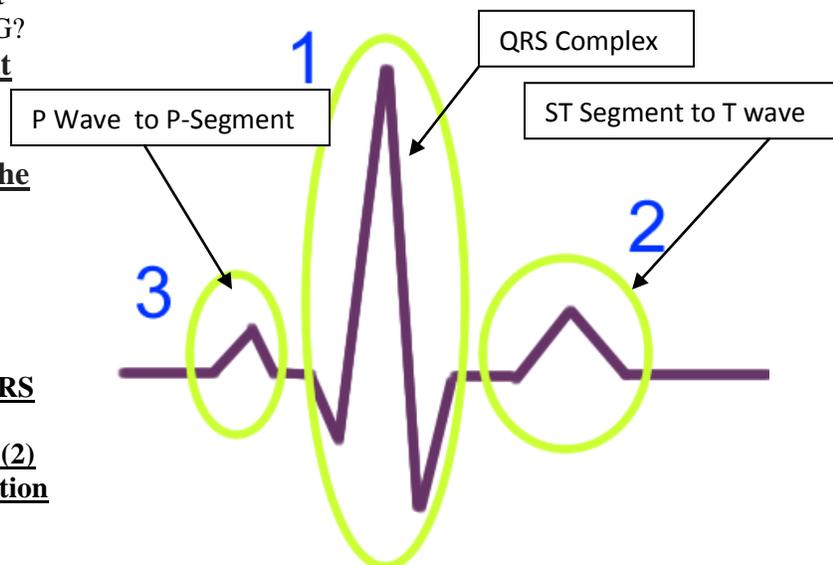
What is an electrocardiogram? What does it tell you about heart function? What can be diagnosed from an ECG/EKG?

**An electrocardiogram (EKG or ECG) is a test that checks for problems with the electrical activity of your heart. It can be used to diagnose electrical abnormalities and different conditions involving the conduction of the heart muscle or myocardium.**

Label the diagram and answer the Q to the right.

**The P-Wave to P-Segment (3) represents atrial depolarization and contraction during diastole. The QRS complex (1) represents ventricular depolarization and contraction during systole. The ST segment to T wave (2) represents the interval between ventricular depolarization and repolarization.**

Identify the wave forms seen on a Lead II ECG



and explain the relationship to the conduction system of the heart

## **BLOOD VESSELS**

ARTERIES (also includes arterioles)

Primary function: distribute blood away from heart

3 layers of blood vessels:

1. Tunica **Externa** - outer connective tissue
2. Tunica **Media** - middle layer; contains vasodilators and vasoconstrictors
3. Tunica **Intima** - inner layer, single layer of endothelial cells.

## **VEINS**

Primary function: veins return blood to **Heart**

The muscle layer is much **Thinner** than arteries.

Veins in extremities contain **Valves**.

List the factors which assist in returning blood to the heart

**Contraction of skeletal Muscle, Inhalation (breathing) creating differences in pressure and suction, and valvular shutting to prevent backflow, large lumens of veins.**

## **CAPILLARIES**

Primary function: **diffusion and exchange** between blood and cells

What are the two types of capillaries and what does each do?

**Vascular Shunts – create a passageway between arterioles and venules, true capillaries are where nutrient/waste exchange occurs**

Capillaries are made up of a single layer of endothelial cells. How does that affect their function?

**One single layer of cells allows for easy diffusion and exchange between nutrients and wastes possible.**

What would happen if blood pressures were high in the capillaries?

**They would easily burst open and be destroyed**

## **CIRCULATION**

**Systemic** - Blood flow from the heart to all parts of the body and then back again.

**Pulmonary** - Blood flow from the heart to lungs and back

What is a pulse? **Pressure wave resulting from expansion and recoil of an artery that occurs from each left ventricle contraction.**

## **BLOOD PRESSURE**

Define the term blood pressure, name the type of blood vessels where blood pressure is significant, and name the normal (average) value in a resting adult.

**Blood pressure is the pressure that blood exerts against the inner walls of the blood vessels. Usually refers to the pressure of the largest systemic arteries. Normal BP is 120 mmHg/80 mmHg.**

- Systolic pressure = Normal is 120 mmHg
- Diastolic pressure = Normal is 80 mmHg

What are some of the factors that influence blood pressure? (don't forget renal and neural factors!)

**Diet and exercise will influence BP. Sympathetic NS causes vasoconstriction which increases BP. Kidneys alter blood pressure by altering blood volume. Kidneys also release rennin that will cause vasoconstriction. Temperature will cause vessels to shrink and increase BP. Salty food increases BP. Chemicals like nicotine and epinephrine cause vasoconstriction, raising BP, and chemicals like alcohol and histamine cause vasodilation lowering BP.**

Which chamber has the thickest wall (myocardium)? Why? **Left ventricle because it has to pump the blood away from the heart out to the body where the blood has the greatest distance to go.**

Do pulmonary veins contain oxygenated blood? **Yes**

Do pulmonary arteries contain oxygenated blood? **No**

Where do coronary veins drain to? **Coronary sinus and back into the right atrium**

Describe the conduction system of the heart.

**Impulse keeps heart pumping in a consistent manner. Impulse first is generated by SA or sinoatrial node (pacemaker) and sends it across to the AV or atrioventricular node which then sends it to the AV or atrioventricular bundle (bundle of His), then to the bundle branches, then to the purkinje fibers which cause myocardial contraction.**

What is the central blood-containing space of a blood vessel called? **Lumen**

How does the structure of veins differ from arteries?

**Veins have larger lumens and thinner tunica media, and arteries have smaller lumens and very thick tunica externa and tunica media.**

What is the aorta?

**Major artery that receives blood from left ventricle and delivers it to the body.**

Define vasodilation and vasoconstriction.

**Vasodilation is blood vessel dilation or widening, and vasoconstriction is when blood vessels constrict due to factors like cold temperatures, etc.**

What causes vasoconstriction?

**Cold temperatures, Sympathetic nervous causes like when we lie down and get up fast, when blood volume drops vessels will constrict to compensate, when we exercise vigorously vessels, except for in skeletal muscle, will constrict.**

What is congestive heart failure? What are the two types? Briefly describe each and include major symptoms.

**When pumping efficiency of heart is depressed so that circulation is inadequate to meet body's needs, the balance between cardiac output and venous return is off. Blood will collect in certain chambers and cause the heart to swell in size. Right side leads to distal/peripheral edema (swelling in legs, hands, feet). Left side leads to pulmonary edema (fluid collection in lungs).**

What is the term referring to all of the events associated with one heartbeat called? Cardiac Cycle

Define the terms systole and diastole. **Systole is ventricular contraction and diastole is ventricular relaxation.**

**Determine whether the following are characteristic of arteries, capillaries or veins:**

Presence of smooth muscle allows them to constrict and dilate. veins and arteries

Lumens are largest. Veins

Have the thickest tunica media. Veins and Arteries

Are able to accommodate a large volume of blood. Veins

Exposed to the highest pressures of any vessels. Arteries

The link between arteries and veins in the pathway of blood. Capillaries

Experience the least pressure. Veins

The smallest vessels. Capillaries

Vessels that transport blood away from the heart. Arteries

The tunica externa is the heaviest wall layer. Arteries

Presence of elastin allows them to stretch and recoil. Veins and Arteries

Walls consist of just a thin tunica intima. Capillaries

Role: the exchange of materials between the blood and the interstitial fluid. Capillaries

Define the terms tachycardia and bradycardia. **Tachycardia is above normal heart rate (very fast), and bradycardia is below normal heart rate (slower).**

What hormones are involved in regulation of blood pressure and blood flow? **Renin from kidneys, thyroxine from thyroid and epinephrine from adrenal cortex.**

What is hypertension? **High blood pressure**

What is hypotension? **Low blood pressure**

What is atherosclerosis?

**When a fatty plaque builds up on the walls of arteries decreasing lumen size and how much blood can flow at a given time. Can lead to blockage and stroke. This disease affects the coronary arteries and aorta**

What is stroke volume? **amount of blood pumped out of each ventricle with each heartbeat.**

Discuss the factors that affect cardiac output.

**Cardiac output (CO) is stroke volume (SV) X heart rate (HR). We can influence our cardiac output by changing either of these factors. We can exercise, change our diets, get injured and bleed which would cause our heart rate to jump, and exercising would also create more force and move blood to the heart faster therefore increasing stroke volume.**

Discuss the factors that regulate heart rate.

**Bleeding of any kind would lower blood pressure and cause the heart to pump faster. Stress, such as fight or flight would cause the release of epinephrine which would cause increased heart rate. The metabolic hormone thyroxine also increases heart rate. Exercise causes the heart to pump faster and low oxygen and blood glucose would also cause the heart to pump faster. Other factors include gender, diet, temperature, presence of disease like congestive heart failure, and some ions and chemicals.**

Name the common term for the sinoatrial (SA) node Pacemaker

What is the function of serous fluid around the heart? **To reduce friction between heart beats and prevent heart layers from sticking together.**

**Label the artery, capillary and vein. Also label the layers of each.**

