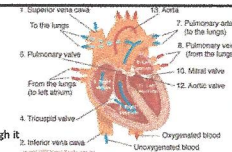


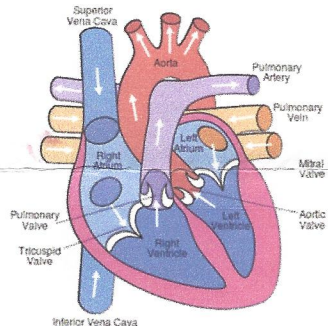
## The Heart: what/how/where

## The Heart: basic anatomy



- The heart is basically a big, convoluted muscles with electricity running through it
- It sits in a sac of fluid called the pericardium
- The blood enters the heart from a vessel and comes into an atrium. It then moves through a valve and into a ventricle. It then gets pushed through another valve into a vessel. *This happens on both sides of the heart at the same time*
- The right hand side of the heart has two big veins called the inferior and superior vena cava which carry de-oxygenated blood to the heart. This then enters the right atrium.
- The blood is then pushed through the 'tricuspid valve' (so called because it has three 'cusps') into the right ventricle.
- This then pushes the blood through the 'pulmonary valve' (which is actually of the bicuspid variety but is sometimes referred to as a semi-lunar valve) and it is sent through the pulmonary artery to the lungs so it can be oxygenated
- On the left hand side, the pulmonary vein takes the oxygenated blood to the left atrium.
- This oxygenated blood then goes through the 'mitral valve' (looks a bit like a bishop's mitre and is of the bicuspid variety) to the left ventricle
- The blood then gets pushed through the 'aortic valve' (of the tricuspid variety but is sometimes referred to as a semi-lunar valve) before entering the aorta which carries it to the peripheries so that they can get the oxygen

## Vessels & Valves

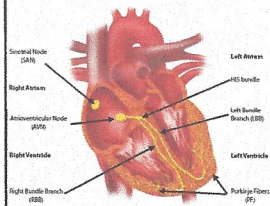


## Things that can go wrong with the heart

- Things can go wrong with:
  - The surrounding tissue of the heart (the pericardium)
  - The actual heart structure itself and its blood supply
  - The valves (e.g.: their structure or functioning)
  - Electrical pathways

## Electricity and the heart

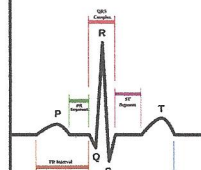
Cardiac Conduction system



- The heart achieves all this movement of blood because it has electricity running through it which causes different parts of the heart muscle to contract at different times.
- This contraction and subsequent relaxation pushes the blood around
- First of all, you get an impulse in the SAN in the right atrium (people refer to this as the 'natural pacemaker' of the heart). The impulse in the SAN spreads to cause both the atria to contract.
- Then there is an electrical impulse in the AVN (also in the right atrium but slightly lower down). This slows the impulse down a bit so that the atria can complete their contraction before the ventricles start.
- The impulse then travels down the Bundle of His which then separates into the Right Bundle Branch and the Left Bundle Branch.
- The bundles travel down the middle septum of the heart before spreading into smaller fibres called the Purkinje Fibres (at the bases of the ventricles)
- The electricity travelling through these bundles of fibres in the ventricular walls causes the ventricles to both contract (which pushes the blood out of the heart on both sides)

## ECGs

- ECGs are wiggles on a sheet of paper which are caused by the detection of electrical activity on the surface of the body.
- This electrical activity is associated with the contractions of the heart



- Each wiggle is referred to as a 'wave'
- P wave = electrical activity associated with atrial contraction
- QRS complex = electrical activity associated with ventricular contraction
- T wave = electrical activity associated with ventricular repolarisation
- Note that atrial repolarisation occurs during ventricular contraction so you can't see it on an ECG because the QRS complex is covering it
- Sometimes you can get little U waves immediately following T waves. These are thought to be repolarisation of the papillary muscles or Purkinje fibres
- A normal rhythm on an ECG is called a 'sinus rhythm' (simply because the sinus node generates it). It is identified by P, QRS and T all occurring in the correct order, fairly regularly, again and again