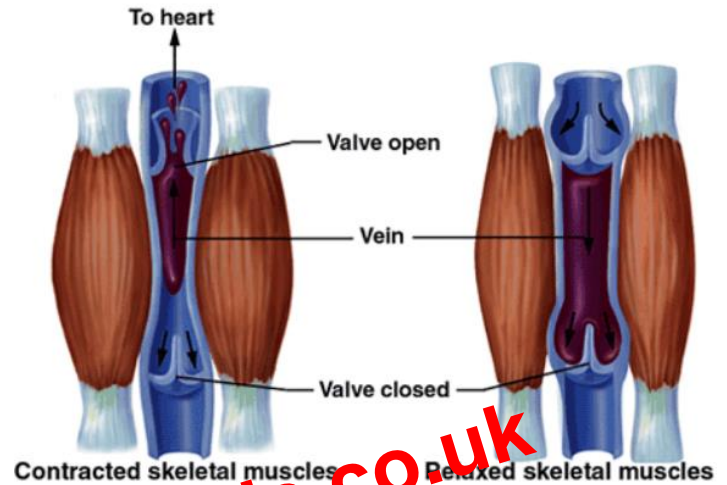


- Semilunar valve opens (aorta and pulmonary artery blood flow)
 - Aortic and ventricular pressure ~ 12mmHg
5. **Isovolumetric ventricular relaxation (Diastole) – (iso means the same)**
- Contraction ends, aortic pressure > ventricular pressure
 - Semilunar valve now close and av still closed
6. **Step 1 repeat**

Skeletal muscle pump and venous return

- Blood returns to the heart when skeletal muscles squeeze veins that pass through in between muscle bundles
- There are valves in the veins to prevent flow from going backwards.e
- Breathing also increases pressure on the veins and helps move blood back to the heart

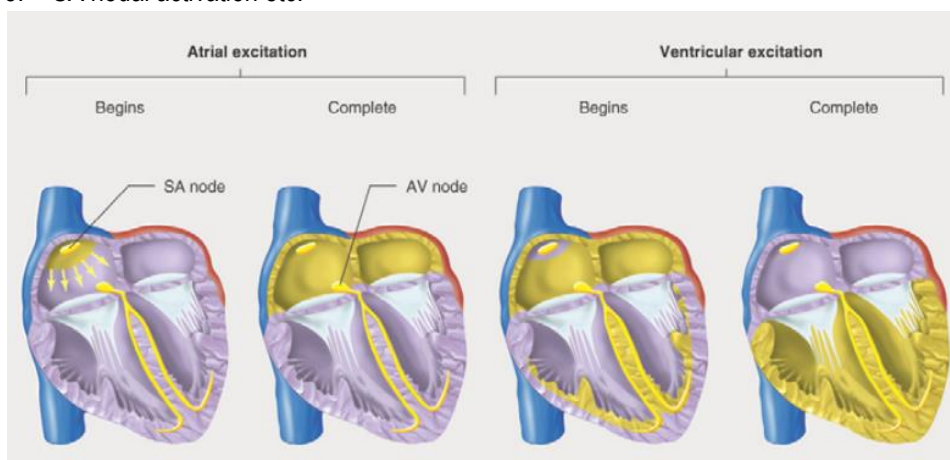


Failure of the atria to contract effectively (Atrial fibrillation) would result in decreased exercise capability. This is because the atria only fills approximately 20% of the blood left. Blood is still pumped around the heart.

ACTION POTENTIALS ARE REQUIRED TO CREATE EACH CONTRACTION

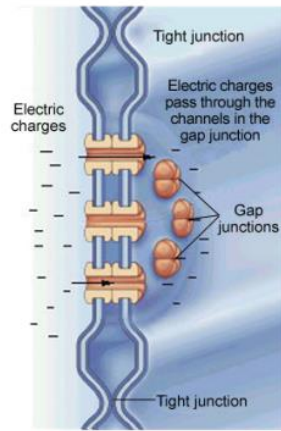
Electric events of the cardiac cycle – initiation, then spread of the action potential

1. Initiation of cardiac action potential by pacemaker cells (sinoatrial node contains pacemaker cells)
2. Activation of the atria
3. Spread of excitation to ventricles via atrioventricular node
4. Activation of ventricles (Bundles of His, Purkinje fibres)
5. SA nodal activation etc.

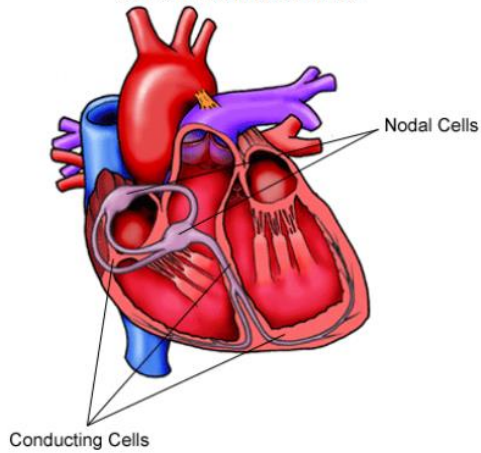


At cellular level, action potentials spread via gap junctions and fast conduction fibres.

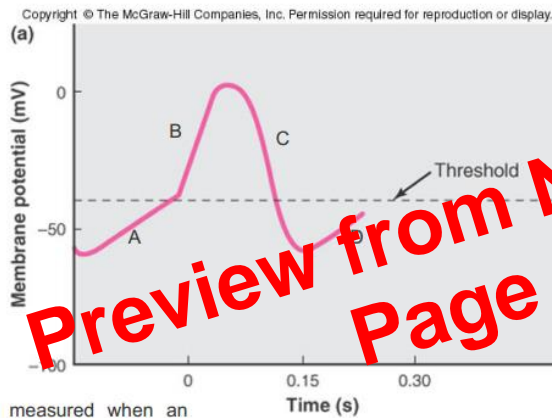
1. Gap junctions – cell to cell movement



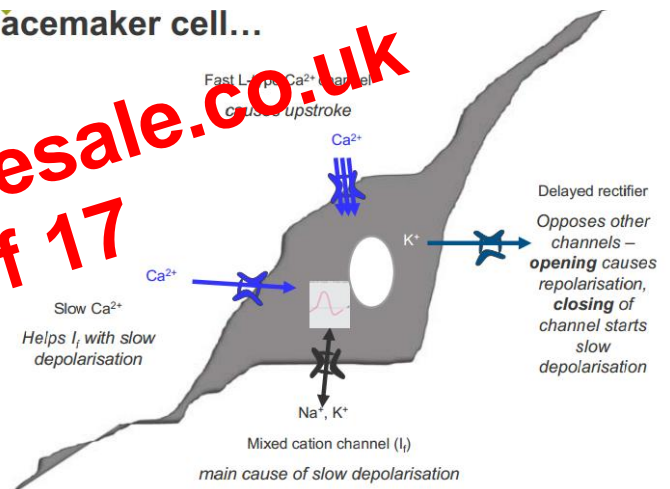
2. Fast conduction fibres



Pacemaker potentials are the spark required for each heartbeat.



Pacemaker cell...



This is what is measured when an electrode is stuck into a pacemaker cells

A – Slow depolarisation is a result of a **mixed cation channel (I_f)/funny/HCN** which cause an **influx of Na^+ and Ca^{2+}** and an out flux of K^+ . There is a higher influx of Na^+

B – Sharp upstroke of depolarization is caused by Ca^{2+} entering the cell through **Fast L type Ca^{2+}**

C – Hyperpolarisation is caused by the out flux of K^+ there from the potassium channel

D – It is the same as A

Changing the slope of A can cause a change in the rate of the heart. The steeper it is the faster the heart rate because of quicker depolarisation.

The action potential has reached the muscle cells (i.e. ventricular muscle cell) – the action potential involved different voltage gated ion channels.