

Why are the walls of the atria thinner than the walls of the ventricles?

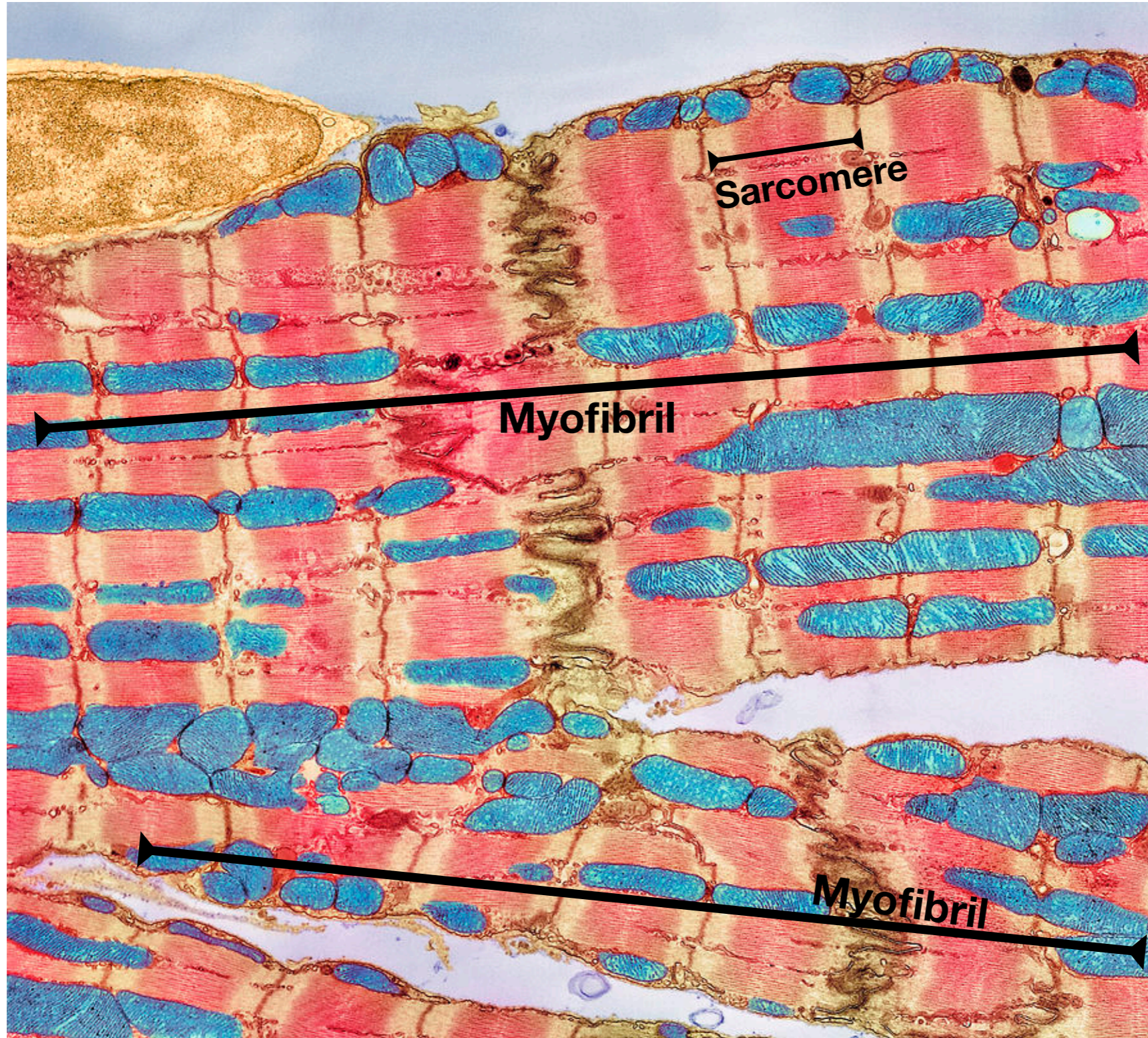
What prevents the atrioventricular valve from being pushed into the atrium when the ventricles contract?

Does the left side of the heart pump oxygenated or deoxygenated blood?

Why does the wall the heart need its own supply of blood brought by the coronary arteries?

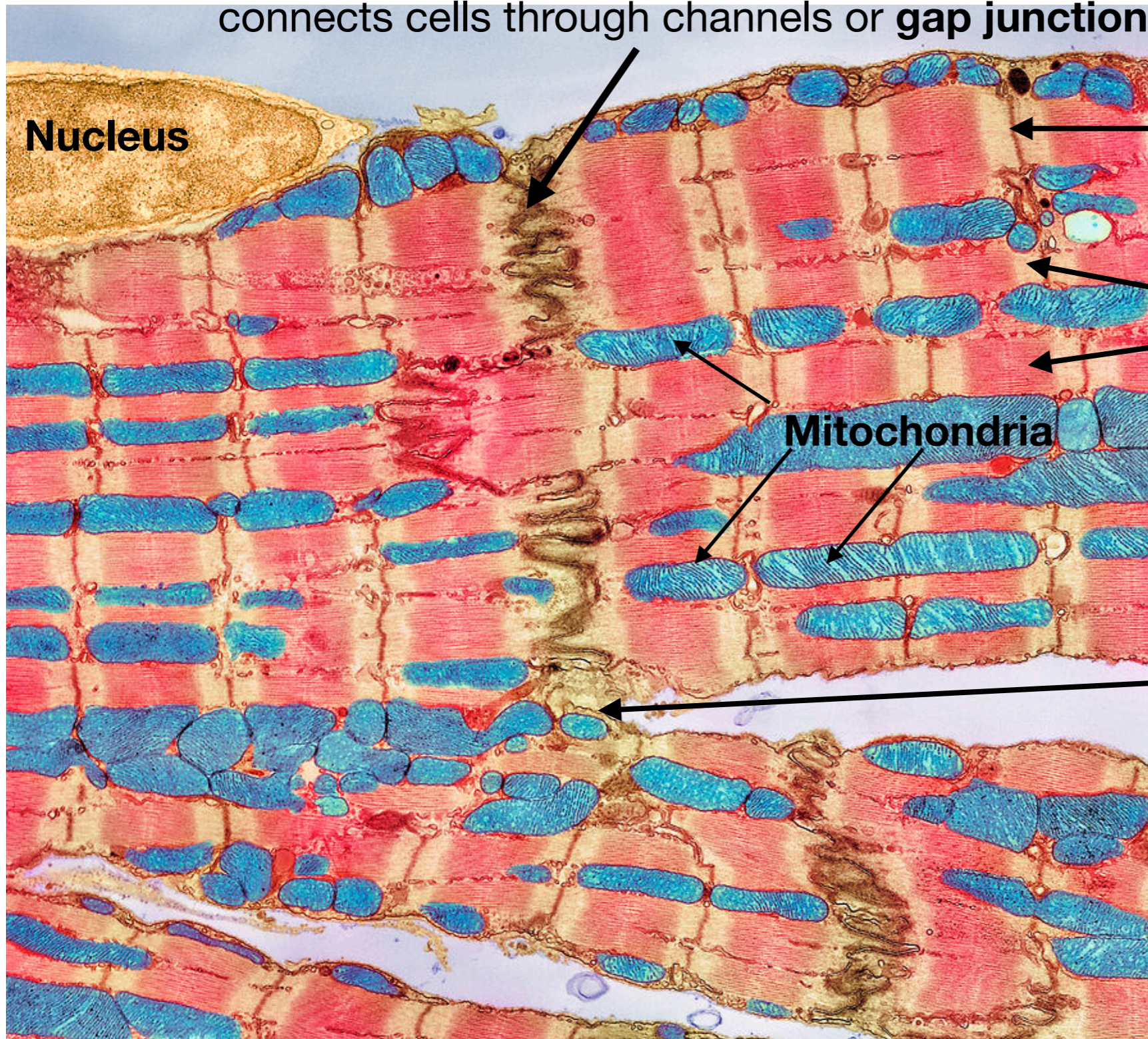
Does the right side of the heart pump a greater volume of blood per minute, a smaller volume, or the same volume as the left?

Heart Beat and Pressure



The Cardiac Myocyte

Double membrane **intercalated disks**
connects cells through channels or **gap junctions**



Nucleus

Z lines give the
striated appearance

Proteins layers
of **actin** and
myosin which
are involved in
muscle
contraction

Mitochondria

Cells can be Y- shaped
to create interconnectedness
between **myofibrils**

Cardiac SARCOMERE CONTRACTION

To be revisited with striated muscle

- Actin protein fibres slides along myosin protein fibres to cause the contraction or shortening of the myofibrils

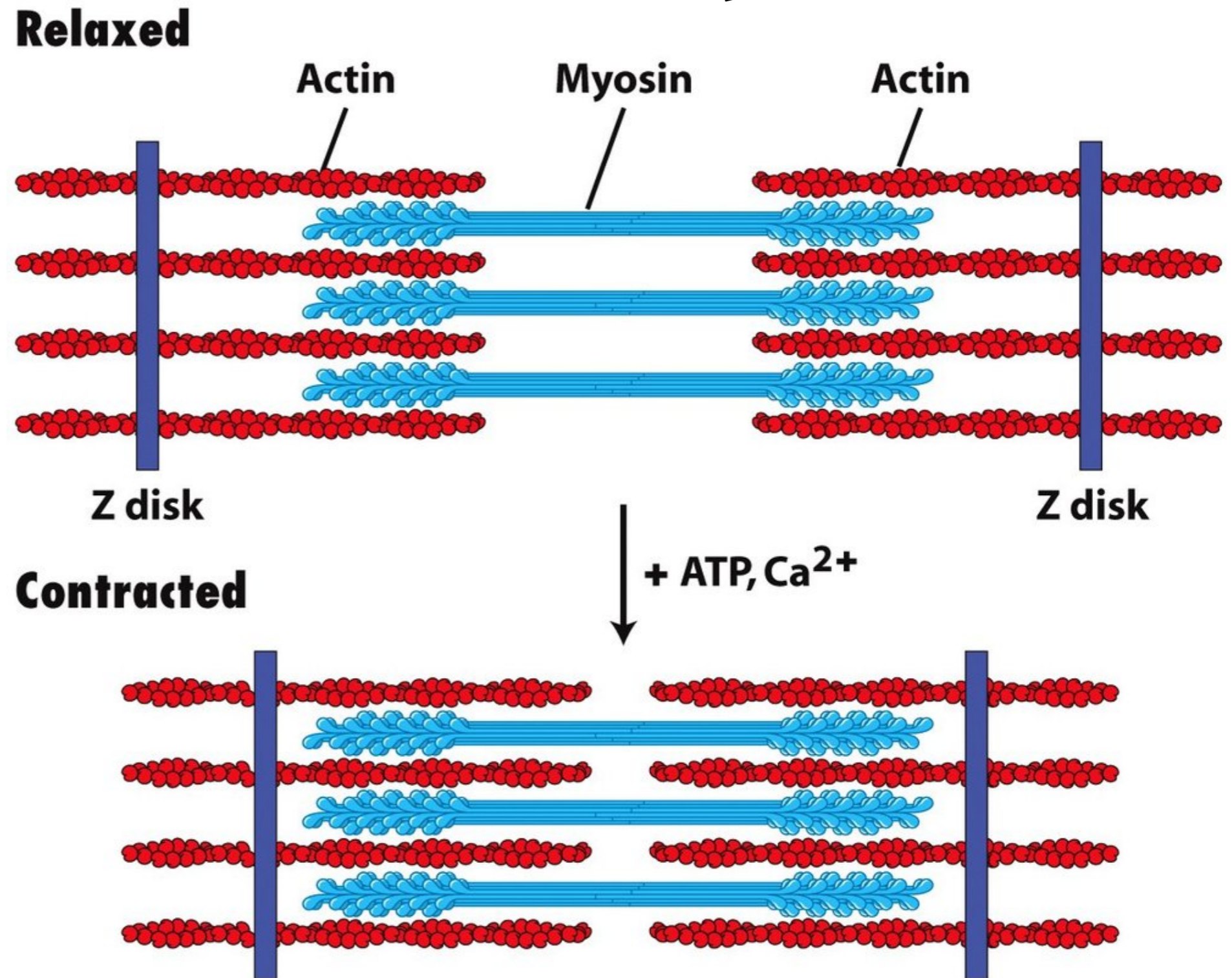
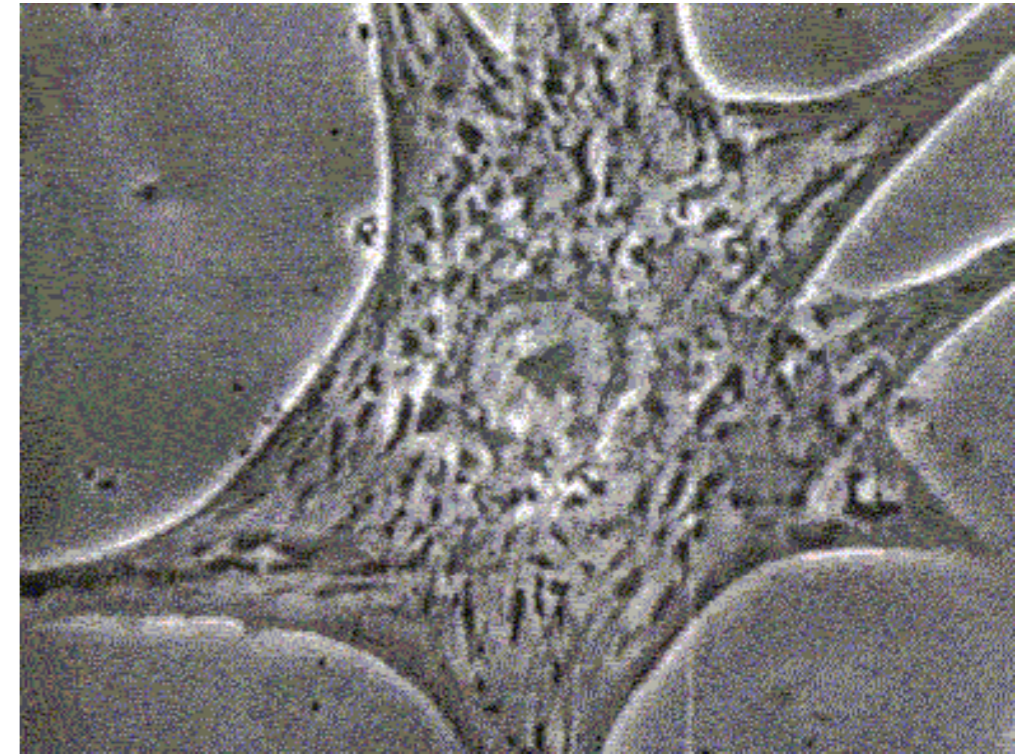


Figure 17-30
Molecular Cell Biology, Sixth Edition
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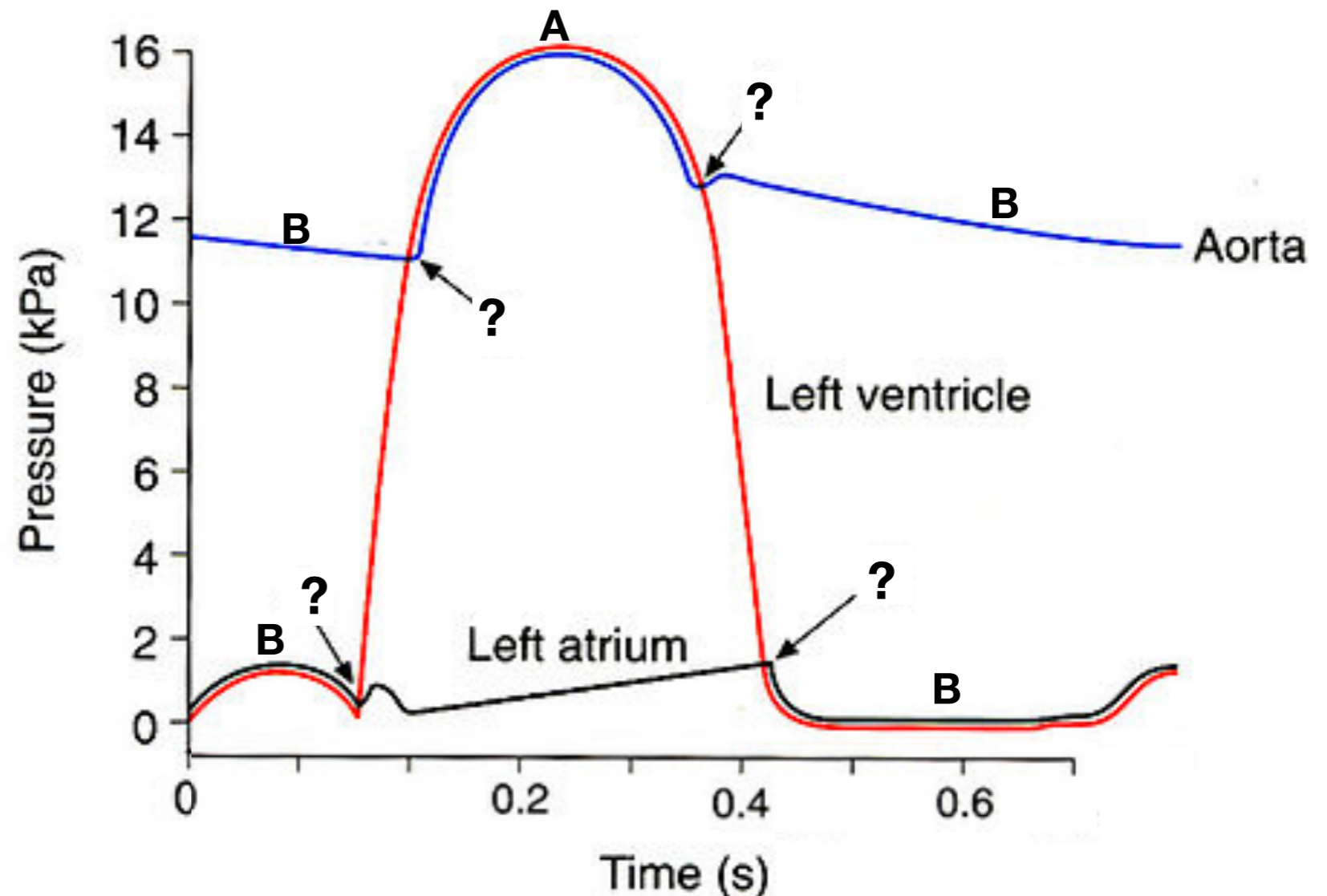
The Sinoatrial Node

- Heart beat is initiated by a group of specialized **myocytes** in the right atrium
- Their contraction is **myogenic** ie. Originates at these heart cells. (No nerve stimulation required)
- a myocyte's membrane **depolarizes** when it contracts and that stimulates adjacent cells to contract
- this causes simultaneous of heart cells



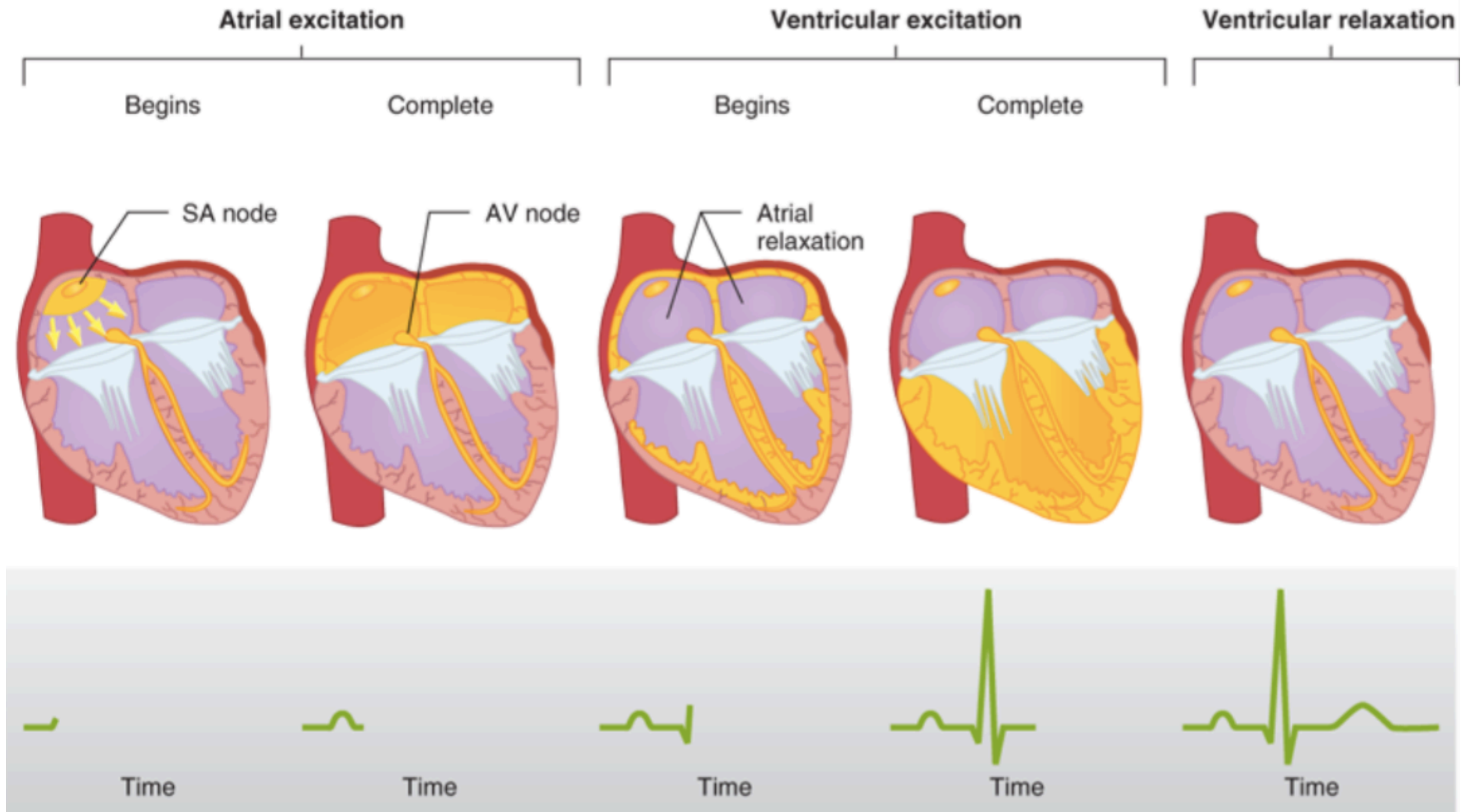
Pressure in the Cardiac Cycle and

- when ventricles contract, pressure increases inside the ventricles (at **A** in the figure) and in the arteries (at **A**)
 - **systolic pressure** (high pressure in the system)
 - when atria contract, pressure is low inside the ventricles (**B**) and in the arteries
 - **diastole pressure** (high pressure in the system)
-
- 0-0.1s atria contracts, AV valve is open.
 - 0.1- 0.15s ventricles begins to contract, semilunar valves closed
 - 0.15-0.4s pressure in ventricles rise until semilunar valves open, pressure in atria rise slowly as blood drains into them from veins
 - 0.4- 0.45s ventricles muscle wanes and pressure drops
 - 0.45 - 0.8s AV valves open and ventricles as ventricular pressure is lower than the atrial pressure



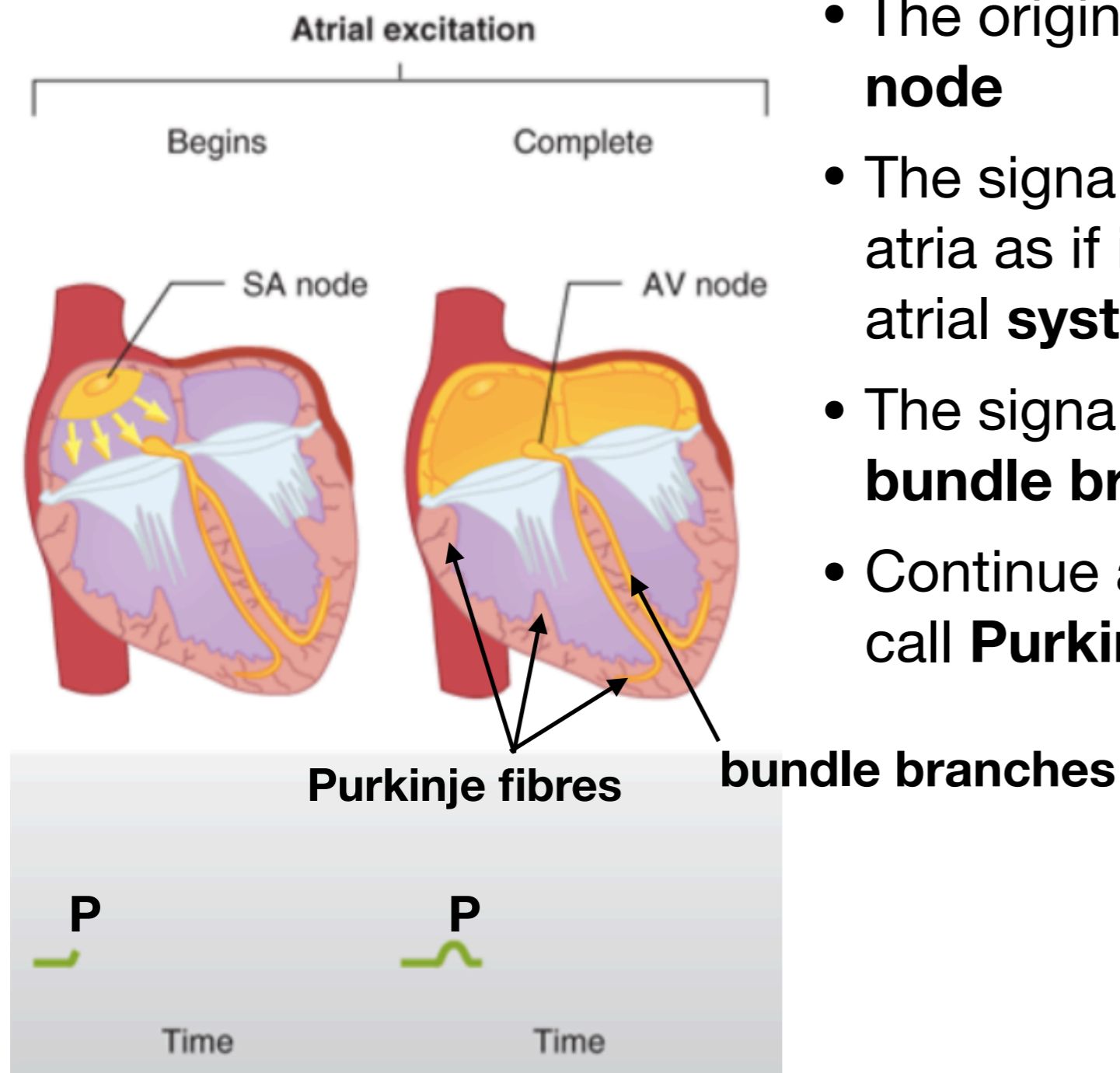
The Sinoatrial Node and Heart beat Progression

- **Signals from the sinoatrial node that cause contraction can't pass directly from atria to ventricles**



The Sinoatrial Node and Heart beat Progression

- **Signals from the sinoatrial node that cause contraction can't pass directly from atria to ventricles**



- The original contraction start at the **SA node**
- The signal spreads rapidly to both atria as if it were one cell (contraction atrial **systole**)
- The signal goes to the **AV node** along **bundle branches** (Delay point)
- Continue along special muscle tissue call **Purkinje fibres**

The Sinoatrial Node and Heart beat Progression

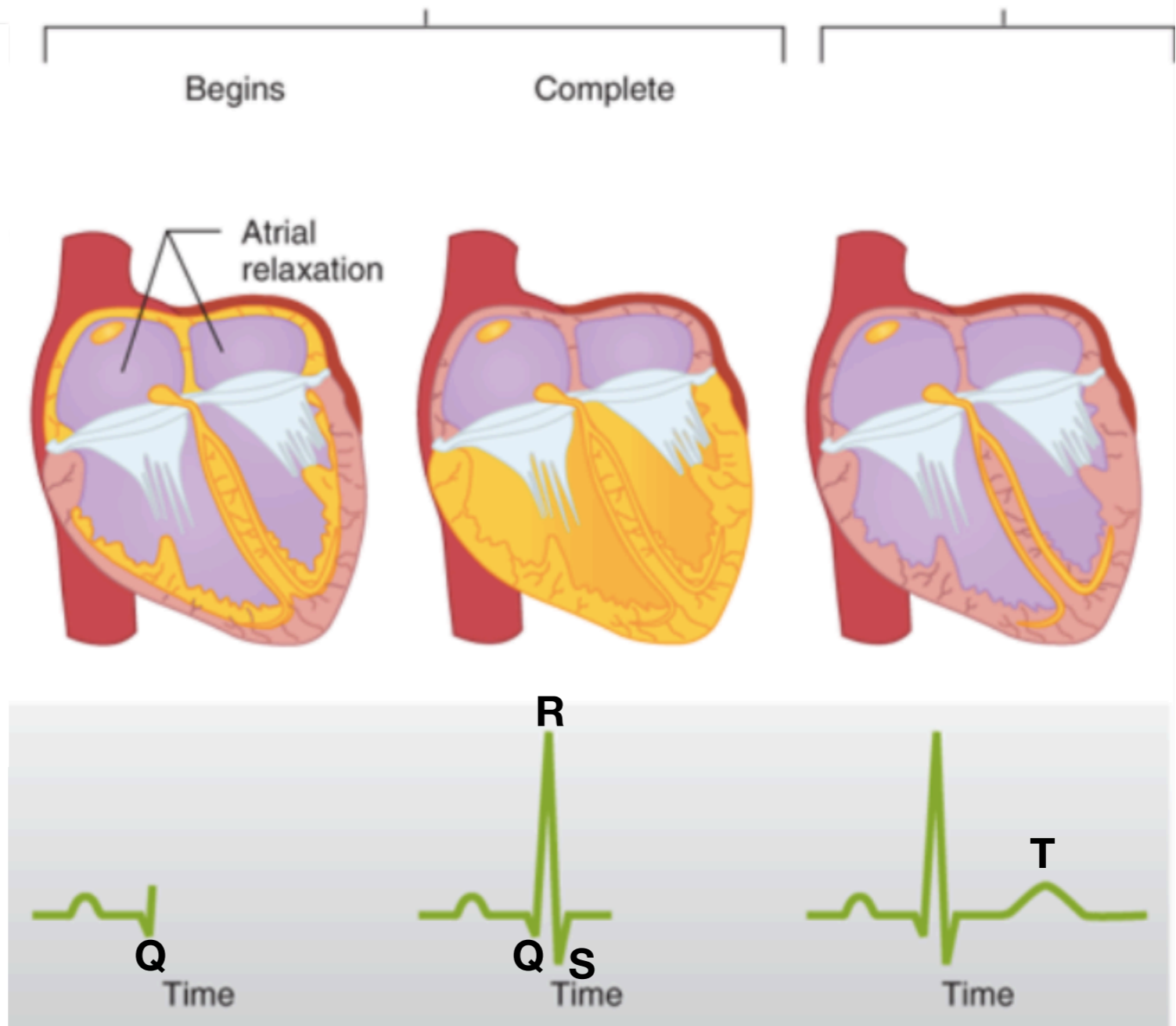
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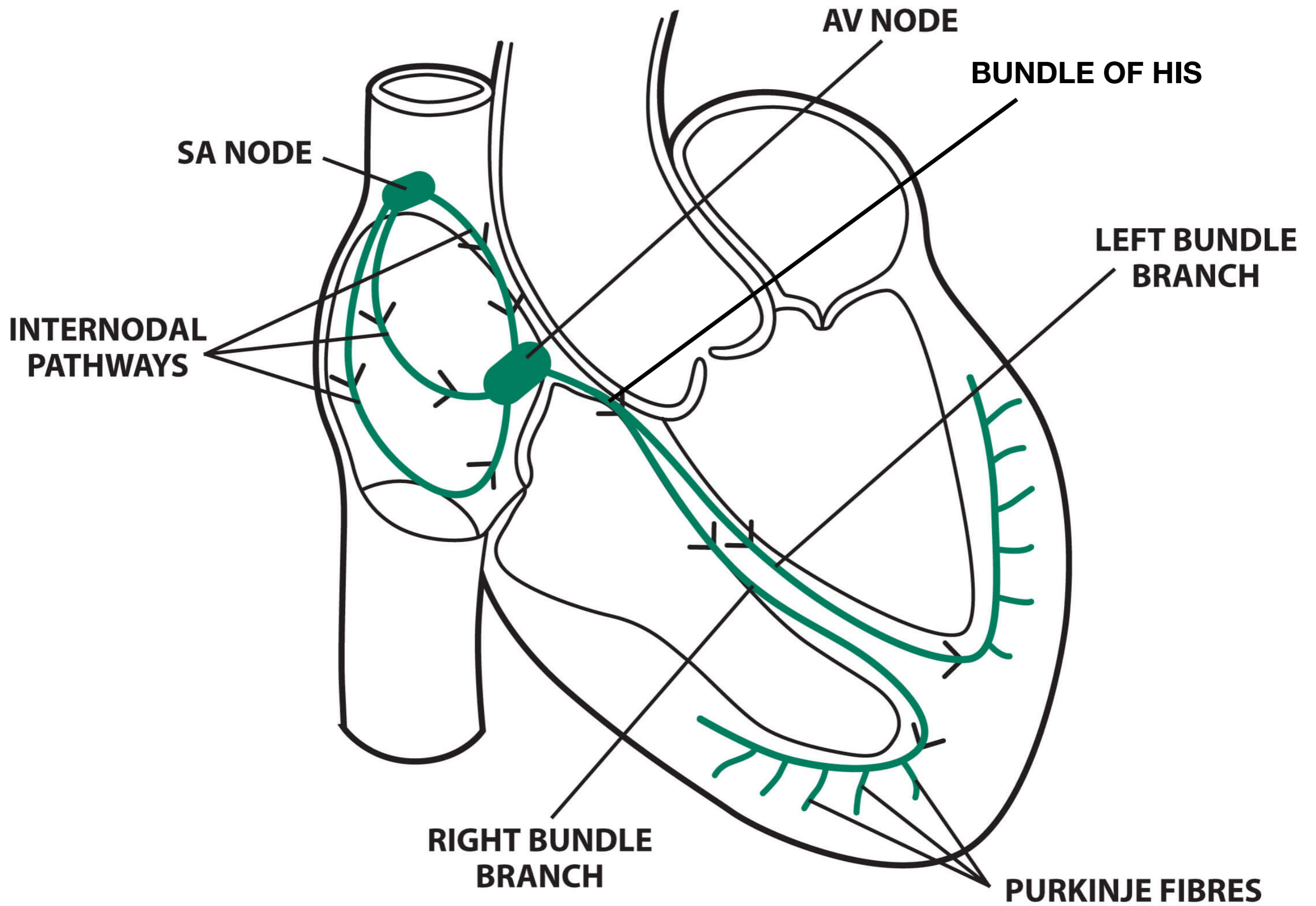
Atrial excitation

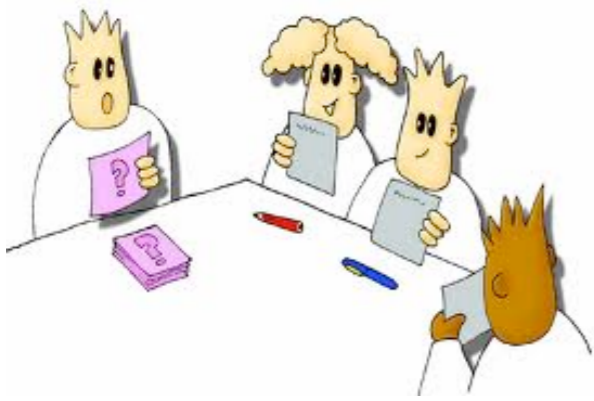
Ventricular excitation

Ventricular relaxation

- **Purkinje fibres** signal the contraction (**systole**) of the ventricles
- The AV valve closes, and opens the semilunar valves
- ventricles empty semilunar closes
- when ventricles begins relaxing (**diastole**) AV valves open and all 4 chambers are filling





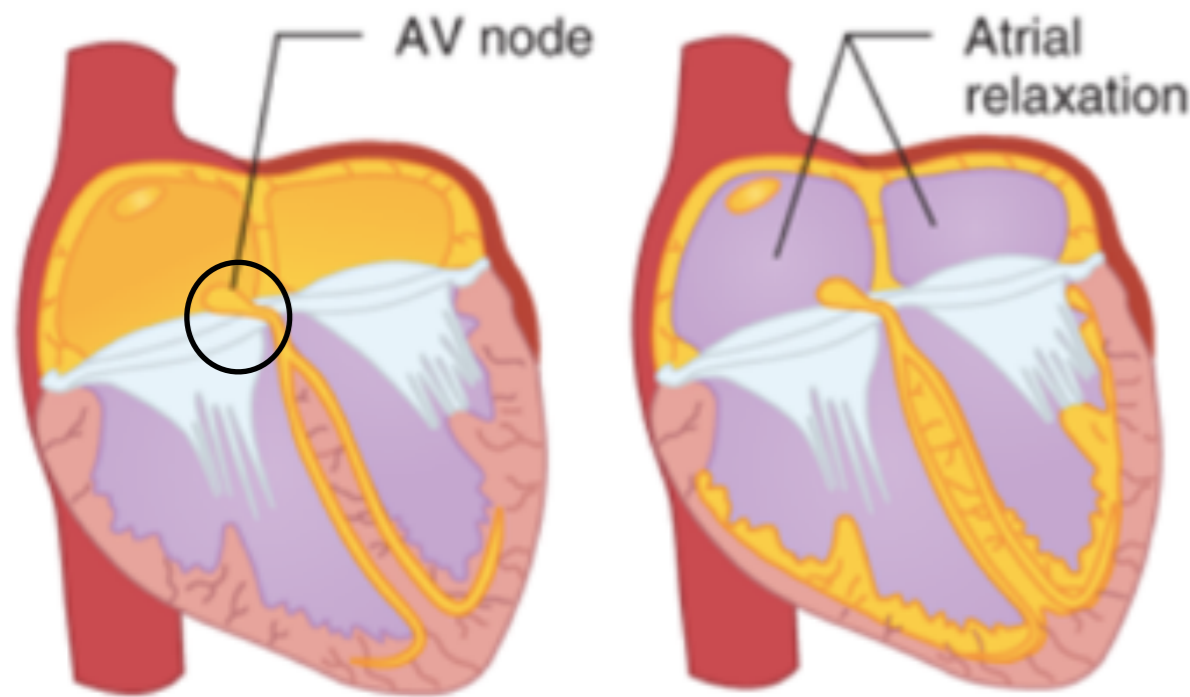


Place the following events in the correct order

- A. The signal travels along the **Purkinje fibres**
- B. The semilunar valves close
- C. The **AV Node** signals
- D. The signal travels through the atrium
- E. The AV valves close
- F. The signal travel the bundle branches
- G. The Ventricles relax
- H. The **AV valves** open
- I. The ventricles contract
- J. The atrium contract
- K. The **SA node** signals
- L. The semilunar valves open

The Sinoatrial Node and Heart beat Progression

- There is a delay in the arrival and passing on of a signal at the atrioventricular node

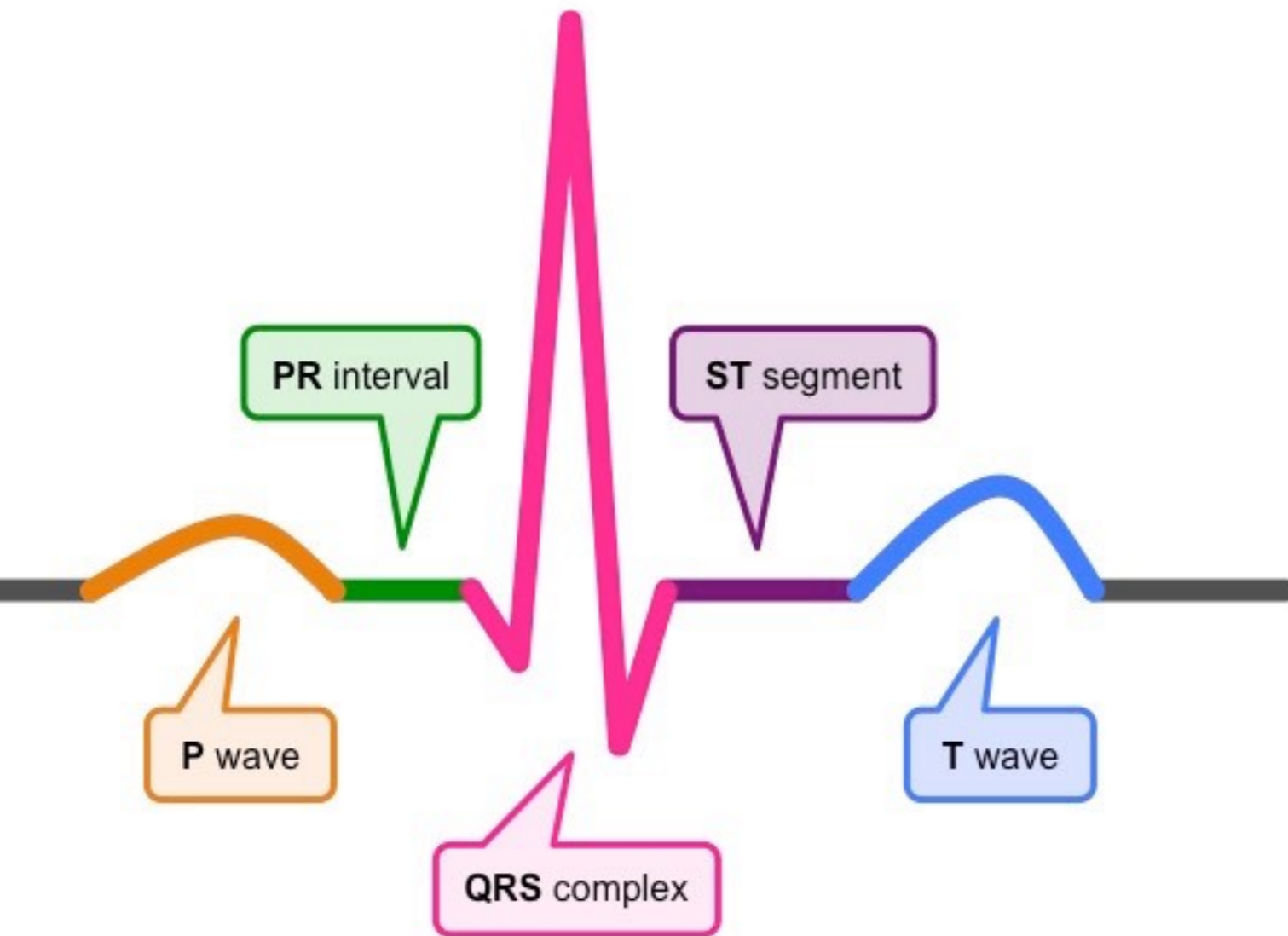


- Atrial contraction and ventricular contraction are staggered as a result of AV node delay.
- approx 0.12s
- AV node cells are smaller and conduct slower
- Few gap junctions between the cells
- more non conductive tissue
- few Na⁺ channel proteins which are involved in signalling transfer between cells
- **THIS DELAY** allows time for the AV valves to snap closed. Ensuring full ventricles and blood flow

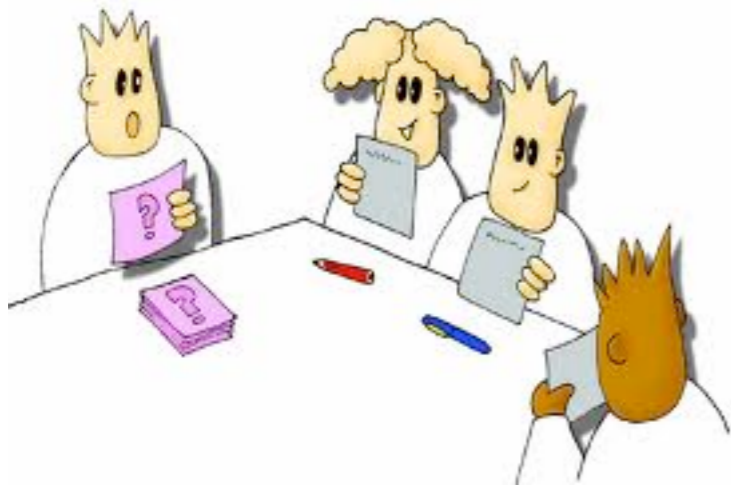


delay in atria and ventricle contraction

THE ECG



- **P wave** represents depolarisation of the atria (i.e. atrial contraction)
- The **QRS complex** represents depolarisation of the ventricles (i.e. ventricular contraction)
- The **T wave** represents repolarisation of the ventricles (i.e. ventricular relaxation)
- Between these periods of electrical activity are intervals allowing for blood flow
 - *PR interval* -blood into ventricles
 - *ST segment* blood flowing into arteries



What part of the ECG is represented by...

The AV valves are open and blood enters the ventricles?

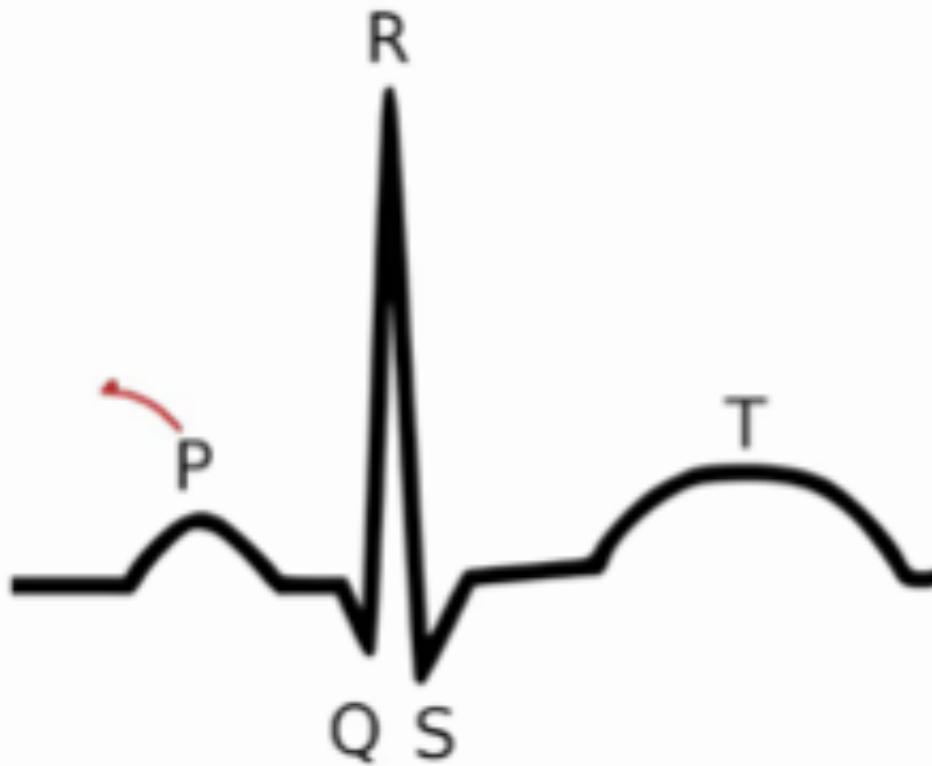
The delay between signalling at the AV node?

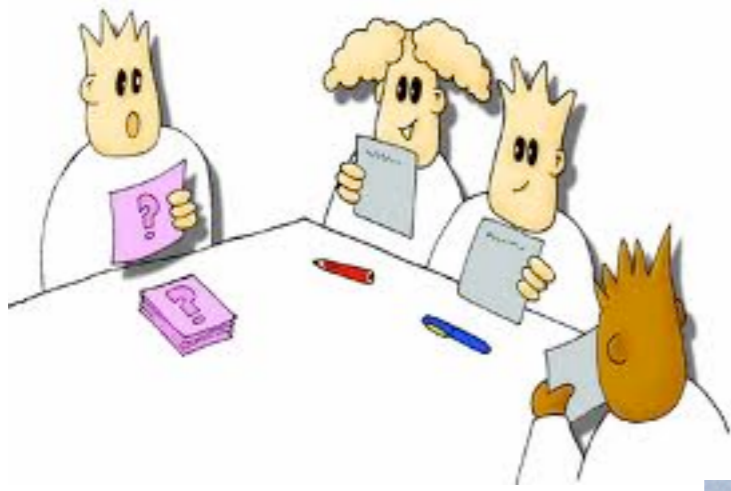
The Ventricles in low pressure or Diastole?

The Greatest pressure in the ventricles?

The SA node signals?

The Atrioventricular valves close shut?





IDENTIFY THE PARTS AND THE FUNCTION

