# Cardiac Muscle Cheat Sheet Cheat Sheet

by thait via cheatography.com/213578/cs/46485/

## Anatomy of the Heart

| | |
|---|---|
| 4 Chambers Blood Circulation | Right AV valve (tricuspid) -> pulmonary(semilunar) valve -> left AV valve/bicuspid/mitral -> aortic/semilunar valve |
| Pulmonary circulation | Chambers on the right pump oxygen poor blood to the lungs |
| Systemic Circulation | Chambers on the left pump oxygen rich blood to body tissues |
| Right atrium | receives oxygen poor blood from inferior and superior vena cava |
| Right Ventricle | receives oxygen poor blood from the right atrium and pumps blood through the pulmonary valve into pulmonary artery |
| Left atrium | receives oxygen rich blood from pulmonary circulation via the left and right pulmonary veins |
| Left Ventricle | receives oxygen rich blood from left atrium and pumps blood through aortic valves into aorta |
| Chordae Tendinae | tendonous fibers attached to the inside edges of AV valves and base of ventricles via papillary muscles, prevents valves from everting |
| Connective Tissue | separates atria for ventricles providing attachment of heart valves |

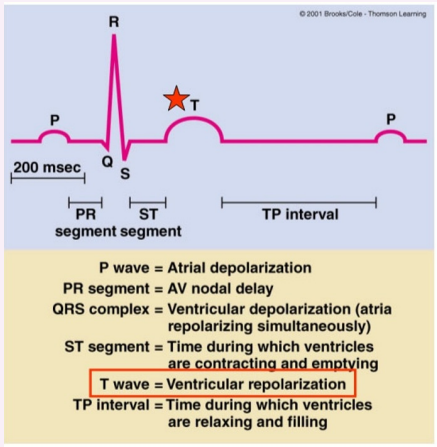
## Electrical Activity

| | |
|---|---|
| Autorhythmiticity | heart muscle is capable of generating its own rhythmic electrical acticity |
| Pacemaker activity | spontaneous, rhythmic generation of electrical impulses by specialized heart cells (like those in the sinoatrial node) that initiate and regulate the heartbeat, ensuring consistent cardiac contraction and blood circulation |
| SA Node | generates 70 AP per min, located in the wall of the right atrium near superior vena cava |
| AV Node | 50 AP per minute, located at the base of the right atrium follows the SA node |
| Bundle of His | specialized pacemaker cells originating at AV node projecting into left and rightv-entricles |
| Purkinje FIbers | 30 AP per min, spread throughout ventricular myocardium |
| Interatrial Pathway | specialized cardiac cells that conducts pacemaker activity from the right atrium to the left atrium |
| Internodal Pathway | pathway of specialized cardiac cells that conducts pacemaker activity from SA to AV nodes |
| AV nodal delay | Pacemaker activity is conducted relatively slowly through the AV node resulting in a delay of approximately 100 ms |

## Electrocardiogram Waveforms

| | |
|---|---|
| P wave | Depolarization of the atria |
| QRS complex | depolarization of the ventricles |
| T wave | repolarization of the ventricles |
| PR segment | represents AV nodal delay |

## Electrocardiogram Waveforms




## Mechanical Events of the Cardiac Cycle

| | |
|---|---|
| Systole | Contracting and emptying |
| Diastole | relaxation and filling |
| End Dastolic Volume | volume of blood in chamber at end of diastole , equivalent to max amount og blood chamber holds during cycle |
| Isovolumetric ventricular contraction | period of time during contraction when chambers stay closed increasing chamber pressure during this periods |
| End systolic volume | amount of blood remaining in the chamber at the end of systole |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## Mechanical Events of the Cardiac Cycle (cont)

| | |
|---|---|
| Stroke volume | amount of volume blood pumped out of the chamber with each contraction |
| Stroke volume equation | EDV - ESV |
| Isovolumetric ventricular relaxation | period of time during relaxation when the chamber remains closed and therefore no blood can enter or leave, chamber pressure decreases then |
| Lub | closure of AV valves |
| Dup | Closing of the semilunar valves |
| Murmurs | abnormal heart sounds from turbulent flow of blood through malfunctioning valves |
| Stenotic valve | stiff narrow valve that doesn't open completely , abnormal whistling sound |
| Insufficient valve | structurally damaged valve that does not close, abnormal swishing sound |
| Rheumatic fever | an auto-immune disease triggered by streptococcal bacteria that leads to valvular stenosis and insufficiency |

## Regulation of Cardiac Output

| | |
|---|---|
| Cardiac Output | HR - SV |
| Heart rate regulation done by | parasympathetic and sympathetic nervous systems |

## Regulation of Cardiac Output (cont)

| | |
|---|---|
| Stroke Volume | regulated intrinsically by volume of venous blood returning to the ventricles and extrinsically by the sympathetic nervous system |
| Parasympathetic | Vagus Nerve to the SA and AV nodes and to the contractile cells of the atria |
| Parasympathetic NTs | ACh and Muscarinic receptors |
| Effects of Parasympathetic Release of ACh | Increases permeability of SA nodal cells to K+ in the SA node leading to greater hyperpolarization and slowing of the K component of the pacemaker potential, in AV node increases permeability of AV nodal to K and in atrial contractile cells, shortens duration of cardiac fiber AP reducing Ca++ permeability |
| Sympathetic | Norepinephrine through beta adrenergic receptors |
| Effects of Sympathetic influence on HR | SA node - less hyperpolarization, acceleration of the K component, av node slowing increase in Ca++ permeability |

## Regulation of Cardiac Output (cont)

| | |
|---|---|
| Stroke Volume Regulation | Extrinsically regulated by neural control and intrinsically by the volume of venous blood returning to heart |
| Intrinsic control | direct correlation between end-diastolic volume and stroke volume |
| Heart failure | inability of CO to meet emands of the body |

## Basic Organization

| | |
|---|---|
| Arteries | composed of large vessels that carry blood from the heart |
| Arterioles | small diameter vessels that arise from the branching of arteries |
| Capillaries | smallest diameter vessels that are formed when arterioles branch |
| Venules | the vessels that form when capillaries join together |
| Veins | large diameter vessels formed by merging of venules |
| Microcirculation | name given to collection of arterioles, capillaries and venules |

## Blood Flow

| | |
|---|---|
| Blood flow | determined by pressure gradient in the vessels and resistance to flow caused by friction and viscosity of the blood |
| Blood flow equation | F=deltaP/R |

| Blood Flow (cont) | |
|---|---|
| F | Flow rate, volume of blood passing through a vessel per unit of time |
| Delta P | Pressure gradient - difference in pressure between the beginning and end of the vessel |
| Resistance | depends on blood viscosity, vessel length, vessel radius |
| Blood viscocity | friction developed in blood determined by the concentration of plasma proteins and number of circulating RBCs |
| Vessel length | friction between blood and the inner surface of a vessel is proportional to the vessel length |
| Vessel radius | friction between blood and the inner surface of a vessel is inversely proportional to the 4th power of the vessel radius |
| Pressure resovoir | Serves as a driving force during ventricular diastole, elasticity of the of artery walls smooth muscle, collagen, elastin |
| Pulse Pressure | pressure difference between systolic pressure and diastolic pressure |
| Mean Arterial Pressure | pressure that is monitored and regulated by BP reflexes |

| Intrinsic (local control) | |
|---|---|
| intrinsic control | factors intrinsic to an organ or tissue |
| Local metabolic changes | factors derived from metabolic activity causing dilation. smooth muscle tone is controlled by release of mediators such as NO |
| O2 concentration | reduced O2 during metabolic demand |
| CO2 concentration | increased CO2 during metabolic demand |
| pH | increases in CO2 and or lactic acid lowers blood pH |
| Extracellular K+ conc. | increased neuronal activity that outpaces the Na+/K+ ATPase |
| Osmolarity | increased solute concentration resulting from metabolic activity |
| Adenosine | released in Cardiac muscle in response to metabolic demand |
| Prostaglandins | produced from teh metabolism of faty acids |
| Histamine release | release when tissues are damaged and leads to vasodilation accompanying an inflammatory response |
| local physical control | temperature and myogenic response |
| Temperature | arteriolar smooth muscle tone is inversely proportional to temperature |
| Myogenic response | arteriolar smooth muscle responds to stretch by contracting |