Lec5\ Cardiac Anatomy & Physiology

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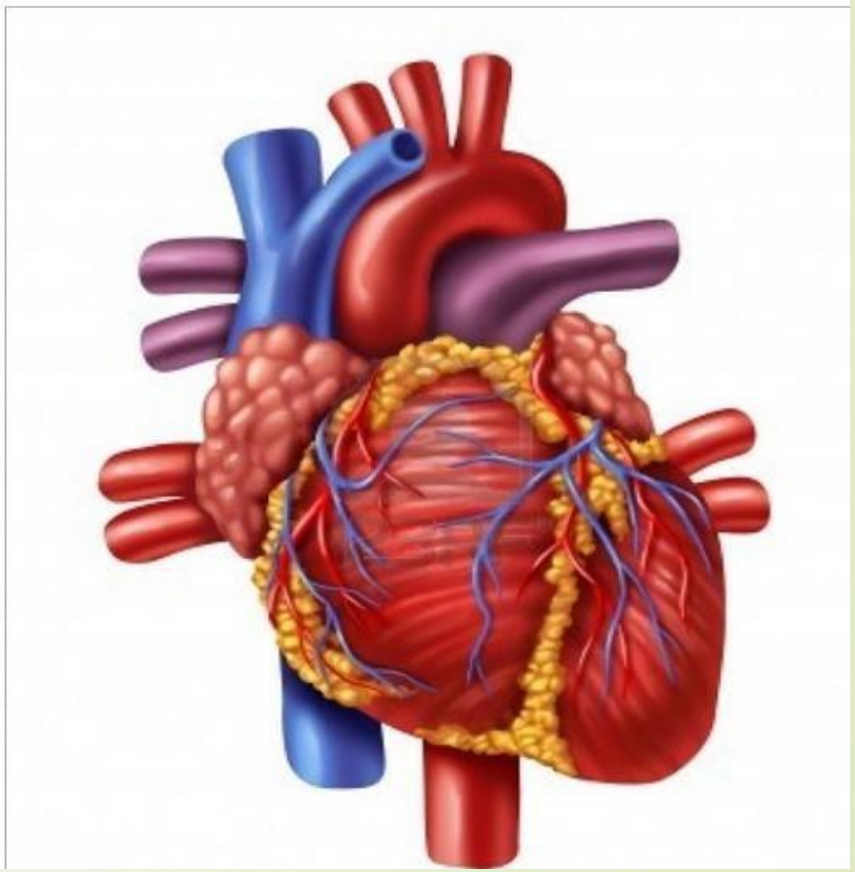


Circulatory System الجهاز الدوران

The heart is a hollow muscular organ made of specialised cells that allow it to act as a pump within the circulatory system

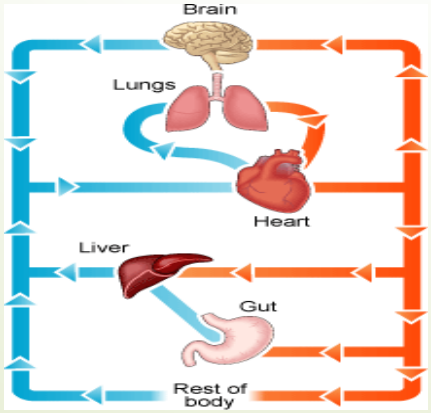
Cardiovascular and **lymphatic systems** make up the **circulatory system** a vast network of organs and vessels responsible for the flow of:

- **Blood**
- **Nutrients**
- **Hormones**
- **Oxygen and other gases**

To and from the Cells of the body

The Lymphatic system

- Lymph
- Lymph nodes
- Lymph vessels



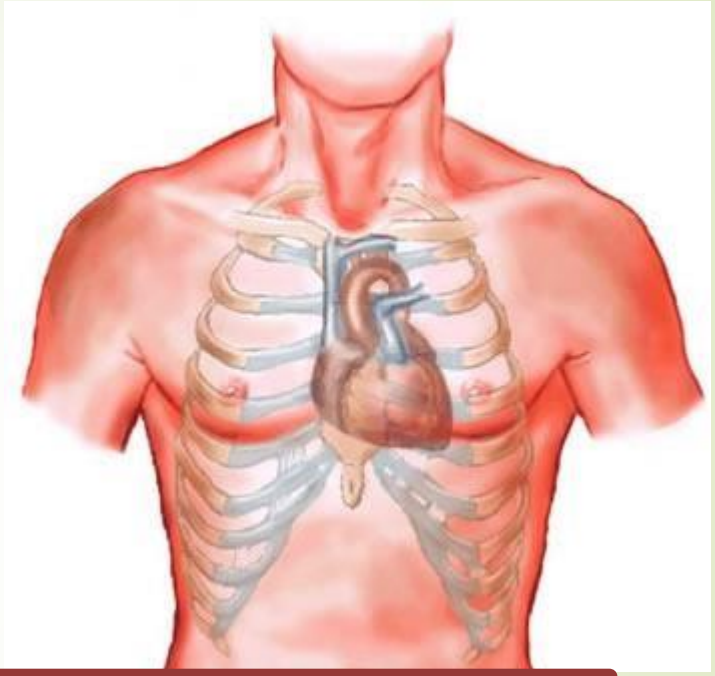
The Cardiovascular system

- Blood
- Blood vessels
- Heart

The Heart

The Heart is:

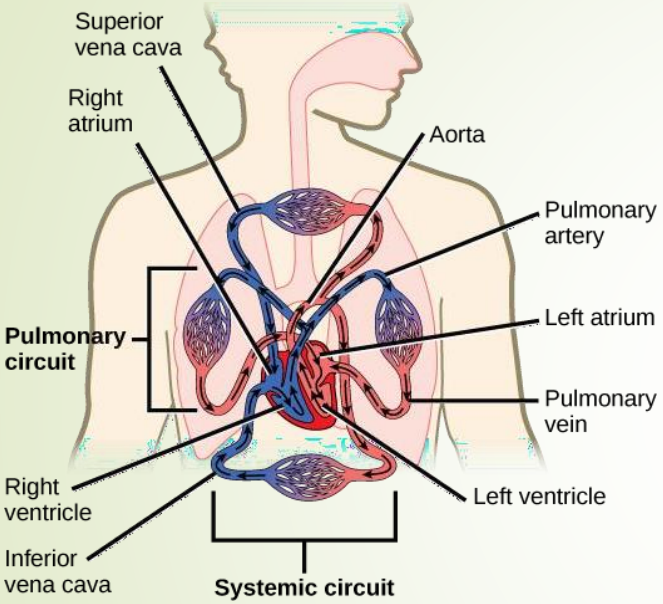
- Located between the lungs in the centre and to the left of the midline
- It is cone shaped and about the size of your own clenched fist
- Can never stop pumping



Primary Function is to drive blood through the cardiovascular system delivering :

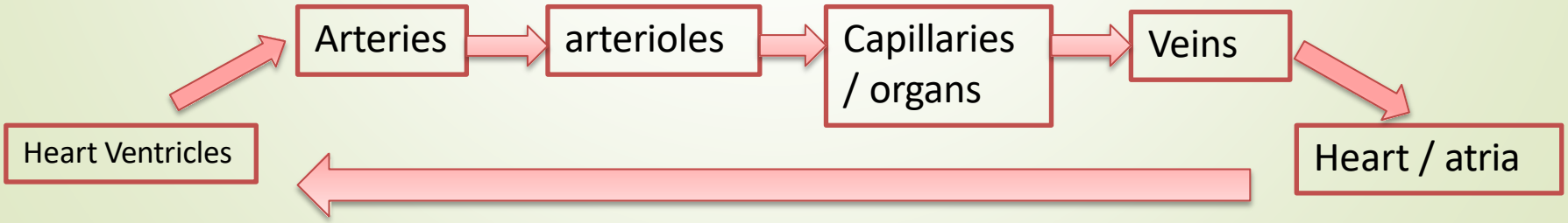
- Oxygenated blood to the tissues and organs of the body sufficient for their metabolic needs
- Deoxygenated blood to the lungs for gaseous exchange

Cardiovascular system



The average human adult has **4-6 litres** of blood repeatedly cycled throughout the body in a closed circulatory system.

It is called a closed system because the blood is contained within the heart and blood vessels at all time and blood always flows in a forward direction.



Structures

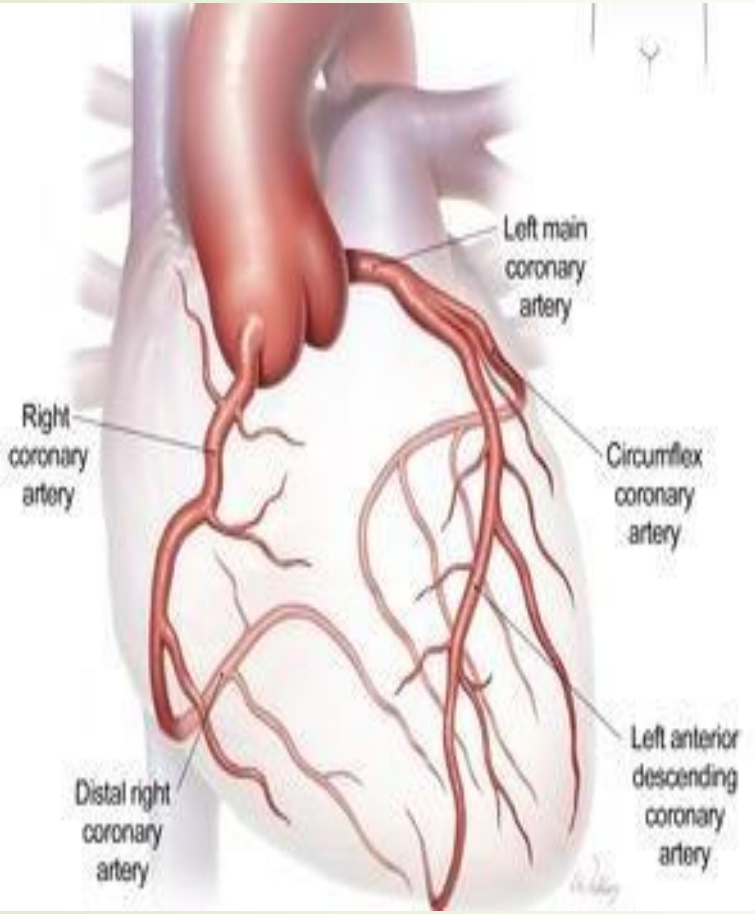
- Human heart is divided into 4 chambers
- 2 Atria and 2 Ventricles – these are hollow
- chambers which receive blood ,They are surrounded by myocardial cells which are able to relax and contract

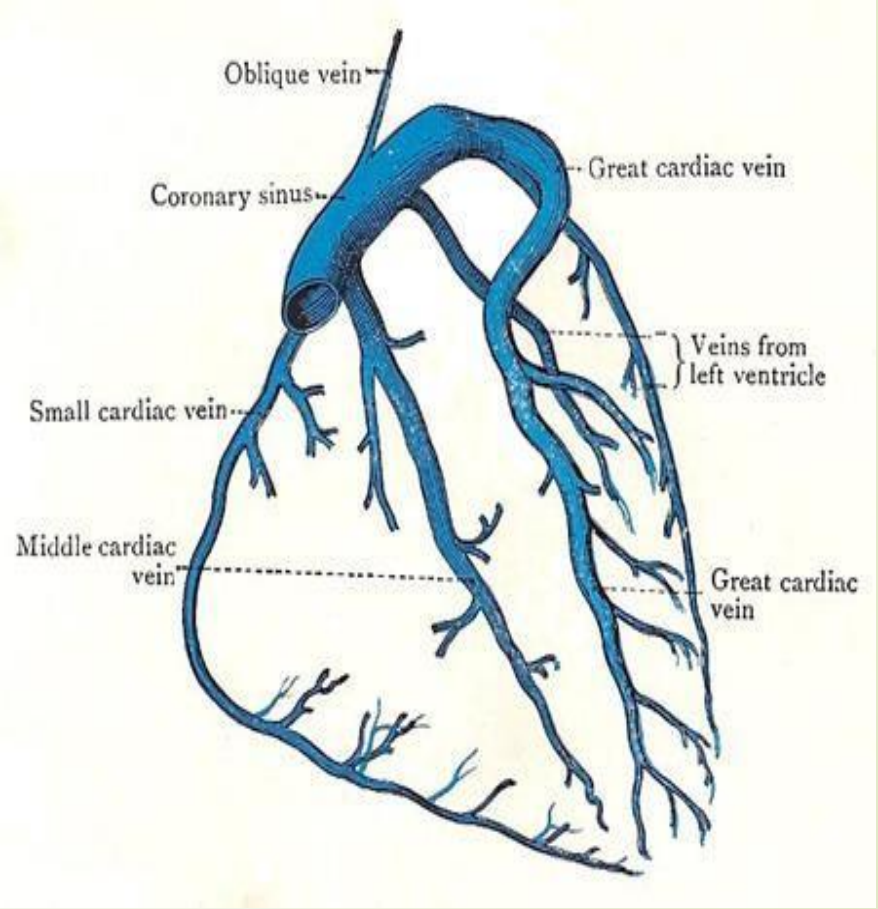
The cardiovascular system consists of circuits:

- Pulmonary circuit provides blood flow between the heart and lungs
- Systemic circuit allows blood to flow to and from the rest of the body
- Coronary circuit provides blood to the heart

- The heart valves ensure that blood flows in one direction through the system

Coronary Circuit





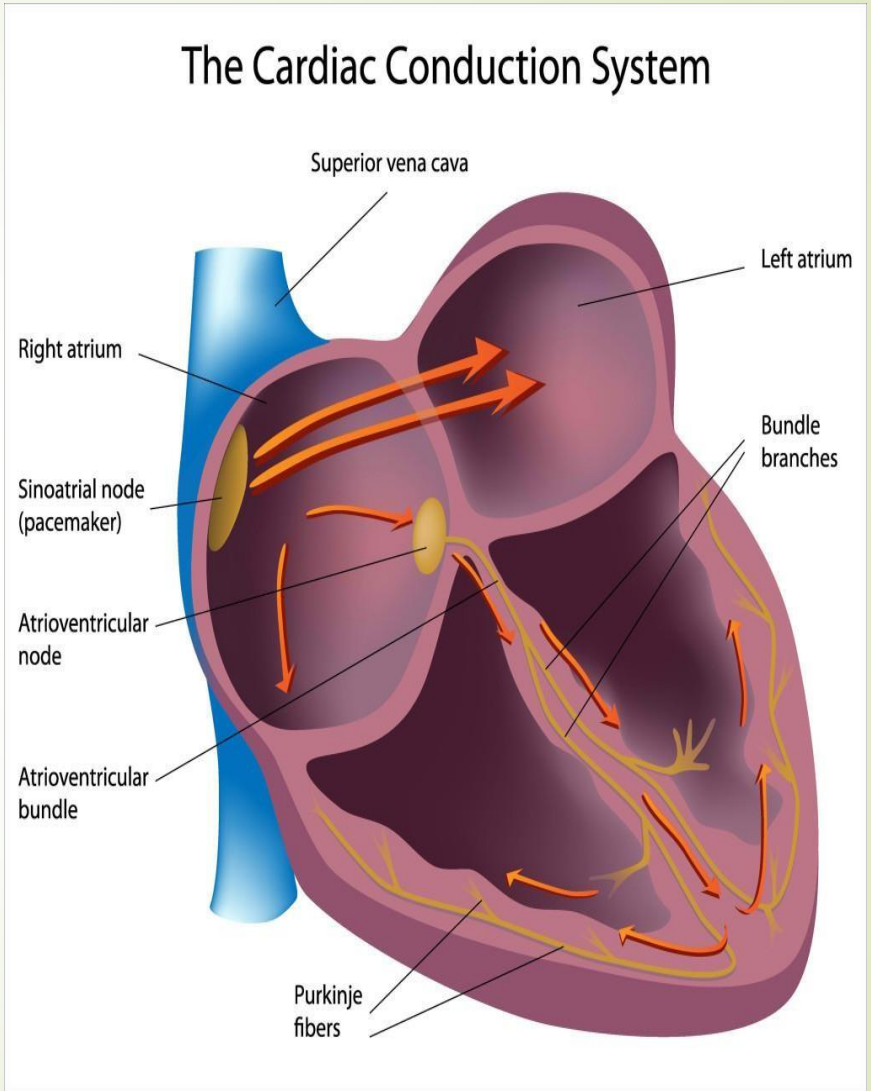
Conduction system

There are 2 basic types of cardiac cell (Myocytes)

- **Myocardial cells**
  contractile
  respond to an electrical impulse and contract

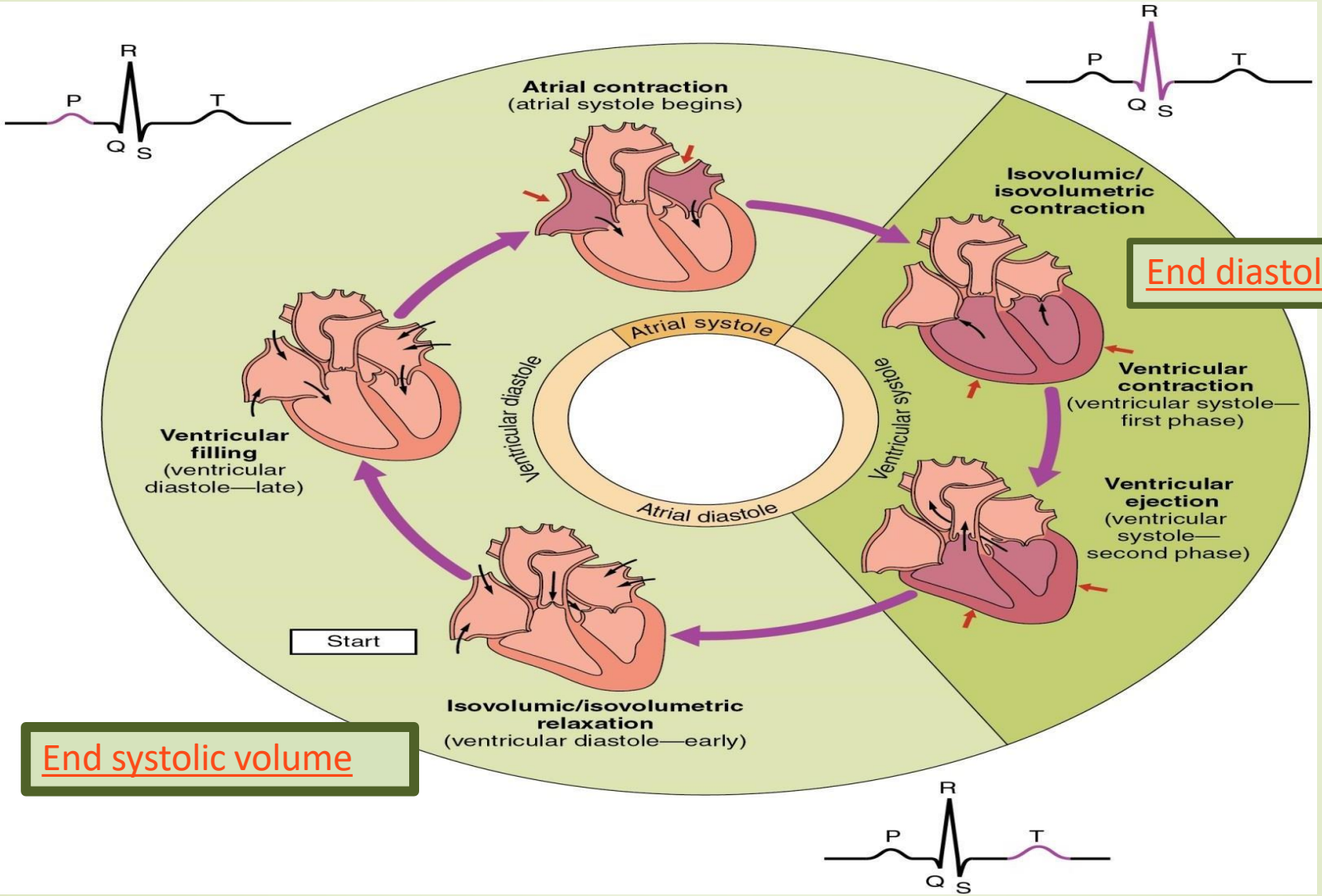
- **Specialised cells**
  the conduction system generates electrical impulses and transmits them through the myocardium

Site of electrical impulse generation	Rate of impulse generation / min
SA node	60 - 100
AV node	40 - 60
Ventricles	< 40



The Cardiac Cycle

Contraction of a chamber = **Systole**
Relaxation of a chamber = **Diastole**

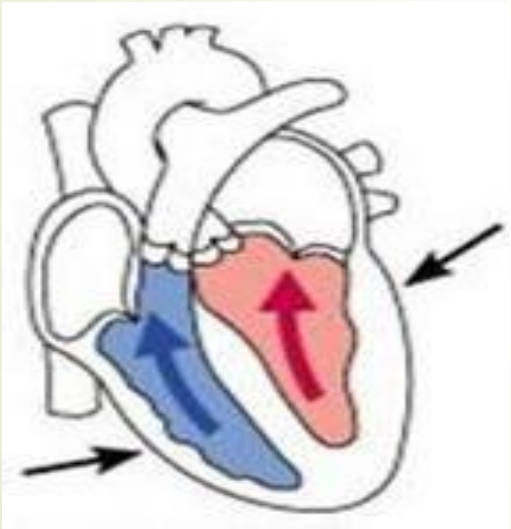


End diastolic volume

End systolic volume

Introduction of Key Terms

End Diastolic Volume = amount of blood in the ventricles at the end of filling / diastole



End Systolic volume = amount of blood In the ventricles at the end of contraction / systole

The ventricles never completely empty

Stroke Volume حجم الضربية = The amount of blood pumped out of the ventricles per beat / contraction (approx 70mls in a healthy adult male

EDV – ESV = SV

Introduction of Key Terms

Cardiac Output (CO)

Amount of blood ejected by the heart per minute = cardiac output (CO)

In a healthy resting adult CO = approx 5-6 litres

CO = Heart Rate x Stroke volume

Ejection fraction is a measurement of the percentage of blood leaving your heart each time it contracts.
Usually measured with imaging e.g. ECHO / cardiac catheterisation / MRI.

Cardiac output and Ejection fraction are important indicators of how efficiently the heart can meet the demands of the body