



CONDUCTING SYSTEM OF THE HEART

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INTRODUCTION

- # The heart pumps blood through the body
- # This is accomplished by contraction and relaxation of the cardiac muscle tissue in the myocardium layer.
- # The heart has an intrinsic system where by the cardiac muscle is automatically stimulated



CONDUCTION SYSTEM

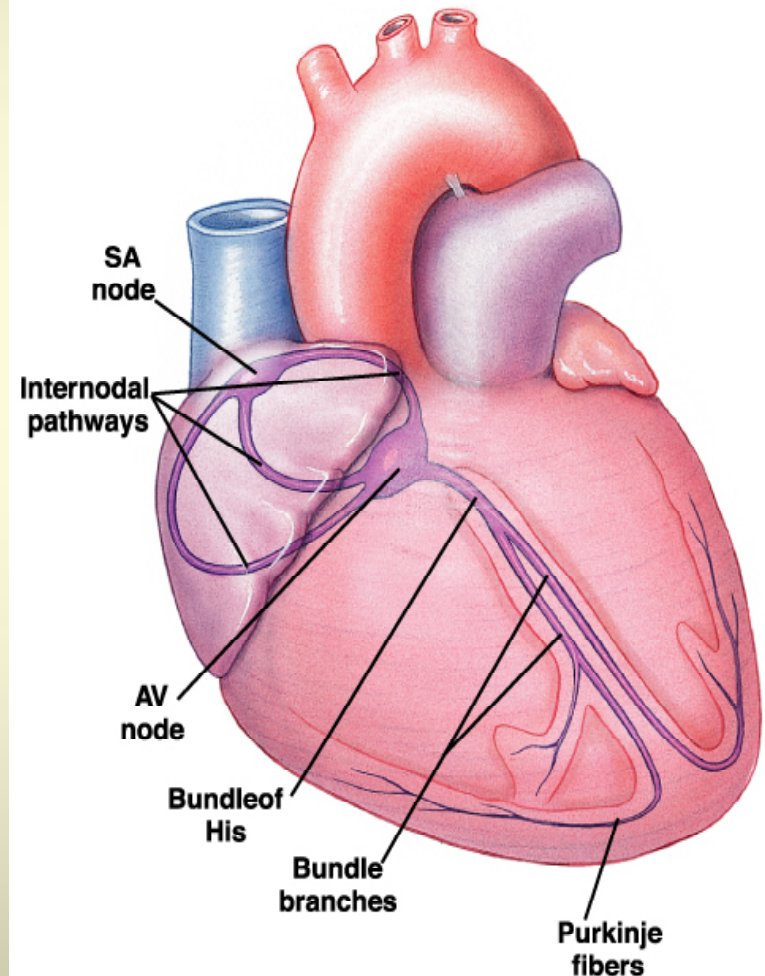
- # **Cardiac conduction system** creates the electrical impulses and sends them throughout the heart. These impulses make the heart contract and pump blood.
- # This electrical conduction system controls the heart rate

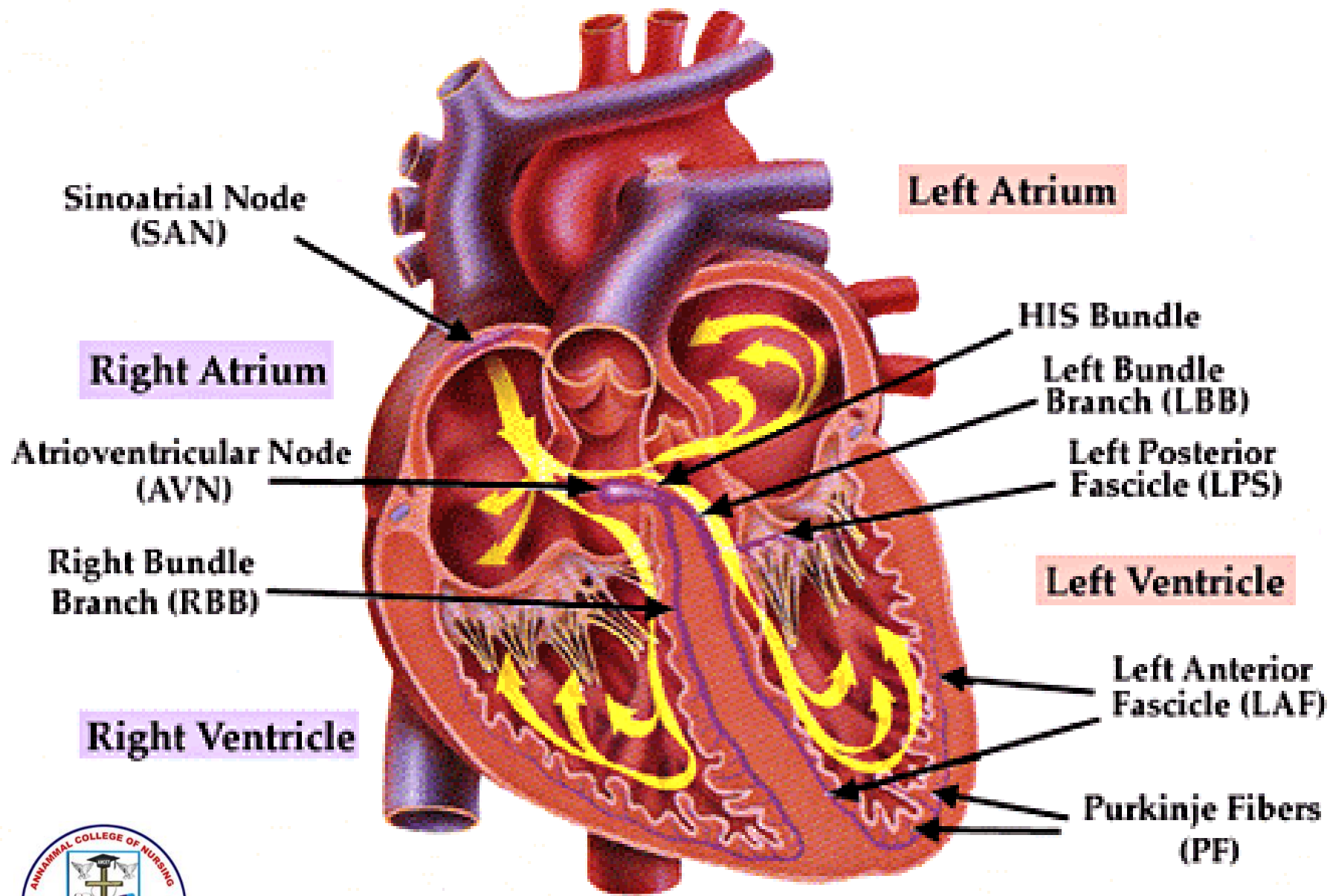


THE CONDUCTING SYSTEM

Structures of the Conducting System

- SA node
- Internodal pathways
- A-V node
- A-V bundle
- Right & Left bundle branches
- Purkinjee fibres





Cardiac Conduction System

SINOATRIAL (SA) NODE

- # SA node is the pacemaker of the heart which contains pacemaker cells
- # Normally SA node is responsible for generating the electrical impulses that bring about the mechanical activity i.e contraction of the heart.



Location of the SA node

- # SA node is a small, ellipsoid strip of specialized cardiac muscle about 3mm wide, 15 mm long, and 1mm thick.
- # Present in posterior wall of right atrium near the entrance of the superior vena cava
- # Initiates impulses 70-80 times per minute without any nerve stimulation from brain

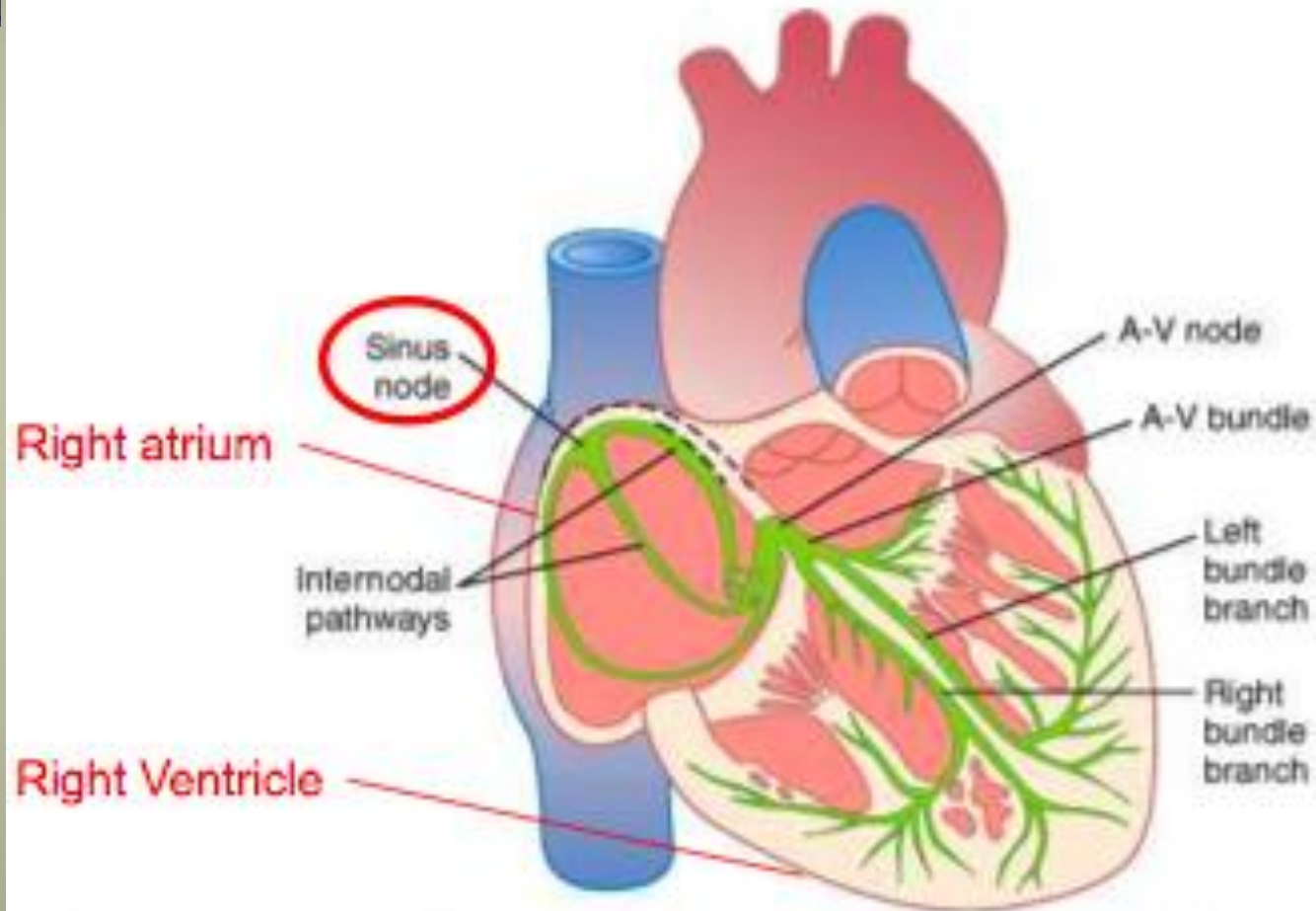


Spread of Cardiac Impulse from SA node to Atrial muscle

The cardiac impulse after it's origin in the SA node spreads through out the atrial muscle through two routes

- Ordinary Atrial muscle fibers
- Specialized conducting bundles - internodal bundles





- These inter nodal pathways conduct the impulses at a faster rate than the ordinary atrial muscle fibers.
- The cause of rapid conduction in these bundles is the presence of specialized conduction fibers.



- Impulses move through atria causing the two atria to contract.
- At the same time, impulses reach the second part of the conduction system



AV NODE



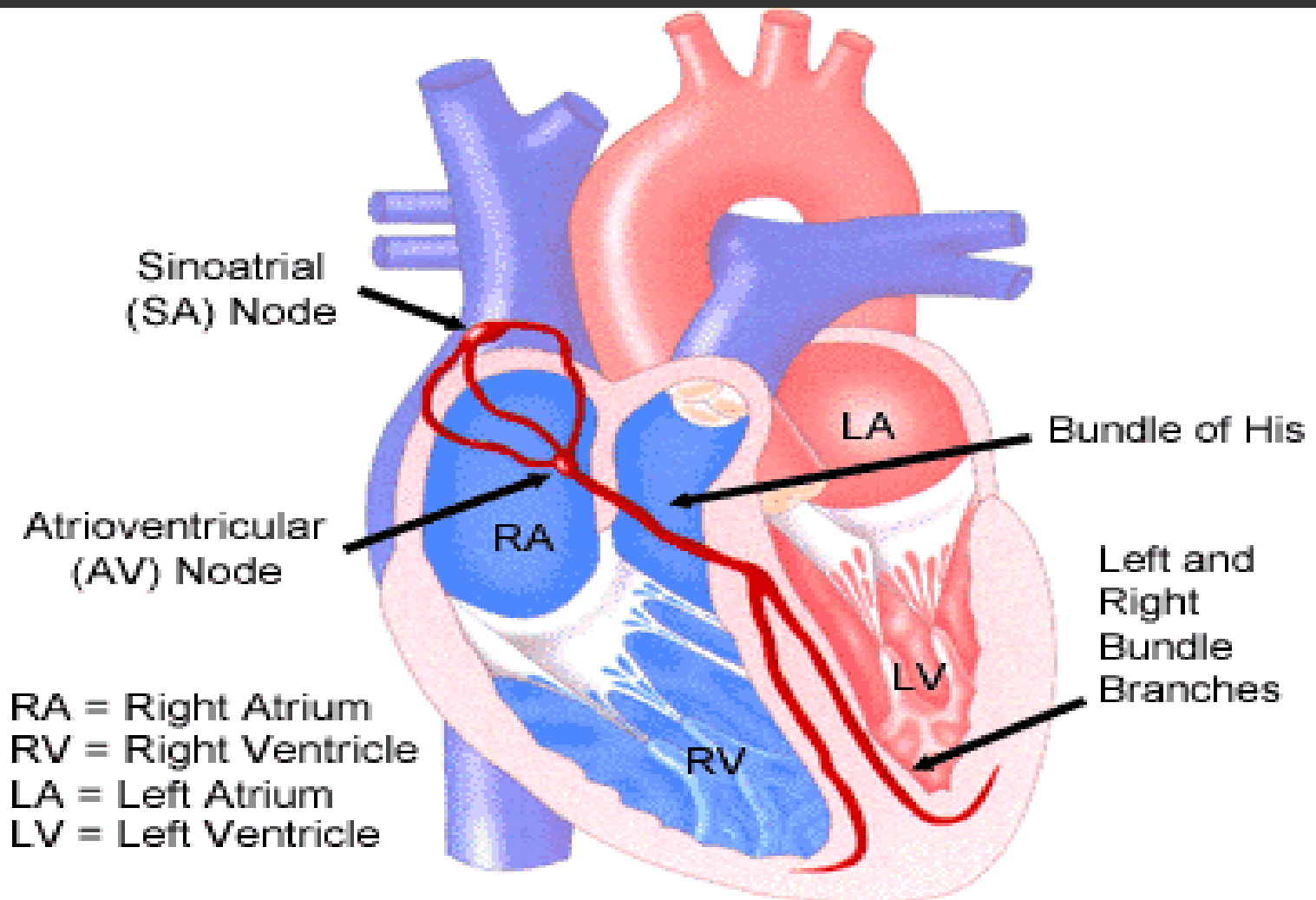
- # The AV node is located in the posterior wall of the right atrium immediately behind the tricuspid valve.
- cells in the AV node conduct impulses more slowly, so there is a delay as impulses travel through the node
- # this allows time for atria to finish contraction before ventricles begin contracting. So that the atria empty blood into ventricles before the ventricles contract.



ATRIO VENTRICULAR BUNDLE (BUNDLE OF HIS)

- # This is a mass of specialized fibres that originates from the AV node. This fibres divides into Rt & Lt bundle branches at the upper end of the ventricular septum.
- These branches extend to the right and left sides of the septum and bottom of the heart.
- From the AV node, impulses travel through to the right and left bundle branches



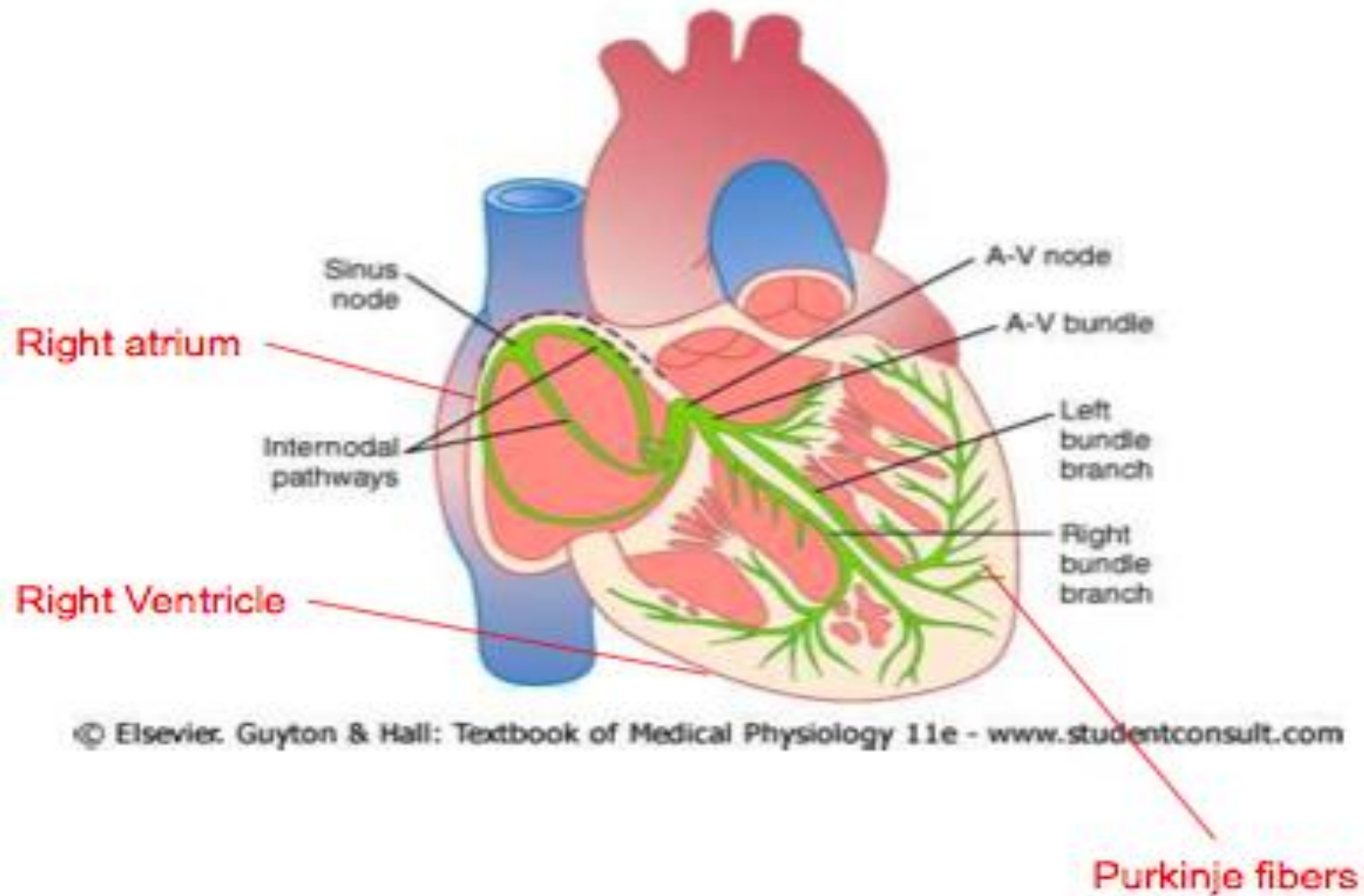


PURKINJEE FIBRES



- # The bundle branches break up into fine fibres called the Purkinjee fibres
- # They transmit the impulses to the myocardium (muscle tissue)
- The bundle of His, bundle branches and Purkinje fibers transmit quickly and cause both ventricles to contract at the same time





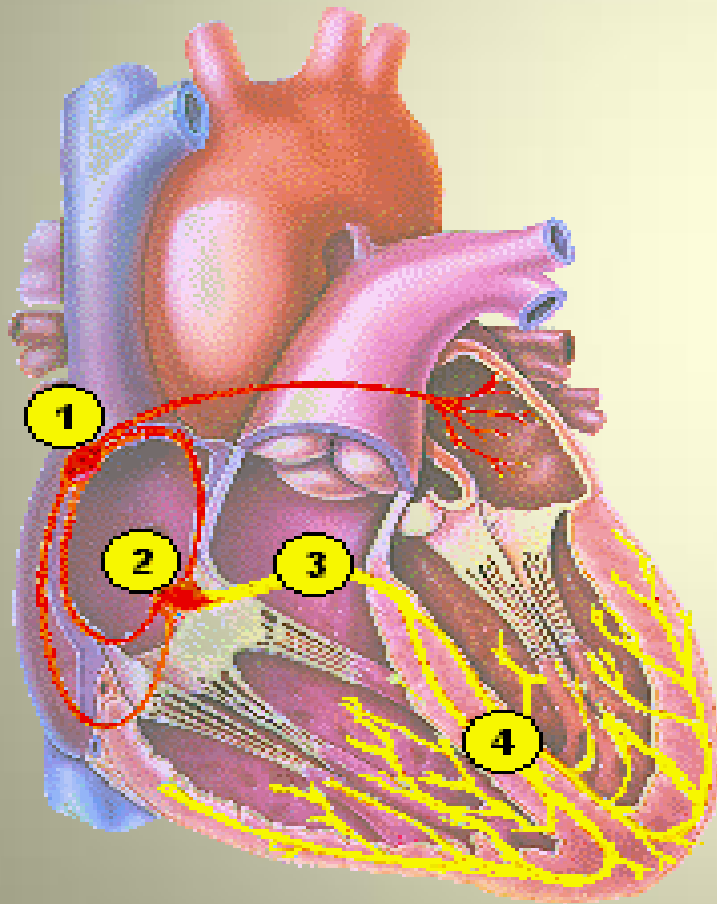


- # As the ventricles contract, blood is forced out through the semilunar valves into the pulmonary trunk and the aorta.
- # After the ventricles complete their contraction phase, they relax and the SA node initiates another impulse to start another cardiac cycle.





Summary of Steps



**1 – Sino atrial node
(SA node)**

**2 – Atrio ventricular
node (AV node)**

3 – Bundle of His

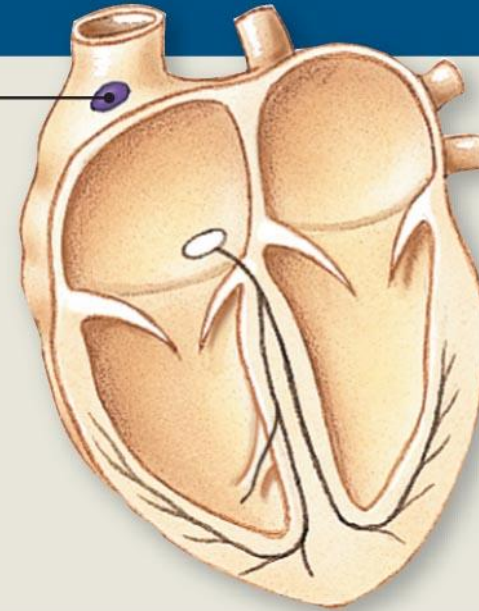
**4 - Right & Left Bundle
Branches which lead to
Purkinje Fibers**



STEP 1

SA node activity and atrial activation begin.

SA node

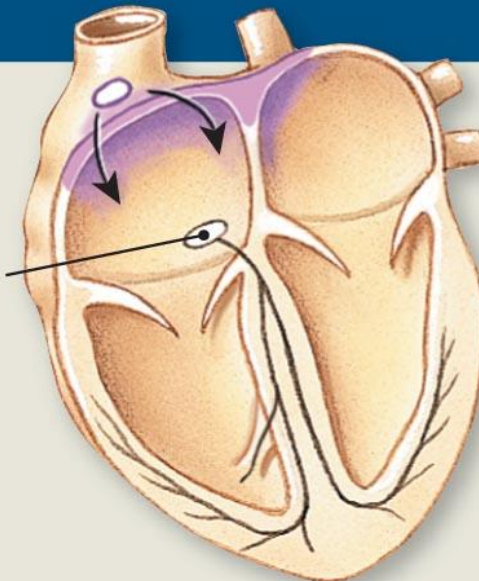


Time = 0

STEP 2

Stimulus spreads across the atrial surfaces and reaches the AV node.

AV node



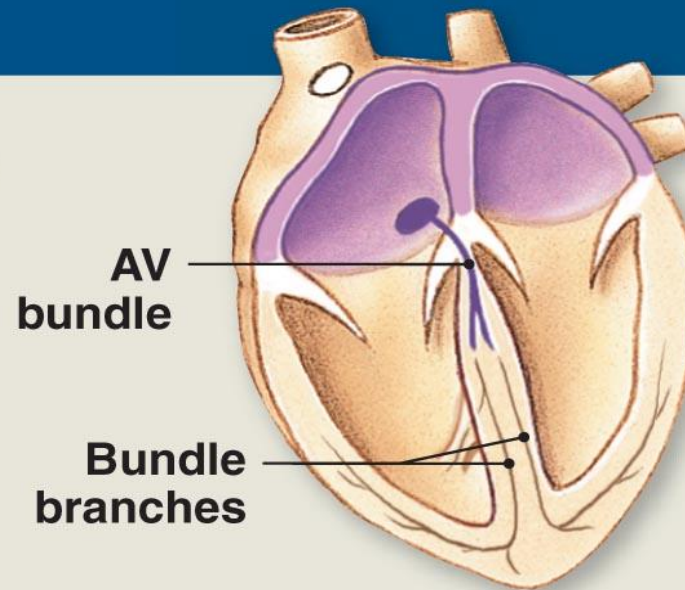
Elapsed time = 50 msec



STEP 3

There is a 100-msec delay at the AV node. Atrial contraction begins.

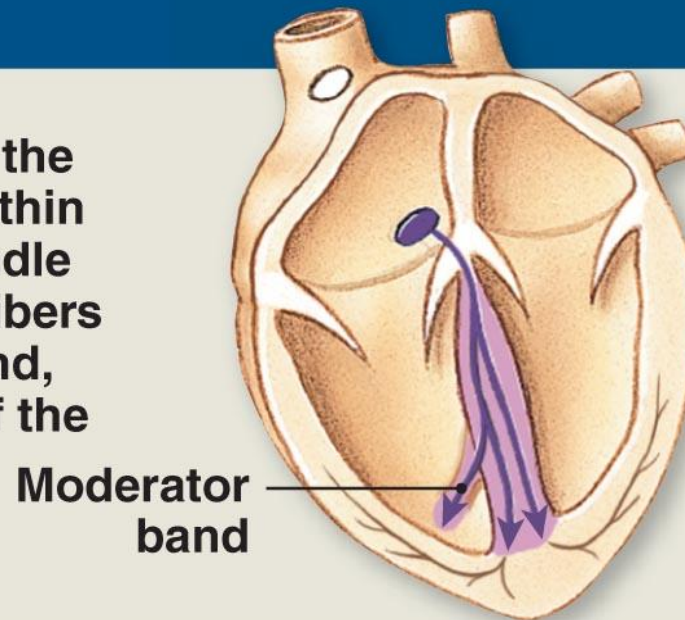
Elapsed time = 150 msec



STEP 4

The impulse travels along the interventricular septum within the AV bundle and the bundle branches to the Purkinje fibers and, via the moderator band, to the papillary muscles of the right ventricle.

Elapsed time = 175 msec



STEP 5

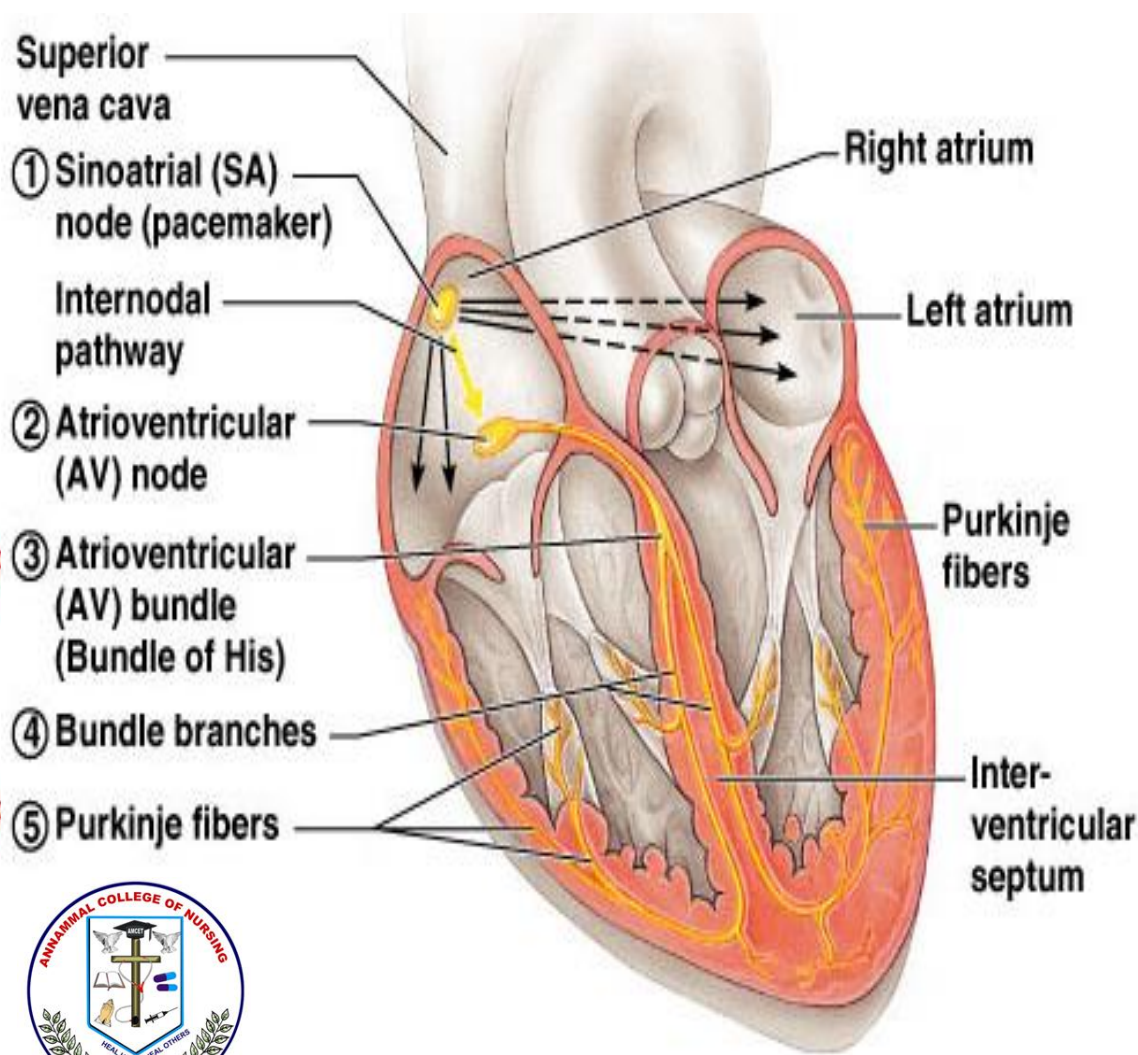
The impulse is distributed by Purkinje fibers and relayed throughout the ventricular myocardium. Atrial contraction is completed, and ventricular contraction begins.

Elapsed time = 225 msec

Purkinje fibers



Summary of Path of Propagation



SA node



30 milliseconds

AV node



90 milliseconds

AV bundle



40 milliseconds

Purkinje fibers



30 milliseconds

Ventricles



30 milliseconds

Outer surface of heart

Total time, 220 milliseconds



THANK YOU

