



**Department of Anesthesia Techniques**



**Title of the lecture**

**ECG**

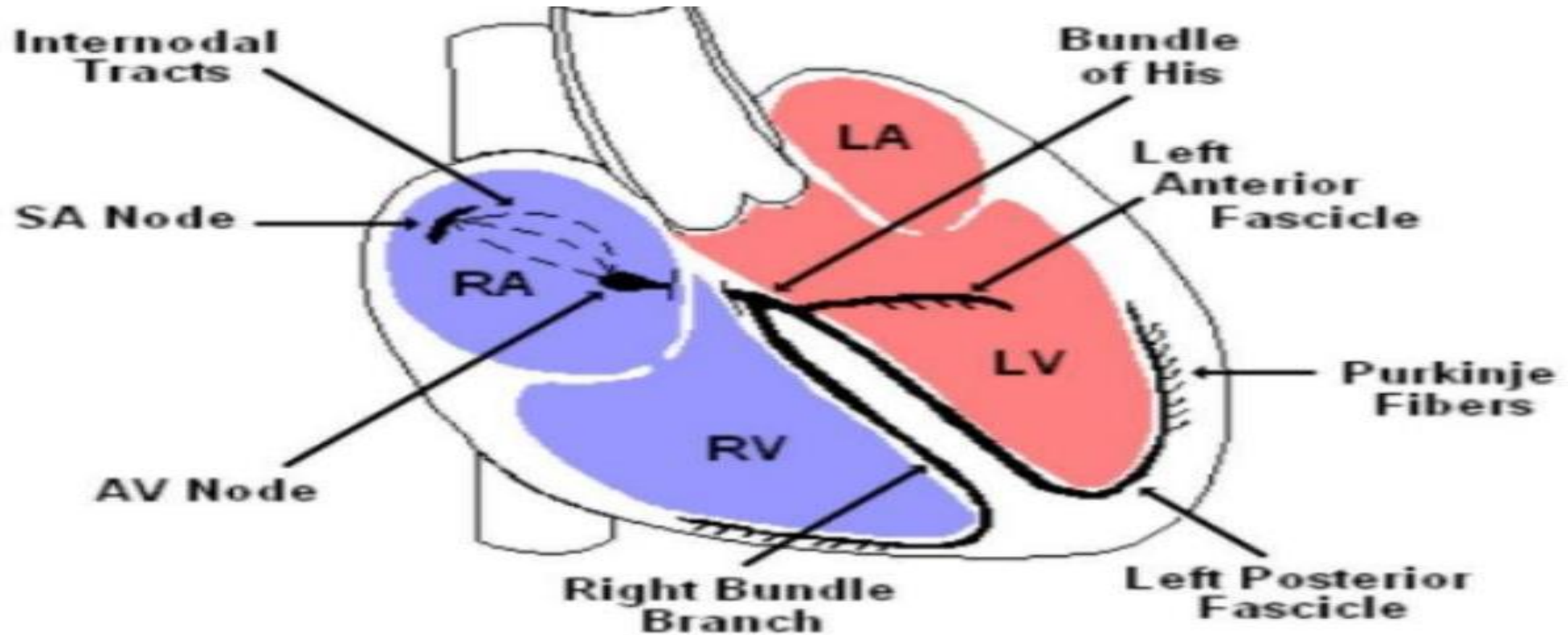
**by**

**M.S.c : Hanna abdukkareem hussein**

## What is an ECG?

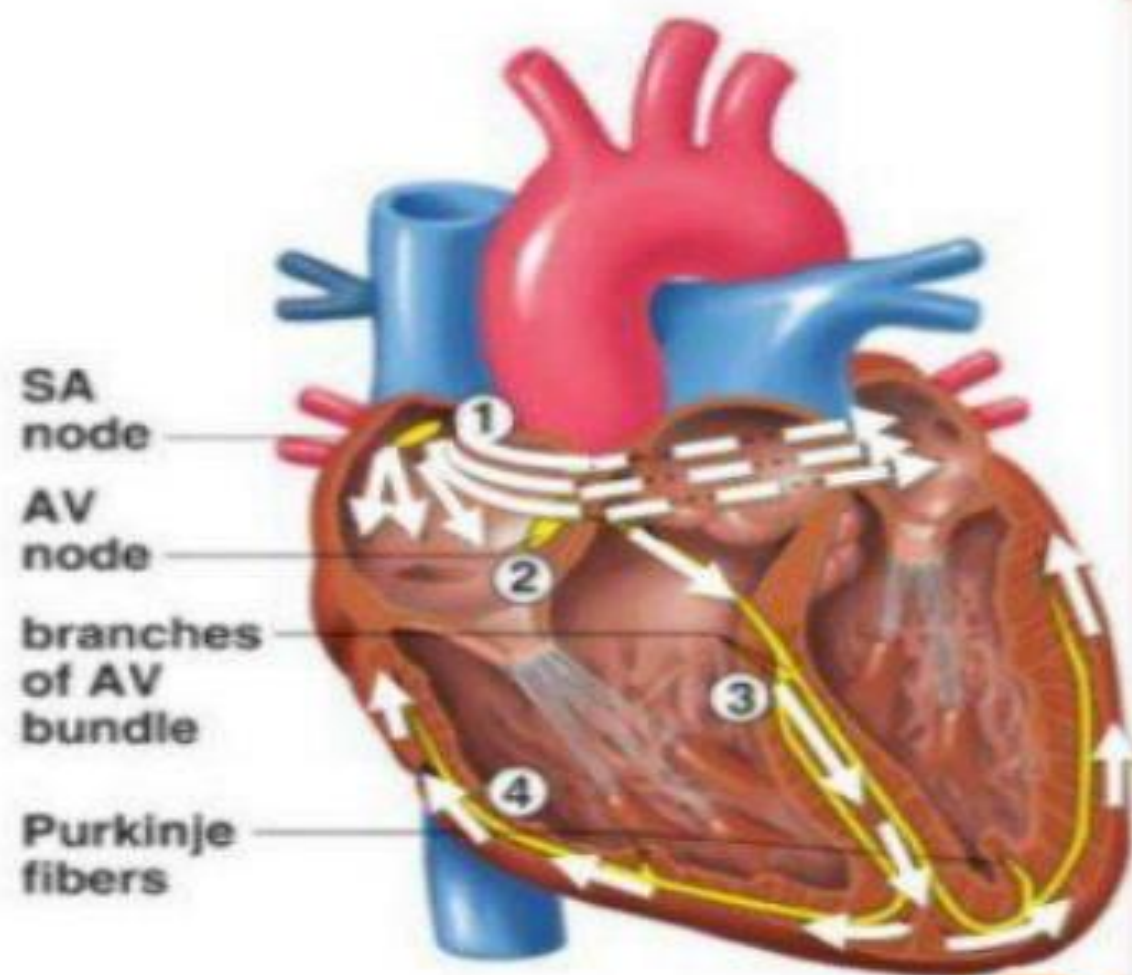
- The electrocardiogram (ECG) is a record of the sum of all electrical activity of the heart to show the heart is working properly or not .

## The Normal Conduction System

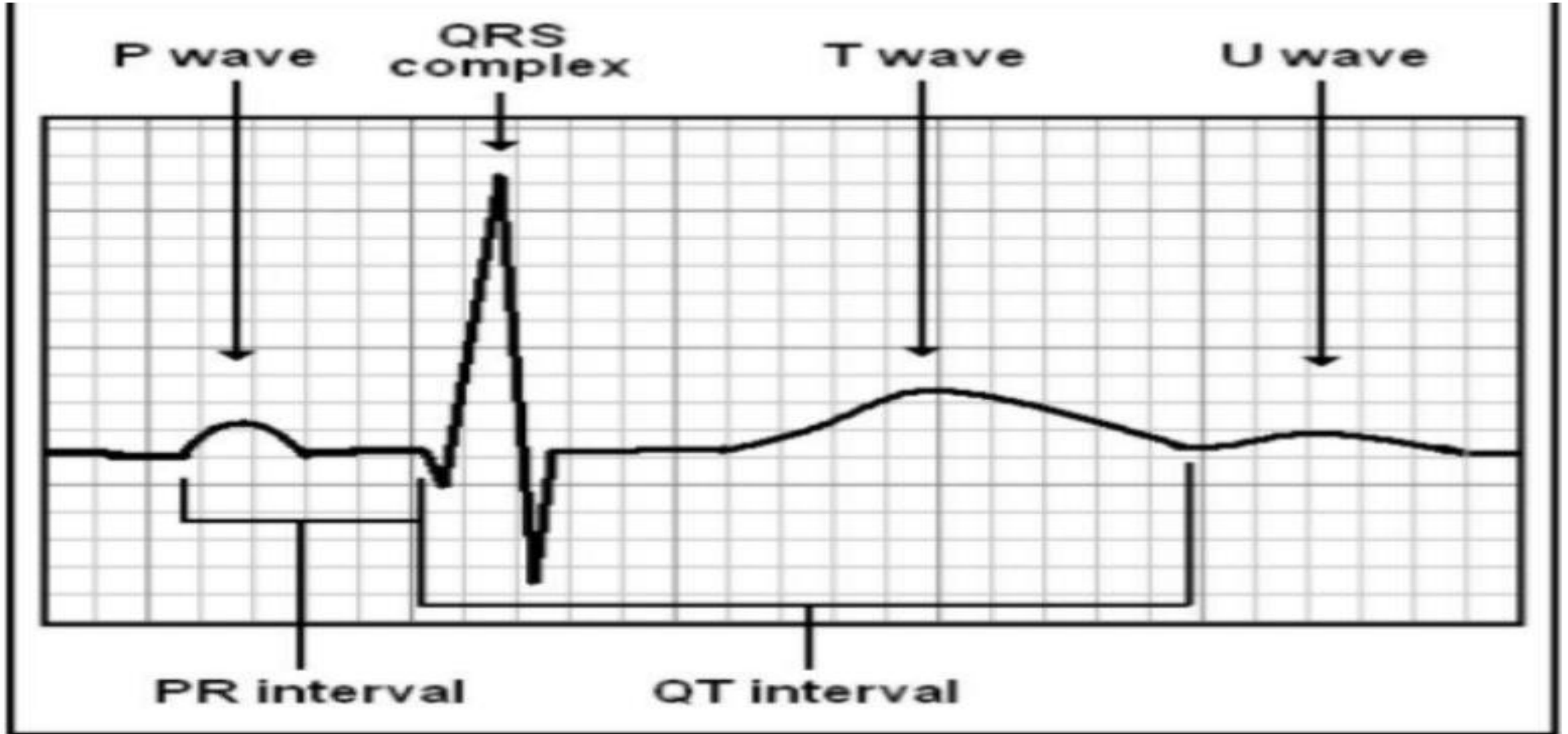


# SIGNAL PROPAGATION IN HEART

1. Stimulus originates in the SA node and travels across the walls of the atria, causing them to contract.
2. Stimulus arrives at the AV node and travels along the AV bundle
3. Stimulus descends to the apex of the heart through the bundle branches
4. After stimulus reaches the Purkinje fibers, the ventricles contract.



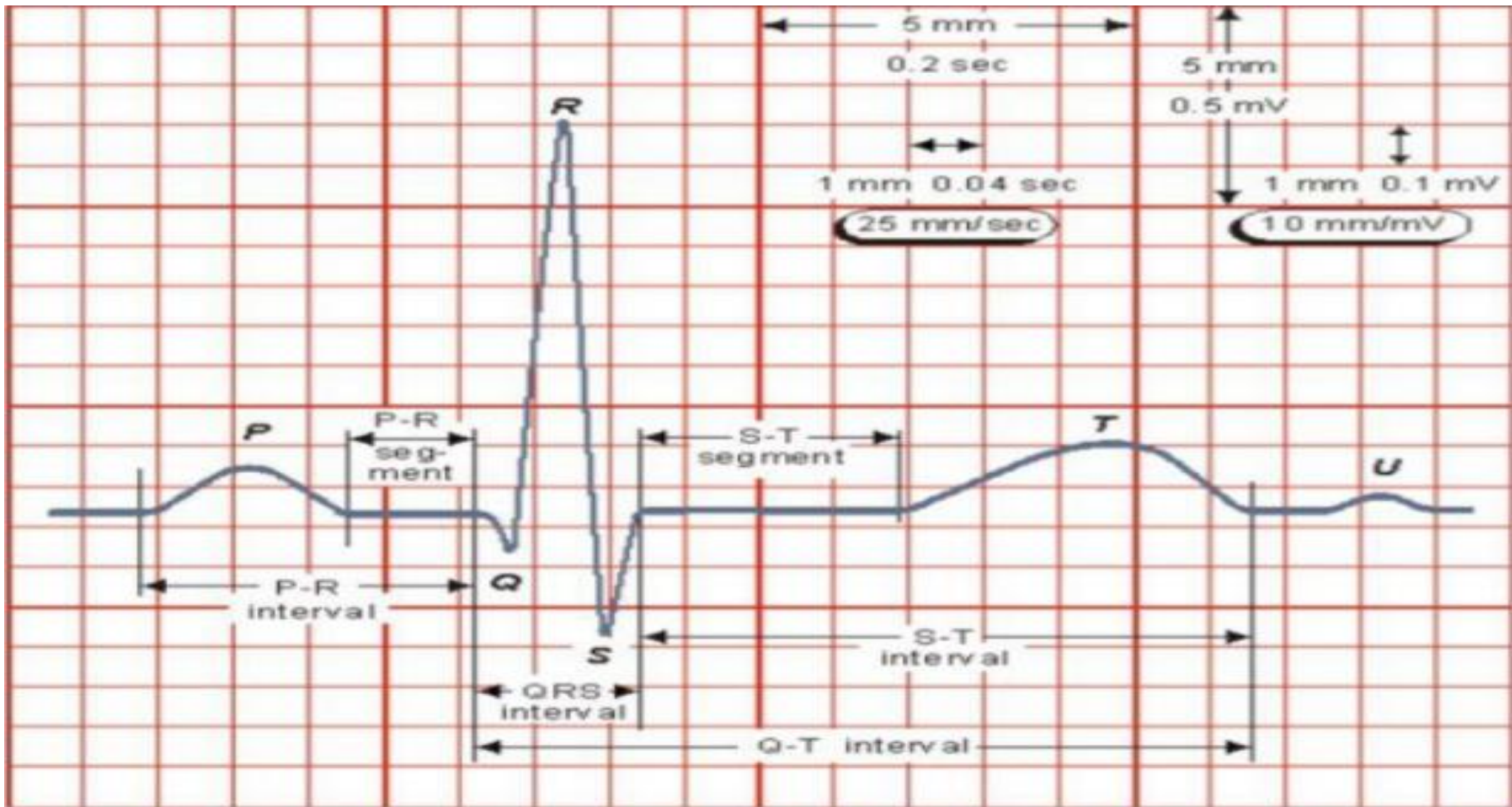
## Waveforms and Intervals



# Normal ECG

## 5 waves : P, Q, R, S, T

- ❖ P wave : caused by atrial depolarization [Less than 2.5 small square (H&V)]
- ❖ QRS complex: caused by ventricular depolarization [ $< 2.5$  small square]
- ❖ T wave :caused by ventricular repolarization
- ❖ Intervals :
  - ✓ P-R interval = 0.12 -0.2s (3-5 ss)
  - ✓ QT-interval = At normal HR:  $QT \leq 11$  small square .

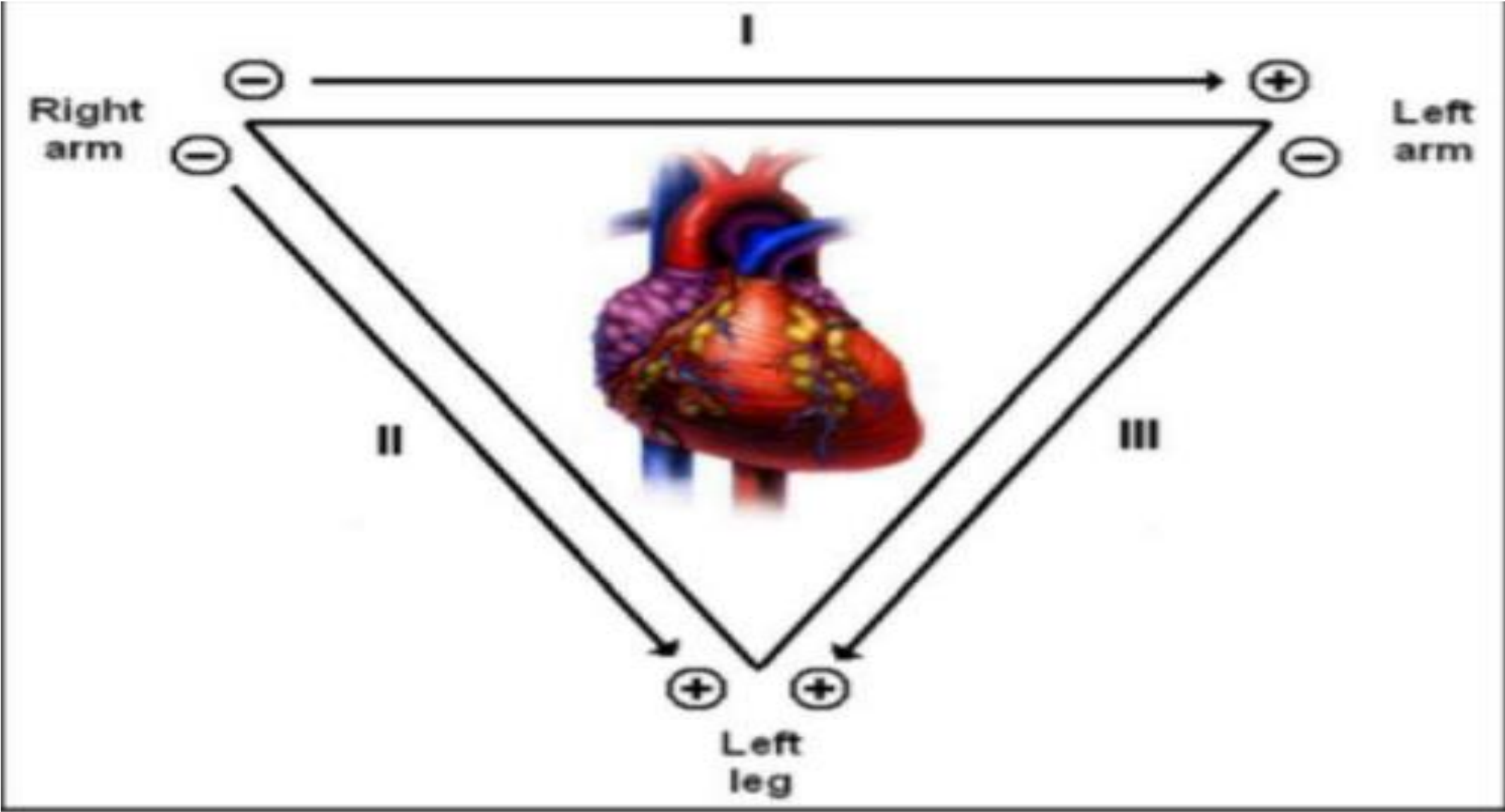


## EKG Leads

- The standard EKG has 12 leads:
- 3 Standard Limb Leads
- 3 Augmented Limb Leads
- 6 Precordial Leads

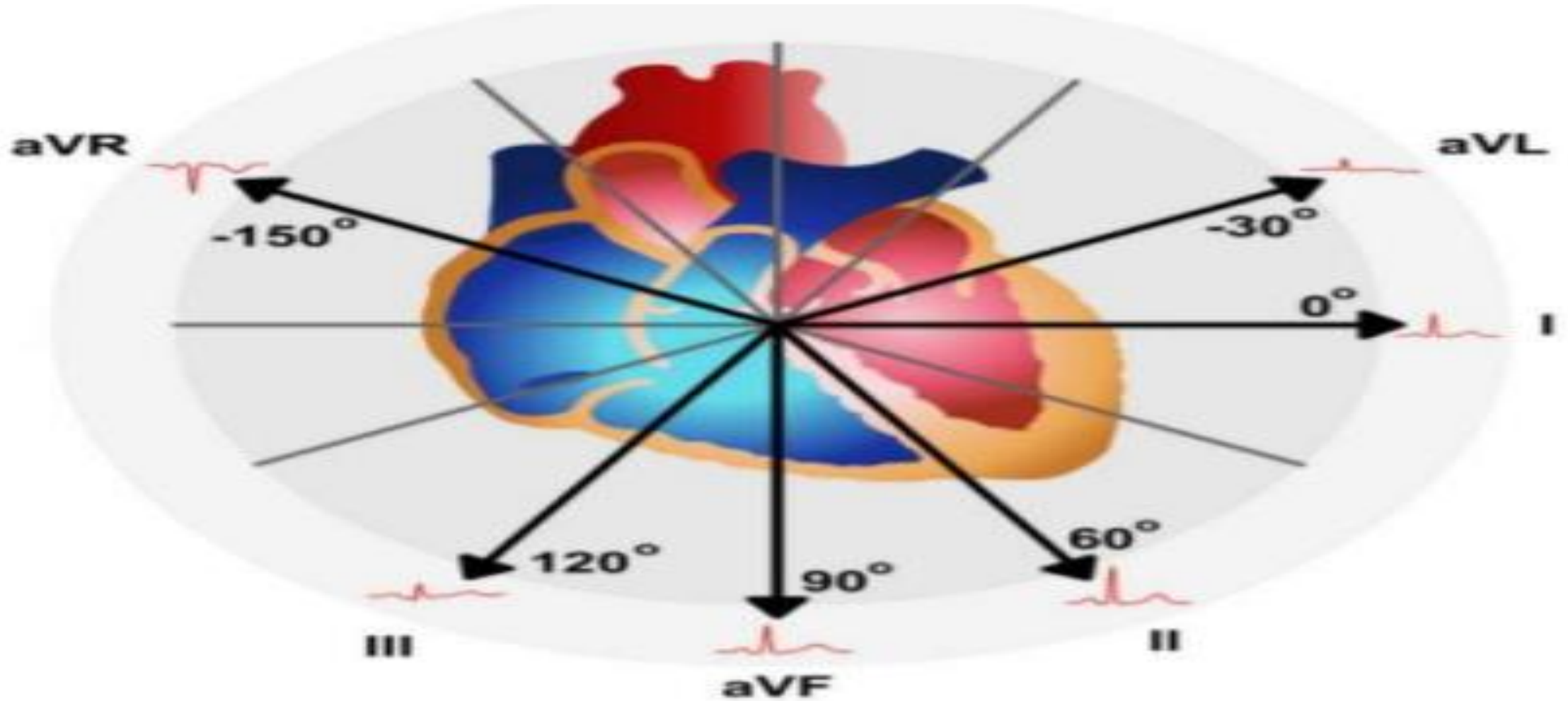
The axis of a particular lead represents the viewpoint from which it looks at the heart.

Standard Limb Leads

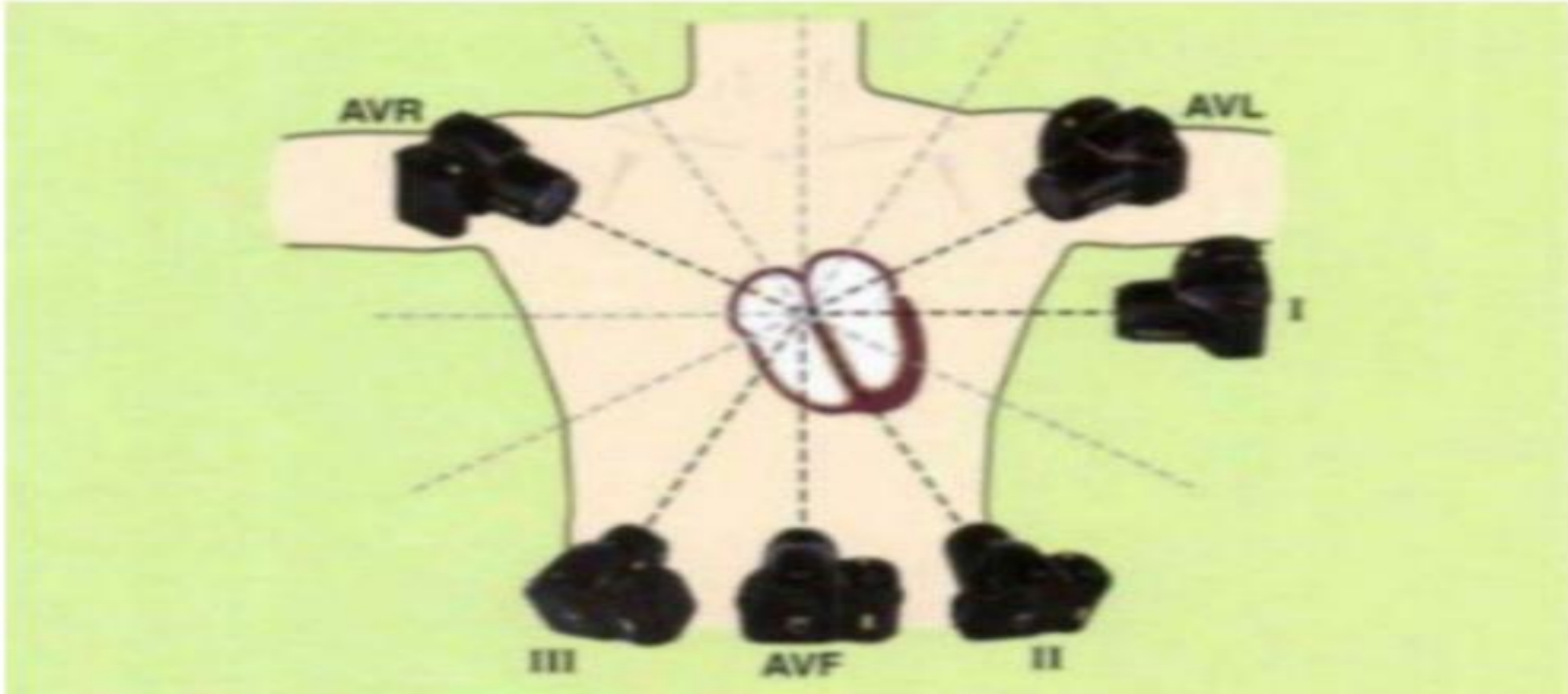




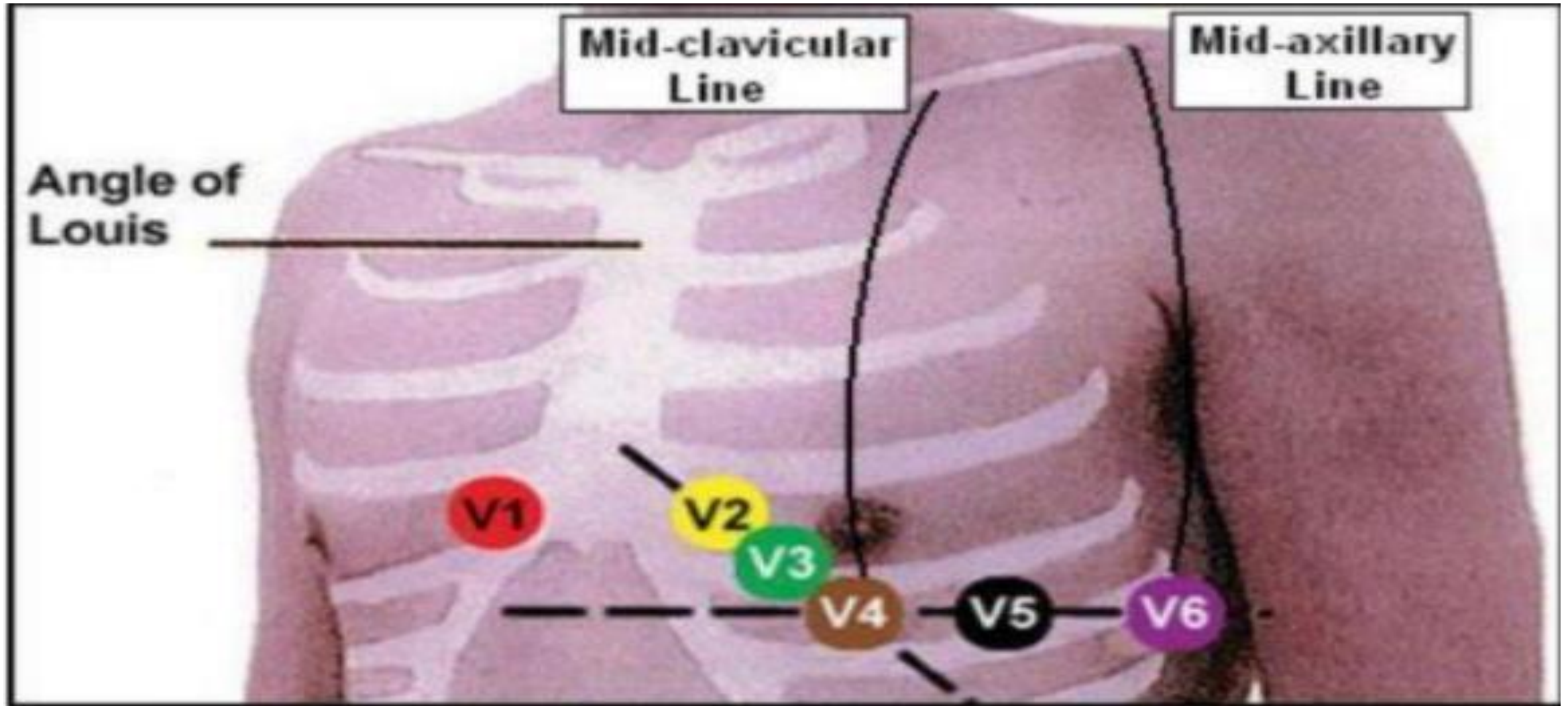
# All Limb Leads









# Limb leads as camera



## Precordial Leads



-   $V_1$  4<sup>th</sup> intercostal space to the right of the sternum
-   $V_2$  4<sup>th</sup> intercostal space to the left of the sternum
-   $V_3$  Directly between the leads  $V_2$  and  $V_4$
-   $V_4$  5<sup>th</sup> intercostal space at midclavicular line
-   $V_5$  Level with  $V_4$  at left anterior axillary line
-   $V_6$  Level with  $V_5$  at midaxillary line  
(*directly under the midpoint of the armpit*)

## 4 Limb electrodes

Right Arm

Red

Left Arm

Yellow

Left Leg

Green

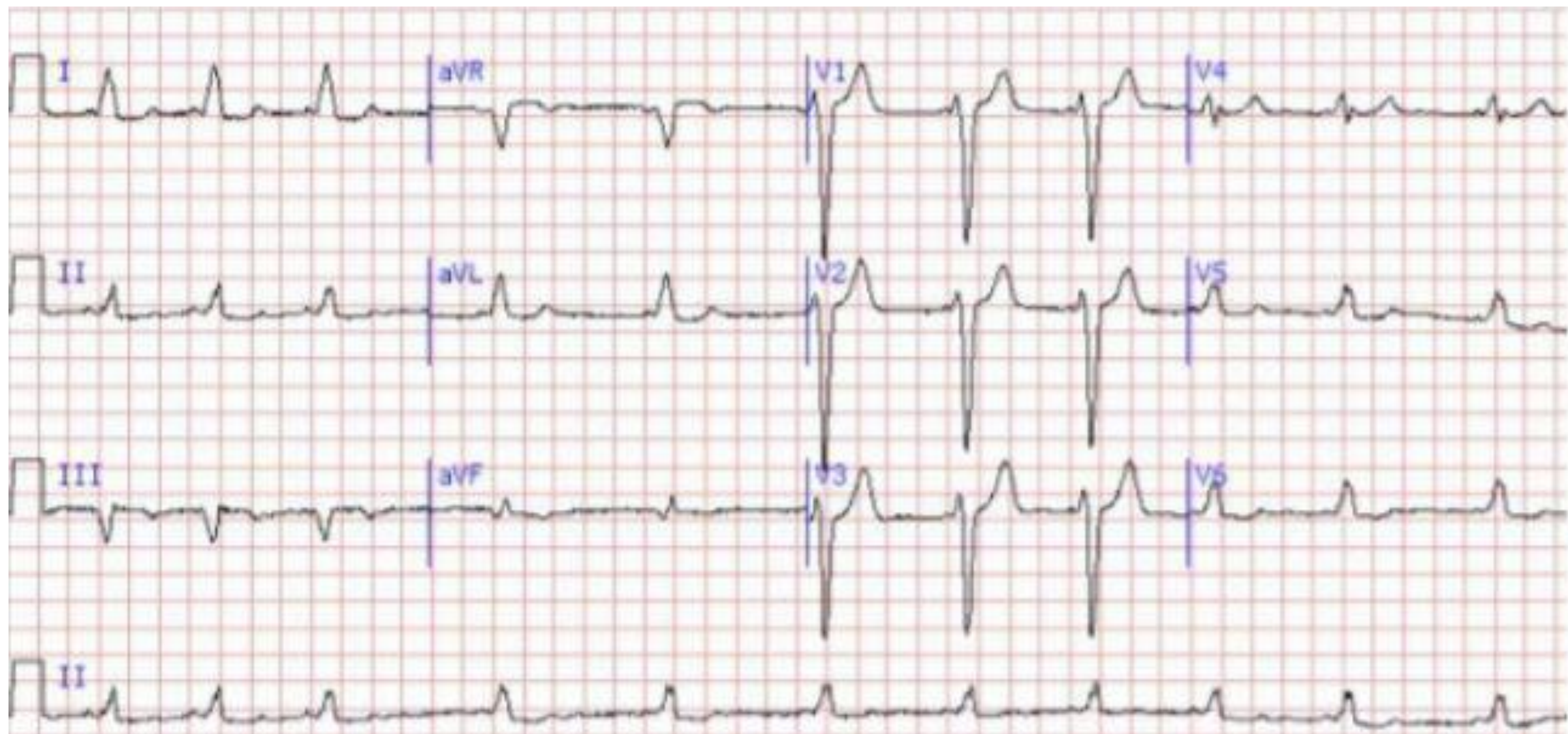
Right Leg

Black



## Summary of Leads

	<b>Limb Leads</b>	<b>Precordial Leads</b>
<b>Bipolar</b>	I, II, III (standard limb leads)	-
<b>Unipolar</b>	aVR, aVL, aVF (augmented limb leads )	V1-V6





## Determining the Heart Rate

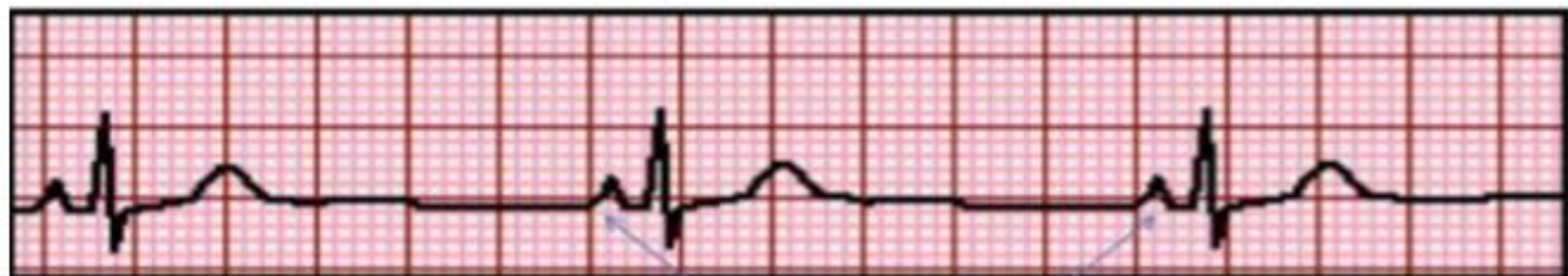
- ❖ Rule of 300 for regular rhythm
- ❖ 10 Second Rule for irregular rhythm

### Rule of 300

- Take the number of “big boxes” between neighboring QRS complexes, and divide this into 300. The result will be approximately equal to the rate
- Although fast, this method only works for regular rhythms



## What is the heart rate?



www.uptodate.com

$(300 / 6) = 50 \text{ bpm} = \text{sinus bradycardia}$

**Normal heart rate = 60 – 100 bpm**

## The Rule of 300

✚ It may be easiest to memorize the following table:

<b># of big boxes</b>	<b>Rate</b>
<b>1</b>	<b>300</b>
<b>2</b>	<b>150</b>
<b>3</b>	<b>100</b>
<b>4</b>	<b>75</b>
<b>5</b>	<b>60</b>
<b>6</b>	<b>50</b>

## 10 second Rule

- As most ECGs record 10 seconds of rhythm per page, one can simply count the number of beats present on the ECG and multiply by 6 to get the number of beats per 60 seconds.
- This method works well for irregular rhythms .

# Summary

## How to read an ECG (the official version)

- Step 1: Rhythm
- Step 2: Rate
- Step 3: Conduction (PQ, QRS, QT)
- Step 4: Heart axis
- Step 5: P wave morphology
- Step 6: QRS morphology
- Step 7: ST morphology
- Step 7+1: Compare the current ECG with a previous one

**Thank you for listening!**

