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# Chapter 3

## Cardiac Activity

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# **Introduction**

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**Main organ: Heart (Cardia)**

**Blood pumping by artery, arterioles and veins**

**Cardiac versus cardiovascular system**

**Electrical signal (ECG) is the cause, pumping is the result**

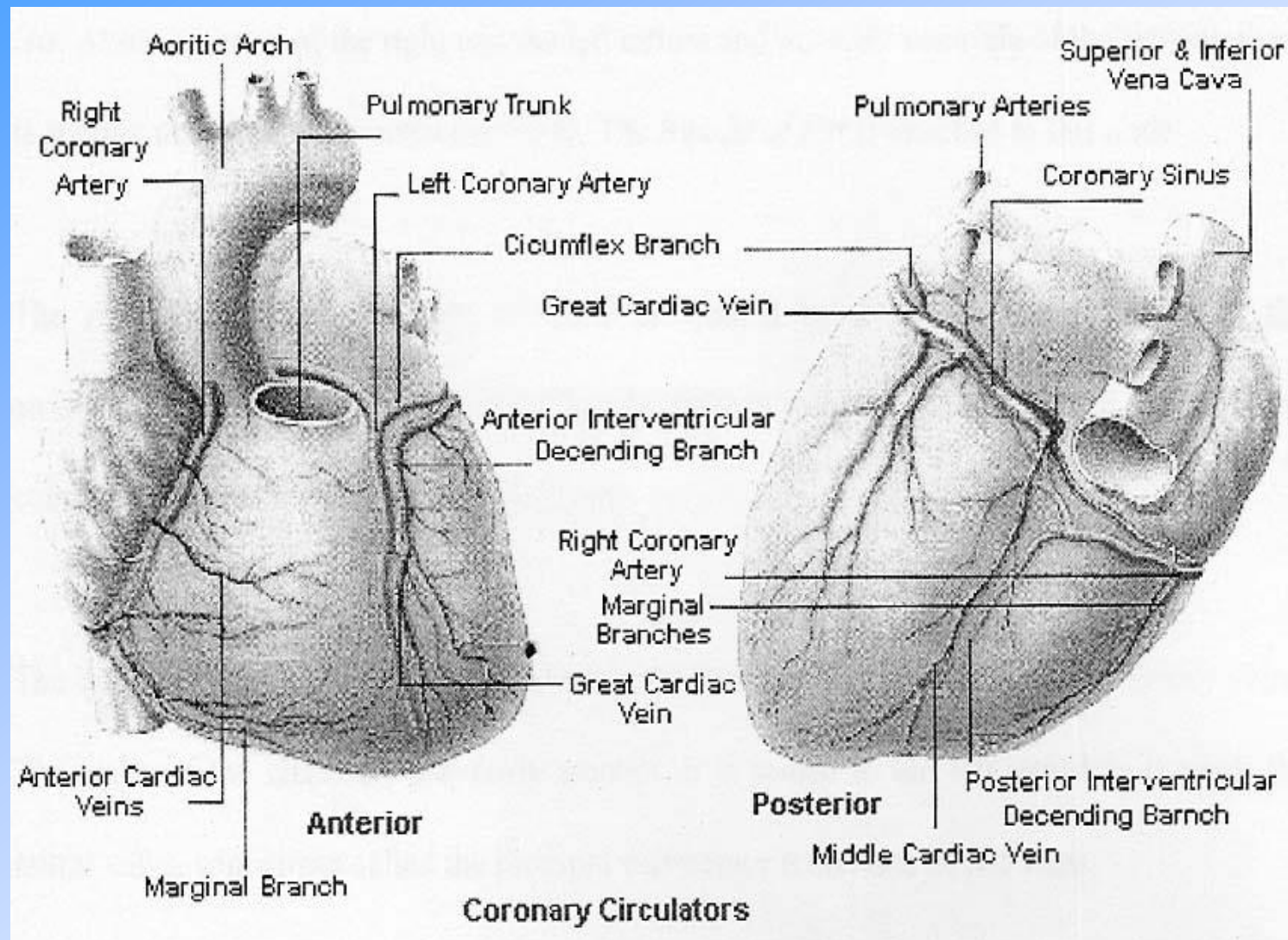
# Heart

**Muscular organ, located in thoracic cavity**

**4 chambers  
2 atria and 2 ventricles**

**pumps blood to and from the body**

**Left side thicker**



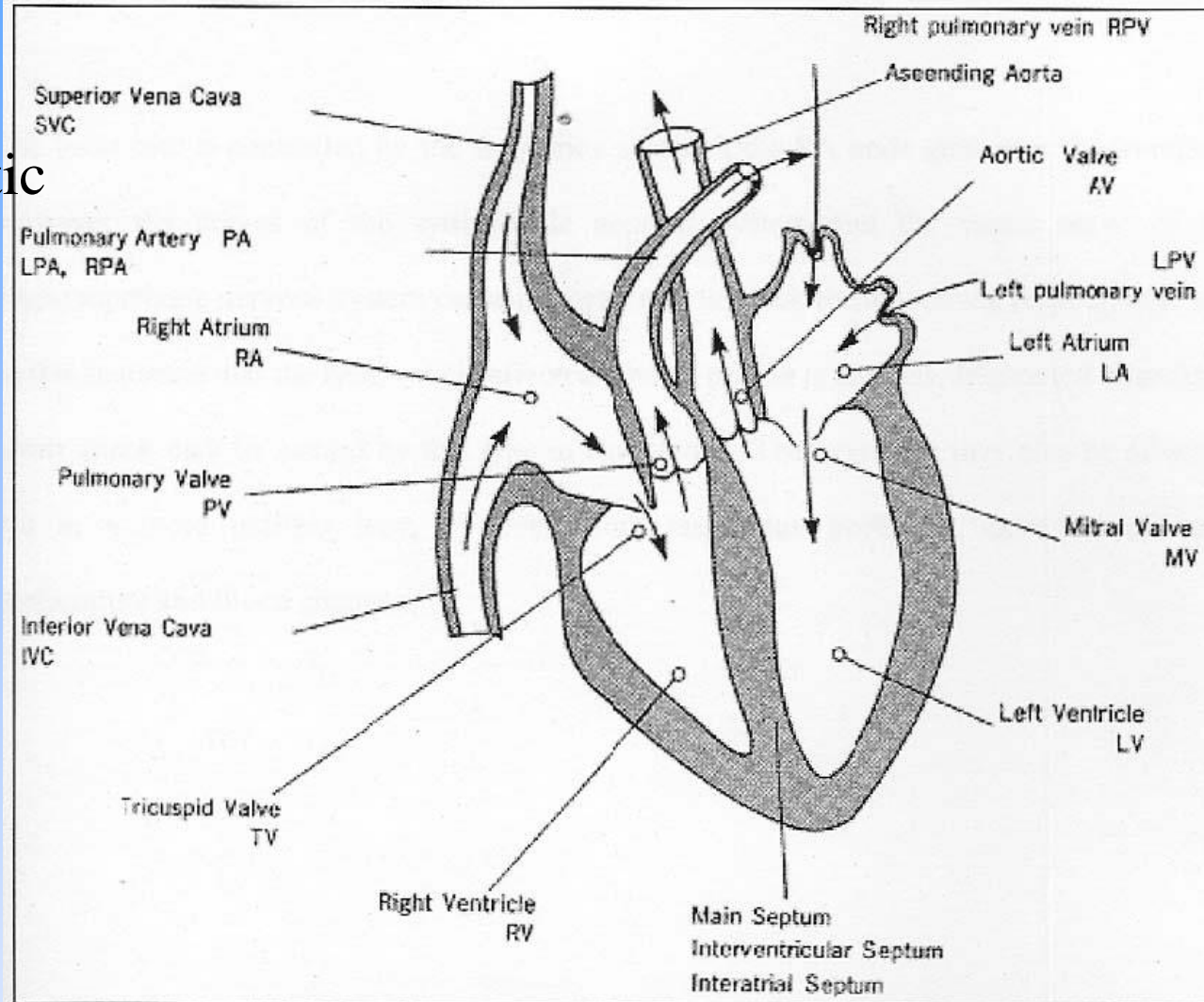
# Blood Conduction

## 4 main valves:

Tricuspid, Pulmonary,  
Mitral (bicuspid), aortic

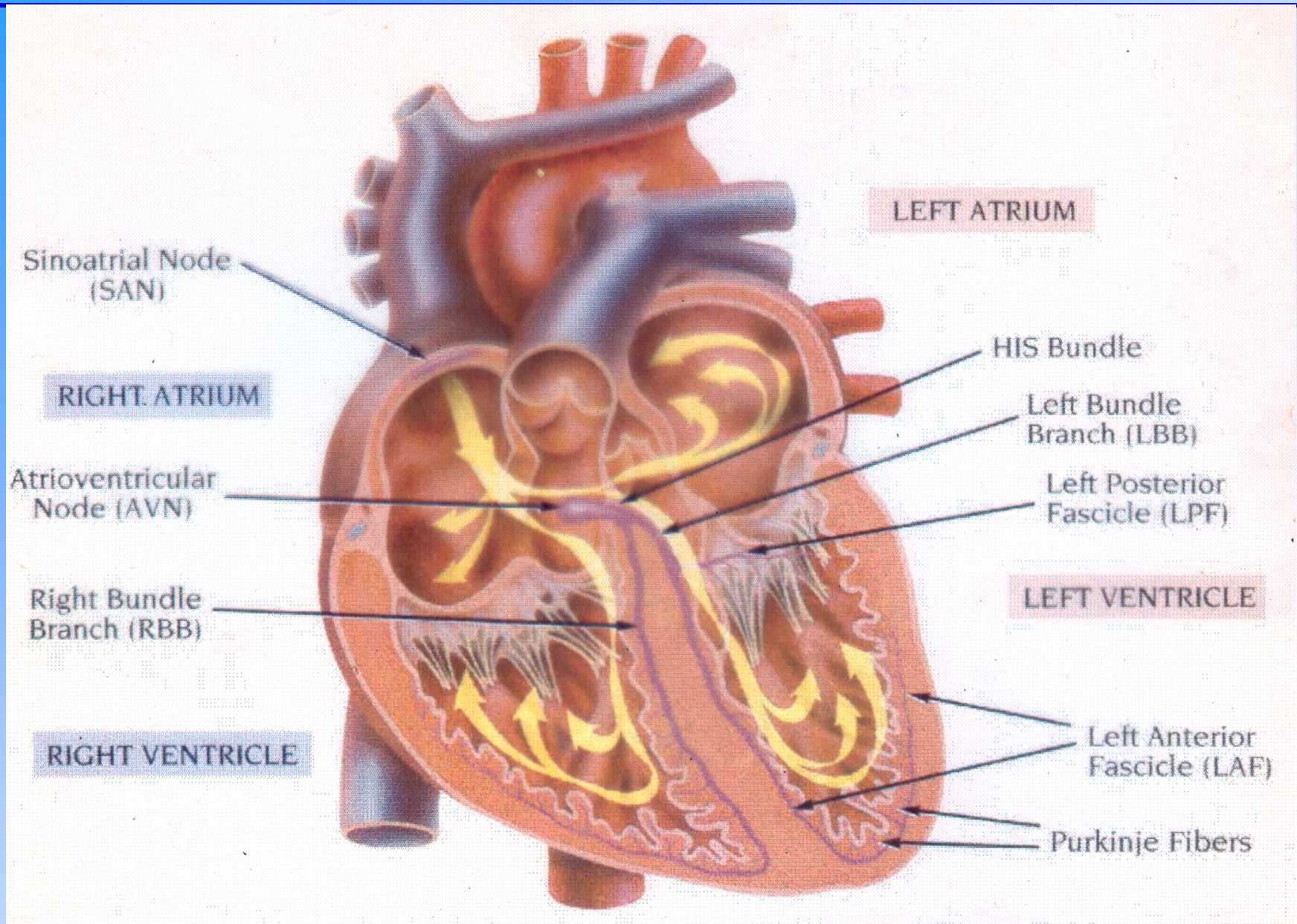
Normally one-way

Artery: from heart  
Vein: to heart





# Electrical Conduction



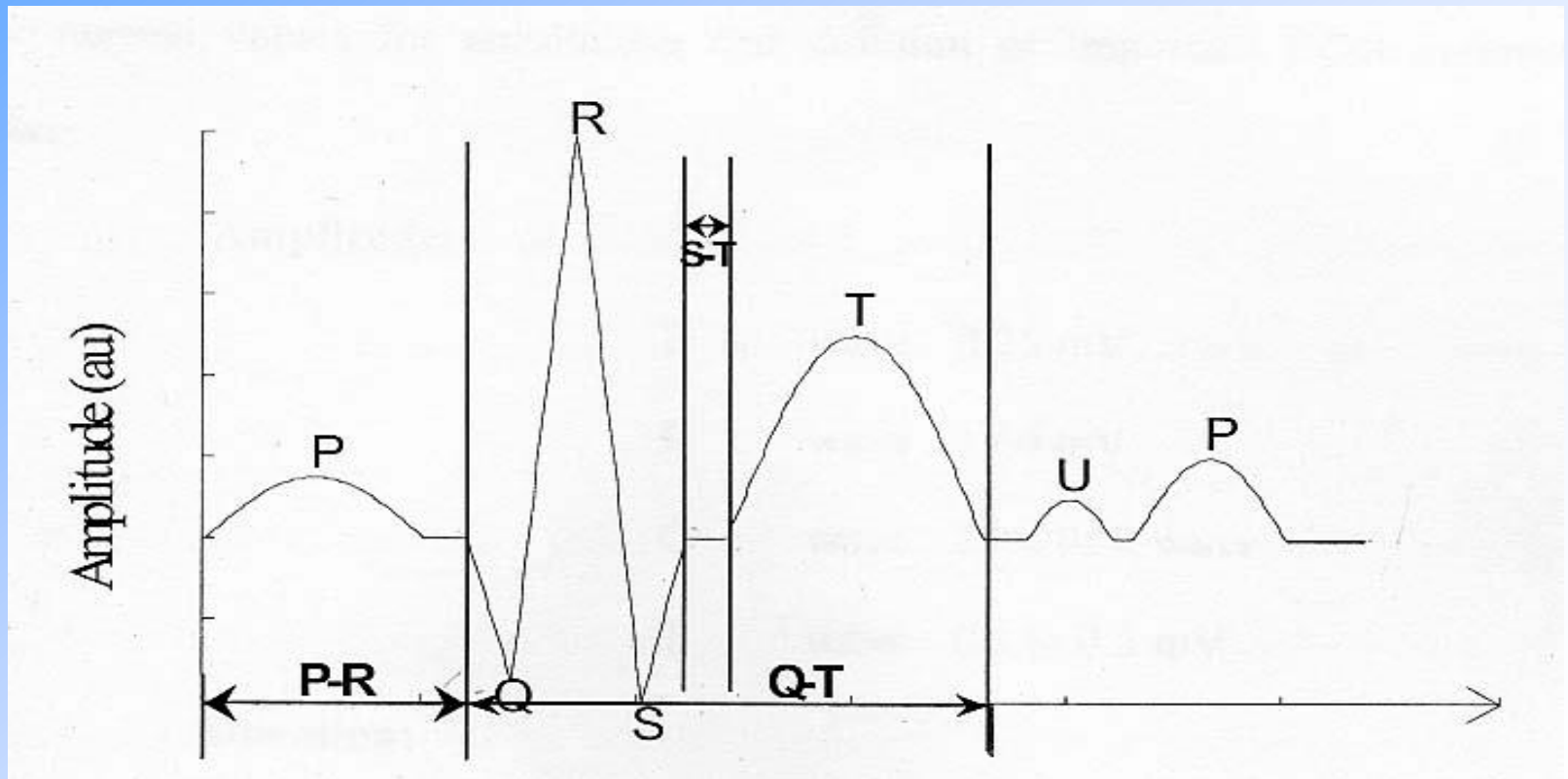


# Electrocardiogram

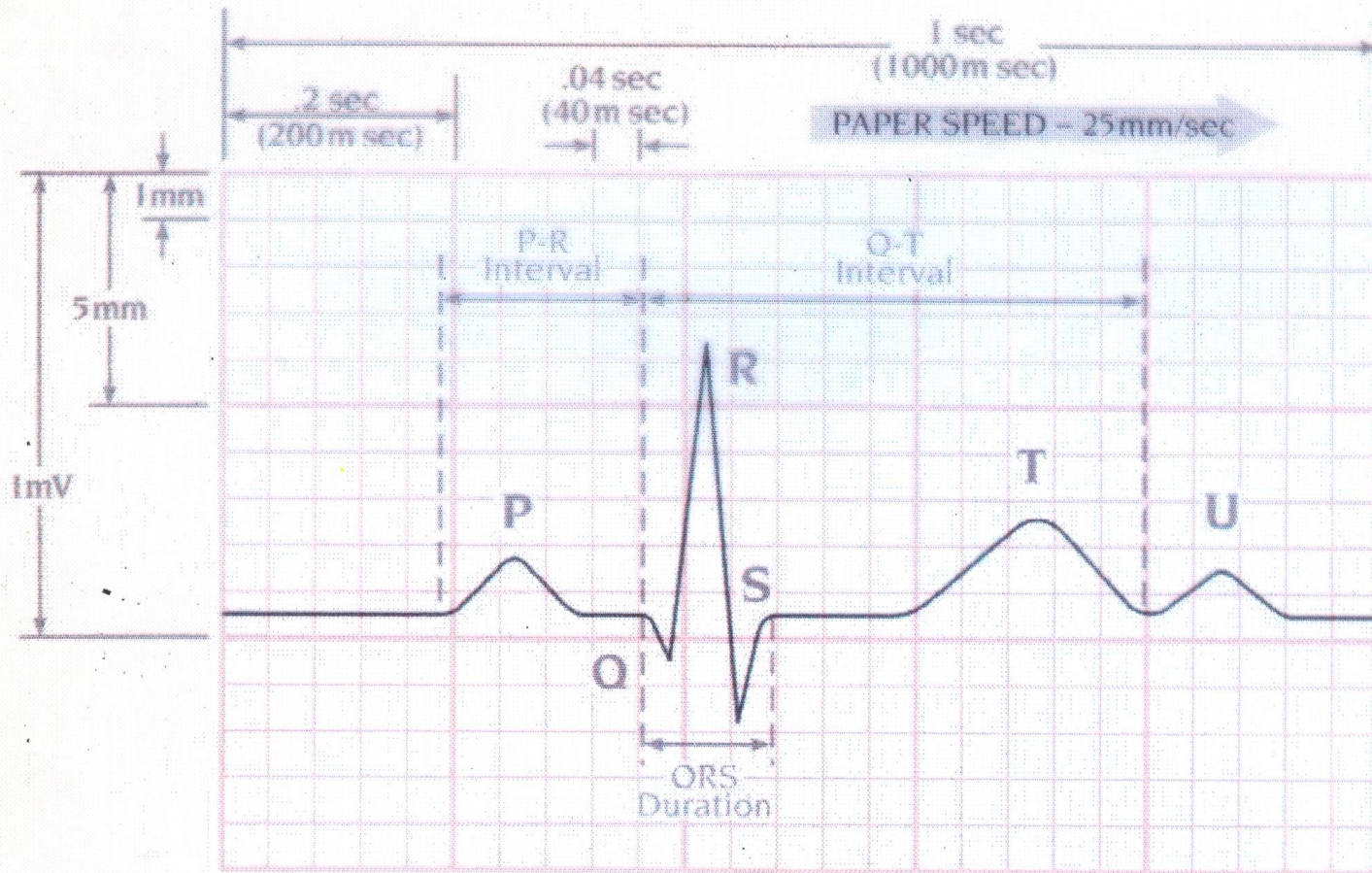
## Cardiac Electrical Activity

Depolarization and repolarization of cardiac muscles

Consists of waves, intervals and segments



# Electrocardiogram



## VERTICAL AXIS

1 Small Square = 1mm (0.1mV)  
 1 Large Square = 5mm (0.5mV)  
 2 Large Squares = 1mV

## HORIZONTAL AXIS

1 Small Square = .04 sec (40 m sec)  
 1 Large Square = .2 sec (200 m sec)  
 5 Large Squares = 1 sec (1000 m sec)

# ECG Parameters

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## Waves

P wave: depolarization of the atrial muscle

QRS complex: repolarization of the atria & depolarization of the ventricles

T wave: ventricular repolarization

U wave: if present, after-potential in the ventricular muscle

## Intervals

P-Q: delay of excitation in the fibers near the AV node

P-R: start of the P wave to the start of the QRS complex  
(time for depolarization to pass from the SA node via the atria, AV node and His-Purkinje system to the ventricles)

Q-T: start of the QRS complex to the end of the T wave  
(time taken to depolarize and repolarize the ventricles)

S-T: end of QRS complex to start of the T wave  
(all cells are normally depolarized during this phase)



# ECG Parameters

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## Normal values of ECG:

Heart rate	120 bpm
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## Amplitudes:

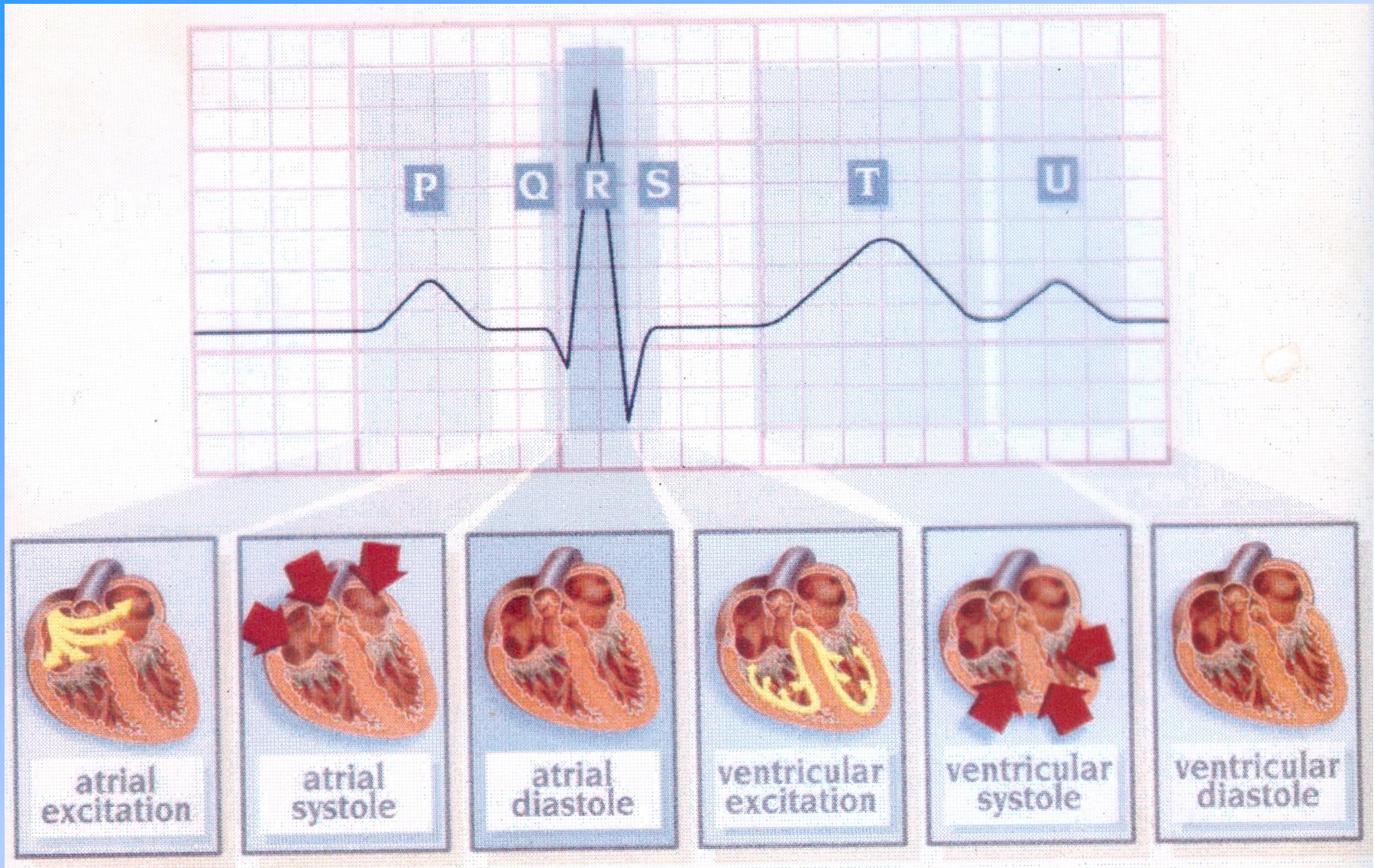
P wave	0.25 mV
R wave	1.60 mV
Q wave	25% of R wave
T wave	0.1 to 0.5 mV

## Durations:

P-R interval	0.12 to 0.20 sec
Q-T interval	0.35 to 0.44 sec
S-T interval	0.05 to 0.15 sec
P wave interval	0.11 sec
QRS interval	0.09 sec



# ECG and Blood Pumping





# Cardiac Cycle

## Two Phases:

Systole: Ventricular  
Contraction

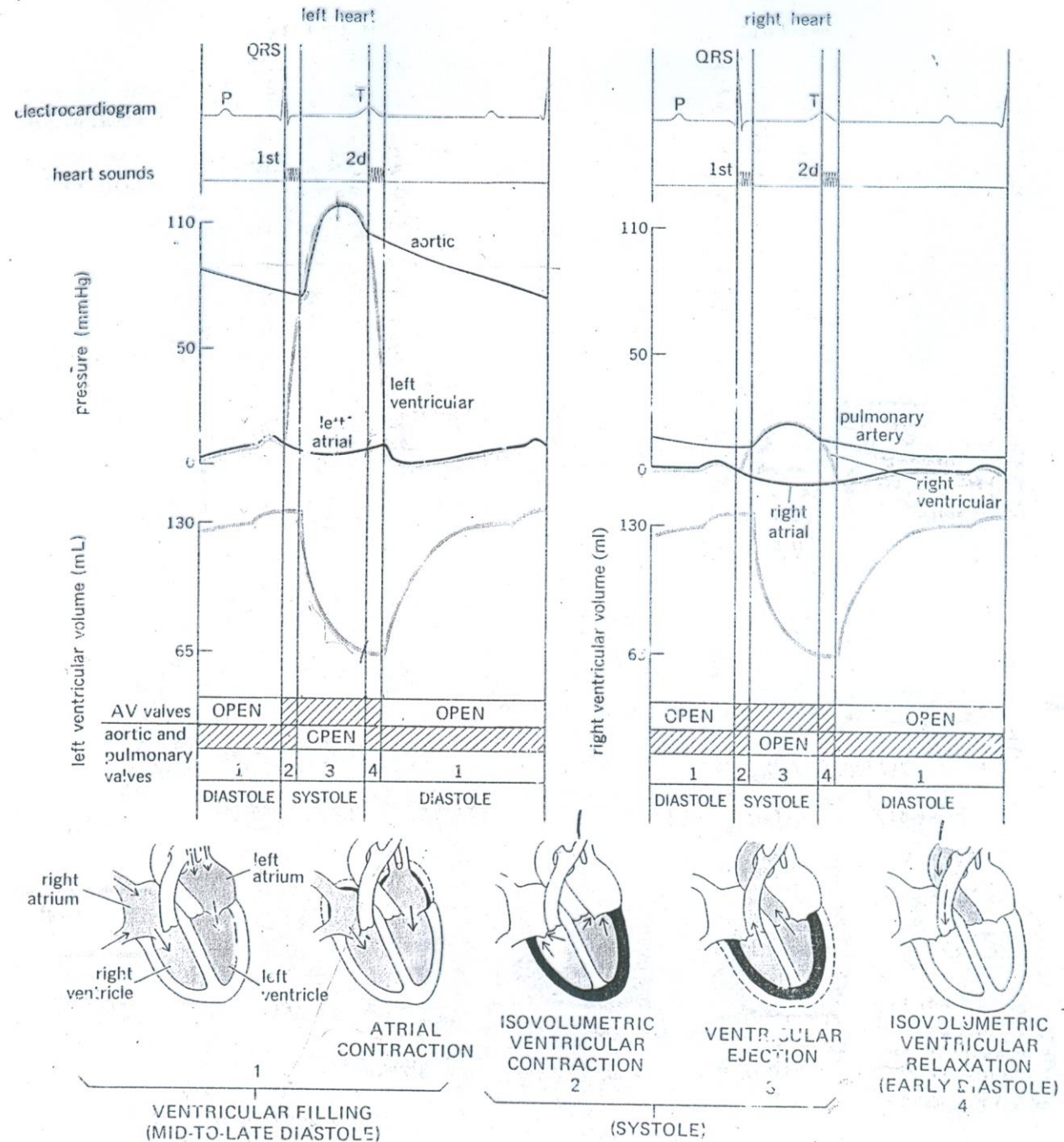
Diastole: Ventricular  
relaxation

## Activities:

Blood pressure

Blood volume

Heart sounds





# Heart Sounds

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## Normal sounds

1<sup>st</sup> sound: **lub**, low-pitched, closure of AV (mitral and tricuspid) valves

2<sup>nd</sup> sound: **dub**, high-pitched, closure of pulmonary and aortic valves

[pitch → peak to peak duration of period of wave]

## Abnormal sounds: heart murmur, sign of heart disease

Flow in usual direction through abnormally narrow valve  
(**stenosis**)

Backward flow through damaged leaky valve (**regurgitation**)

Inter-atrial and/or inter-ventricular through small hole in main septum

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Questions?  
Comments!

Thank You !!!

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