

Anatomy Of The Heart

4 chambers:

left and right **atria**

left and right **ventricles**

4 heart valves:

right AV valve (tricuspid)

left AV valve (bicuspid)

pulmonary/semilunar valve

aortic/semilunar valve

Flow of Blood

Right atrium: receives oxygen-poor blood from systemic circulation from **inferior and superior vena cavae** then pumps blood into **right ventricles** from **right AV valve**

Right ventricle: receives oxygen-poor blood from right atrium then pumps blood through the **pulmonary valve** into **pulmonary arteries**

Left atrium: receives oxygen-rich blood from pulmonary circulation then into **left and right pulmonary veins** and pumps blood through the **left AV valve** into the left ventricle

Left ventricle: receives oxygen-rich blood from left atrium then pumps blood through the **aortic valve** into the **aorta** which will go to the rest of the body

Purpose of Heart Valves

ensures one way blood flow

when pressure is greater behind valve it **opens**

when pressure is greater in front of valve it **closes**

has **chordae tendineae** which prevents valves from everting on itself during ventricular contraction

Heart Sounds & Definitions

murmurs: abnormal heart sounds due to malfunctioning valves

stenotic valve: stiff narrow valve that does not open completely, **whistling** sound

insufficient valve: valve that does not close properly, **swishing** sound

first heart sound (lub) -> closure of **AV valve**
second heart sound (dup) -> closure of **semilunar valve**

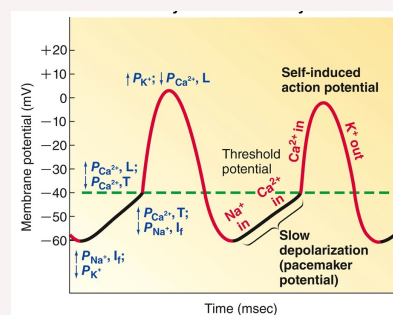
Regulation Of Cardiac Output

Heart rate: regulated by **parasympathetic** and **sympathetic** nervous system

Stroke volume: volume of venous blood returning to the ventricles

Cardiac Output = **heart rate X stroke volume**

AP of Pacemaker Cells



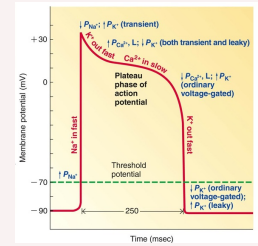
Key:

I_f - Funny Channels

T - Transient Type Calcium Channels

L - Long Lasting Calcium Channels

AP of Cardiac Cell



Pacemaker Definitions And Terms

Nodes: specialized cardiac cells capable of pacemaker activity are grouped together to form nodes

Sinoatrial (SA) Node: located in the **wall of the right atrium**, able to conduct **70 AP** for minute

Atrioventricular (AV) Node: located in the **base of the right atrium**, able to conduct **50 AP** for minute

Bundle of HIS: located at the AV nodes and **projects into the left and right ventricles**

Purkinje Fibers: small fibers that extend from the Bundle of HIS, able to conduct **30 AP** for minute

Interatrial Pathway: conducts pacemaker activity from the **right atrium to the left atrium**

Internodal Pathway: conducts pacemaker activity from the **SA node to the AV node**

Flow of AP

SA node -> AV node -> Bundle of HIS -> Purkinje Fibers

Heart Walls Definitions

Endocardium: thin layer of endothelial tissue lining the interior of each chamber

Myocardium: middle layer of the heart, has **intercalated disks** with **desmosomes** and **gap-junctions**

Epicardium: thin external membrane covering the heart and filled with **pericardial fluids** to protect the heart

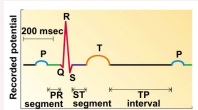
Electrocardiogram Waveforms

P-wave: *depolarization* of the atria

QRS Complex: *depolarization* of the ventricles

T-wave: *repolarization* of the ventricles

Electrocardiogram

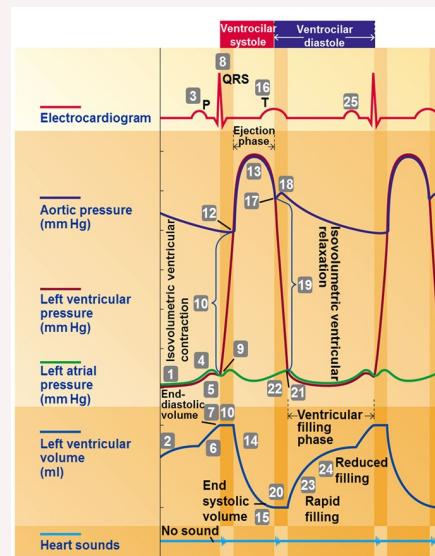


PR = AV Nodal Delay

ST = Time when ventricles are contracting & emptying

TP = Time when ventricles are relaxing & filling

Cardiac Cycle Image



Mechanical Events of the Cardiac Cycle

Systole: periods of contraction & emptying

Diastole: periods of relaxing & filling

End-diastolic volume: volume of blood at the end of diastole

isovolumetric contraction: period of time during contraction where the chambers are **closed** and the chamber pressure **increases**

End-systolic volume: the amount of blood remaining at the end of systole

Stroke volume: end-diastole volume minus end systole volume

Mechanical Events of the Cardiac Cycle (cont)

isovolumetric relaxation: period of time during relaxation when chamber remains **closed** and the chamber pressure **decreases**