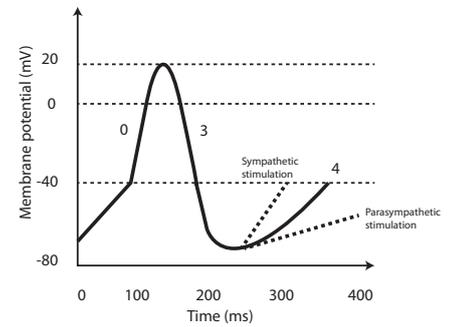


Outline normal impulse generation and conduction in the heart.  
Describe the features present in a normal heart that prevent generation and conduction of arrhythmias

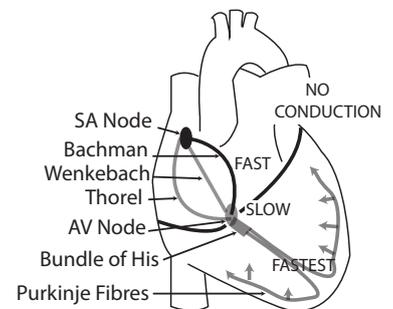
Impulse generation

- occurs in specialised cardiac pacemaker cells
- due to a slow depolarisation in phase 4
- caused by the opening of T-type Ca channels (time)
- influenced by
  - PNS - muscarinic receptors - ACh - slowing
  - SNS - adrenergic beta 1 receptors - faster
- SA node has the fastest rate and usually sets the HR
- AV node and Bundle of His have pacemaker cells also but are slower



Conduction in normal heart

- begins SA node, 5 cm/sec
- through atria (thorel, bachmann and wenkebach) 100 cm/sec
- slows at AV node 4 cm/sec (AV node pause)
- Bundle of His 100cm/sec
- Purkinje fibres 400cm/sec



Features which prevent conduction abnormalities

conducting pathways

- are characterised by multiple intercalated discs and gap junctions which improve conduction
- in the event that an upstream pacemaker is blocked the downstream pacemaker can take over

excessive firing of pacemaker cells

- the AV node (due to the AV delay) stops the conduction of impulses with rates >220
- eg. atrial flutter and 2:1 or 3:1 block

re-entry (re-excitation of myocytes prior to the next pacemaker potential)

structurally

- AV gate being the only point between the atria and ventricles
- only allows forward conduction (nil retrograde)
- abnormalities cause WPW

physiologically

- the purkinje fibres and normal myocytes are not pacemakers cells
- they have a phase 1 and 2 which lengths the refractory periods
- if there is a re-enterant pathway they will not conduct in the absolute refractory period