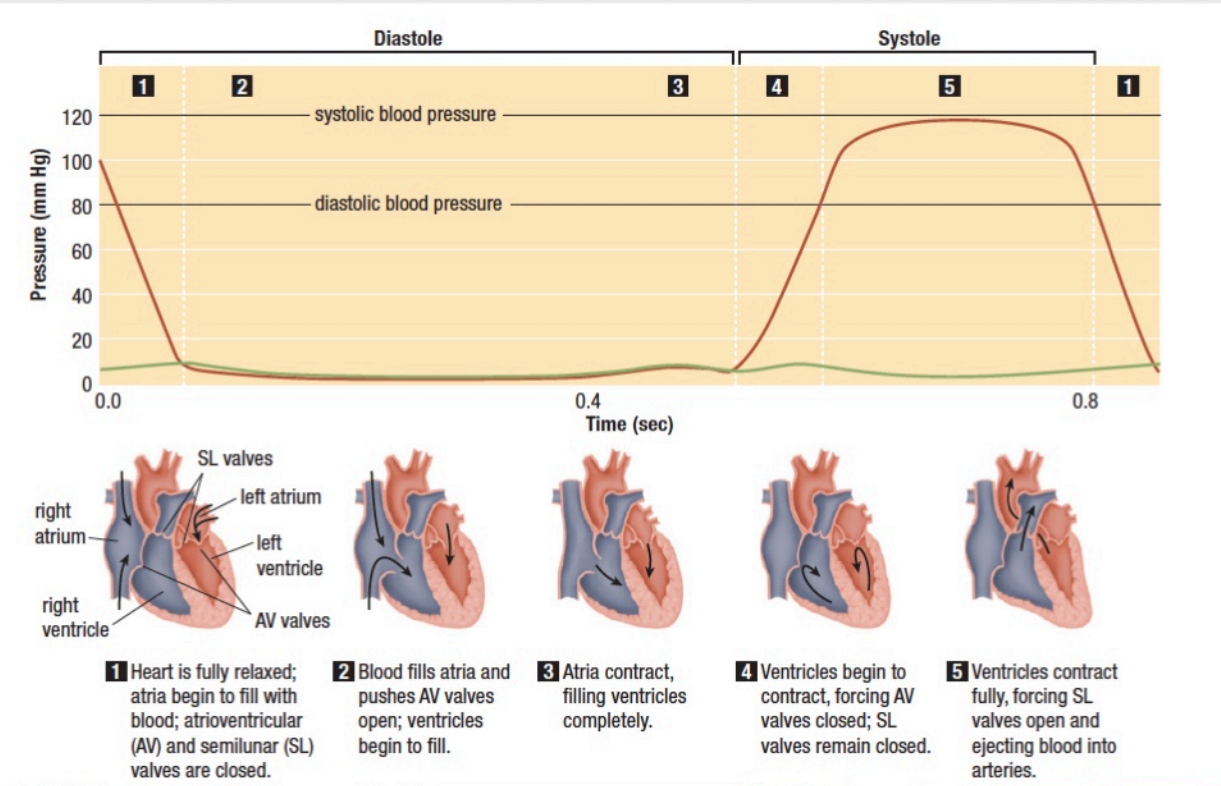
Structure	Description/Function
aorta	• largest artery of the body • brings OXYGENATED BLOOD from the heart to the body
pulmonary arteries	• brings DEOXYGENATED BLOOD from the heart to the lungs
pulmonary veins	• brings OXYGENATED BLOOD from the lungs to the heart
superior vena cava	• brings DEOXYGENATED BLOOD from the UPPER body to the heart
inferior vena cava	• brings DEOXYGENATED BLOOD from the LOWER body to the heart
septum	• separates the heart into two parallel pumps, each with an atrium and a ventricle
atria	• receive blood and pump it into ventricles, located at the top of the heart,
ventricles	• pump blood: right side to the pulmonary circuit (lungs) and left side to the systemic circuit (rest of the body) • muscular walls that are much thicker than the atria walls because ventricles must pump blood over a longer distance
pericardium	• two-layer connective tissue membrane that has fluid between the layers (protects the heart from friction with other tissues)
coronary blood vessels	• give the heart the blood supply it needs to function

Structure	Description/Function
semilunar valve	• valve located between: a) left ventricle and the aorta and b) right ventricle and the pulmonary artery • prevents backflow of blood
atrioventricular valve	• valve located between each atrium and ventricle to prevent backflow of blood from the ventricles to the atria
sinoatrial node	• a mass of muscle and nerve cells in the right atrium; initiate heartbeat and maintains regular rhythm
atrioventricular node	• a mass of conducting cells that transmits the signals from the SA node to the muscles of the ventricles
Purkinje fibre	• a conducting fibre that carries the electrical signals from the AV node to the muscle cells of the ventricles

Circulation

1. **Deoxygenated** blood from the body enters the **right atrium**.



2. Contraction of the right atrium forces the blood through the **atrioventricular valve** and into the right **ventricle**.
3. The right ventricle contracts to force the blood through the **semilunar value** and then the **pulmonary** arteries to the lungs.
4. **Oxygenated** blood from the lungs enters the **left atrium** through the **pulmonary veins**.
5. The **left atrium** contracts and squeezes blood through the **atrioventricular valve** and into the left ventricle.
6. The **left ventricle** contracts and forces blood out through the **semilunar valve** and then the **aorta** which branches into major arteries around the body.
7. **Deoxygenated** blood from the body enters the **venules** which merge into veins which merge into the **inferior vena cava** and **superior vena cava**. Blood flows into the **right atrium** of the heart and the cycle begins again!

The Cardiac Cycle

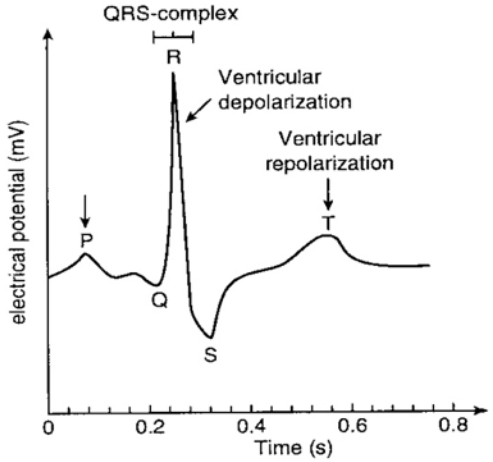
• the cardiac cycle is a complete heartbeat - a contraction and relaxation of each chamber (atria/ventricles) of the heart
    - 0.8 s under normal conditions
- Figure 3:

Regulation of Heart Rhythm

• heart tissue has the unusual ability to contract and relax on its **own** (unlike other muscles) - this is called **myogenic muscle**
    - this is an advantage in case the nervous system is damaged

1. Heart beat initiated in a cluster of cells in **right atrium** called the **sinoatrial (SA) node**. It acts as a **pacemaker** to set the normal rhythm.
2. The electrical signals first pass over the **atria** causing the muscles to contract.
3. The signal reaches the cells of the **atrioventricular (AV) node** located in the wall of the heart between the **right atrium** and **right ventricle**.
4. From the **AV node**, the **Purkinje fibres** run down the **septum** and through the ventricles.

• the heart rate can be adjusted by the **sympathetic** (prepares the body for stress) and **parasympathetic** (recovery) nervous systems
    - when the body is preparing for stress, signals from the brain go through the **sympathetic** nervous system and cause the **heart rate** to increase
        - this increased heart rate increases **blood flow** and oxygen to the tissues
    - when the stress is no longer present, signals from the brain go through the **parasympathetic** nervous



system and cause the heart rate to return to normal

Observing the Heartbeat

• the electrical signals of the heart can be measured with an **electrocardiograph**

Analyzing the Heartbeat

• P wave: caused by contractions in the **atria**
• QRS: electrical signal travels to the **Purkinje fibres** to the tip of the **ventricles**
• T: ventricular repolarization (getting ready for the next contraction)

11.4 The Cardiac Cycle and Circulation

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Structure	Description/Function
aorta	
pulmonary arteries	
pulmonary veins	
superior vena cava	
inferior vena cava	
septum	
atria	
ventricles	
pericardium	
coronary blood vessels	
semilunar valve	
atrioventricular valve	

Structure	Description/Function
sinoatrial node	
atrioventricular node	
Purkinje fibre	

deoxygenated	pulmonary veins	aorta
pulmonary	left atrium	semilunar valve
left ventricle	right ventricle	atrioventricular valve
venules	superior vena cava	inferior vena cava
oxygenated	right atrium	

Circulation

1. _____ blood from the body enters the _____.
2. Contraction of the right atrium forces the blood through the _____ and into the _____.
3. The right ventricle contracts to force the blood through the _____ and then the _____ arteries to the lungs.
4. _____ blood from the lungs enters the _____ through the _____.
5. The _____ contracts and squeezes blood through the _____ and into the left ventricle.
6. The _____ contracts and forces blood out through the _____ and then the _____ which branches into major arteries around the body.
7. _____ blood from the body enters the _____ which merge into veins which merge into the _____ and _____. Blood flows into the _____ of the heart and the cycle begins again!

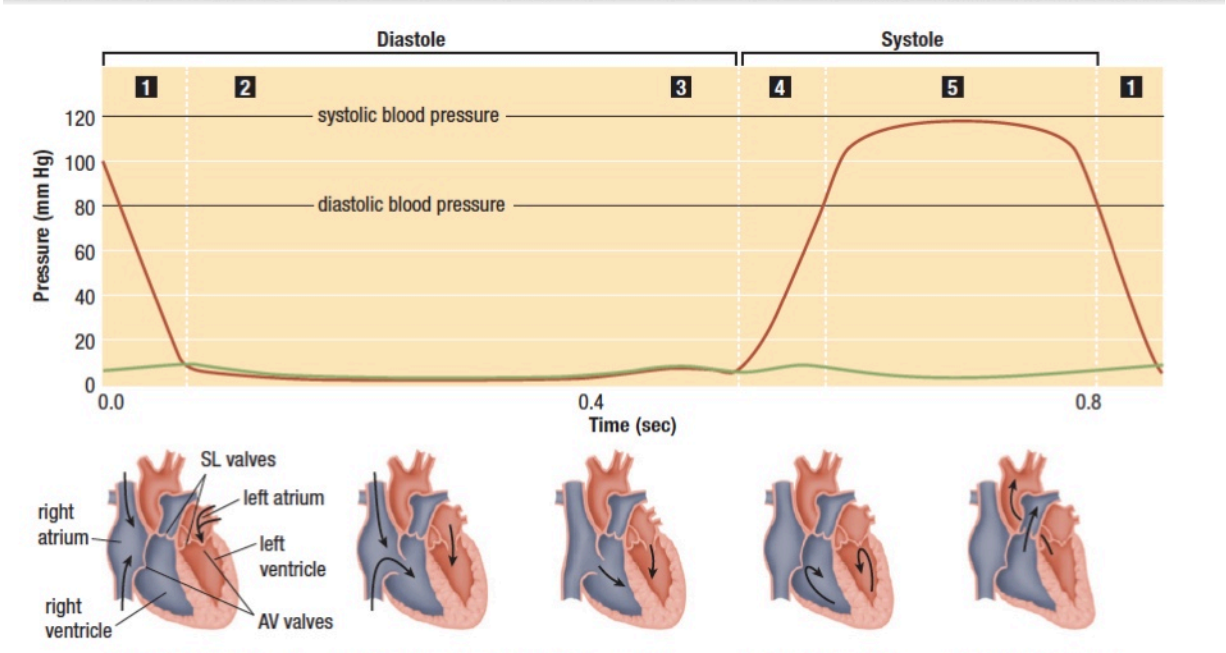
REFER TO THE HEART DIAGRAM AND LABEL THE ABOVE STEPS ON THAT DIAGRAM.

The Cardiac Cycle

• the cardiac cycle is a complete heartbeat - a contraction and relaxation of each chamber (atria/ ventricles) of the heart

    • 0.8 s under normal conditions

• **Figure 3:**



What is happening at the following numbers on the graph?

1	2	3	4	5

own	septum	blood flow	parasympathetic
right atrium	pacemaker	atria	atrioventricular node
atria	right ventricle	sinoatrial node	
heart rate	ventricles	myogenic muscle	
sympathetic	electrocardiograph	Purkinje fibre	

Regulation of Heart Rhythm

• heart tissue has the unusual ability to contract and relax on its _____ (unlike other muscles) - this is called _____

    • this is an advantage in case the nervous system is damaged

1. Heart beat initiated in a cluster of cells in _____ called the _____ _____. It acts as a _____ to set the normal rhythm.
2. The electrical signals first pass over the _____ causing the muscles to contract.

3. The signal reaches the cells of the _____ located in the wall of the heart between the _____ and _____.
4. From the _____, the _____ run down the _____ and through the ventricles.

• the heart rate can be adjusted by the _____ (prepares the body for stress) and _____ (recovery) nervous systems
    • when the body is preparing for stress, signals from the brain go through the _____ nervous system and cause the _____ to increase
        • this increased heart rate increases _____ and oxygen to the tissues
    • when the stress is no longer present, signals from the brain go through the _____ nervous system and cause the heart rate to return to normal

Observing the Heartbeat

• the electrical signals of the heart can be measured with an _____

Analyzing the Heartbeat

• P wave: caused by contractions in the _____
• QRS: electrical signal travels to the _____ to the tip of the _____
• T: ventricular repolarization (getting ready for the next contraction)