UNDERSTANDING PHYSIOLOGY

CVS

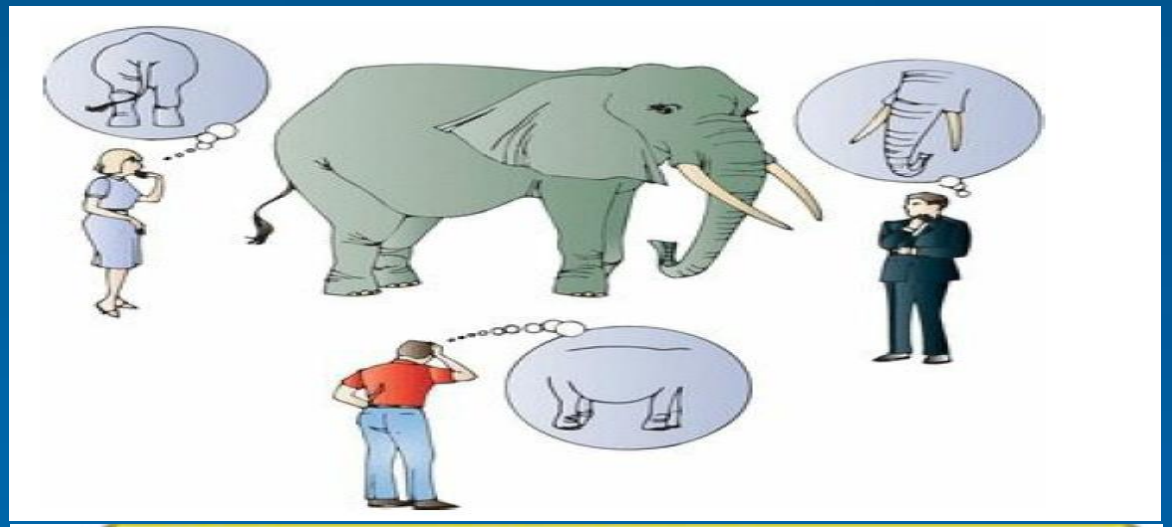
Normal ECG

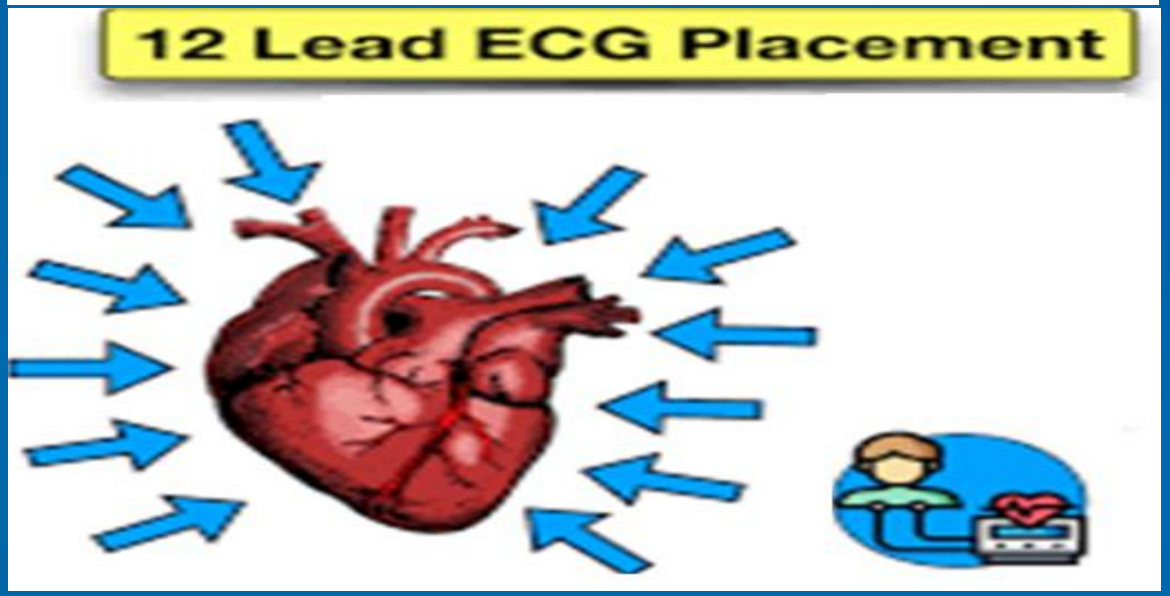
DR. KHALED AHMED ABDEL-SATER

The Electrocardiogram (ECG)

Definition: It is a recording the electrical changes that occur in the heart during cardiac beat from many "views."

- The apparatus used is called the **Electrocardiograph**





ECG consists of 12 different leads that record the same electrical cardiac change but from different views and each of them has a normal picture.

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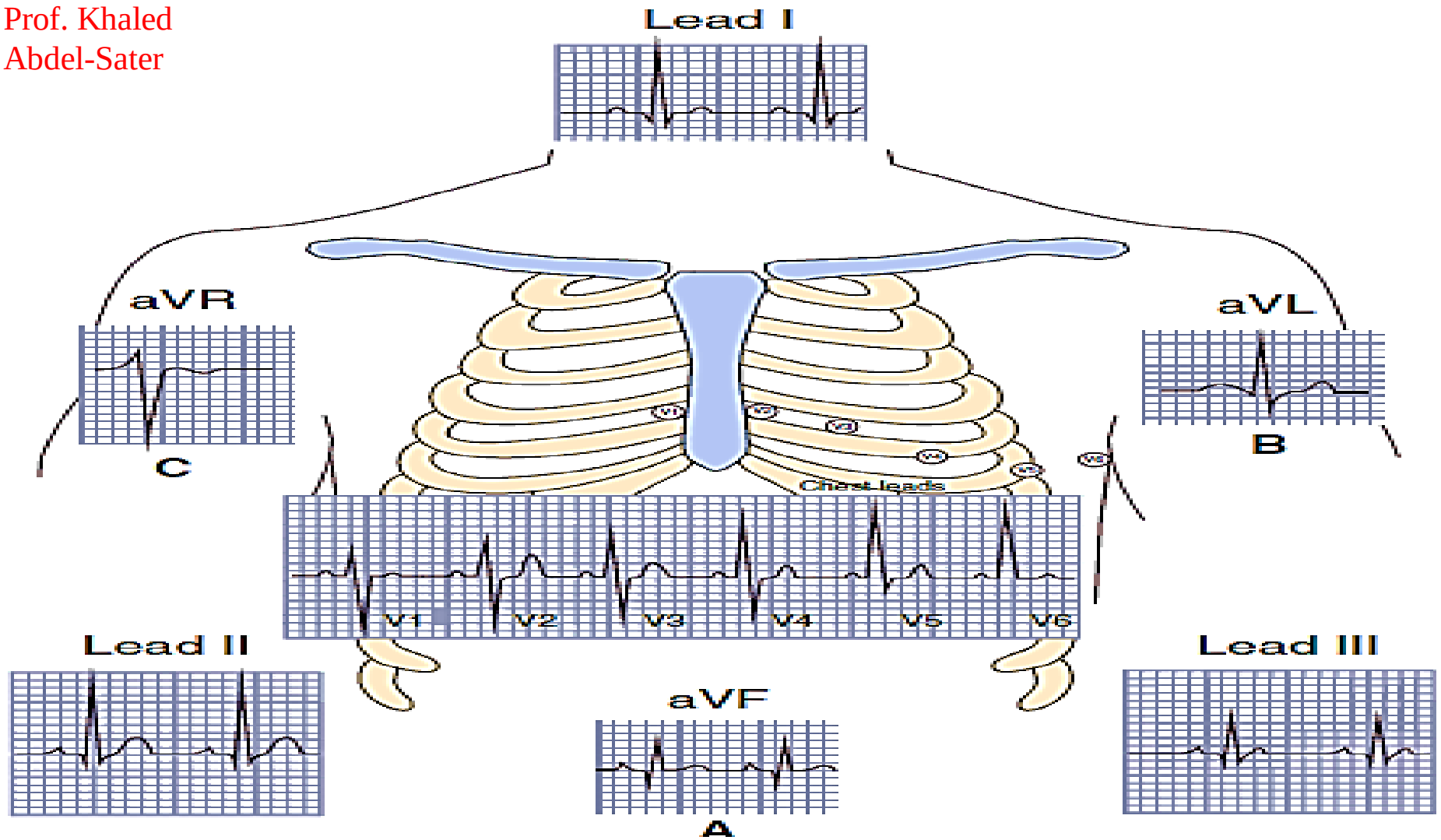
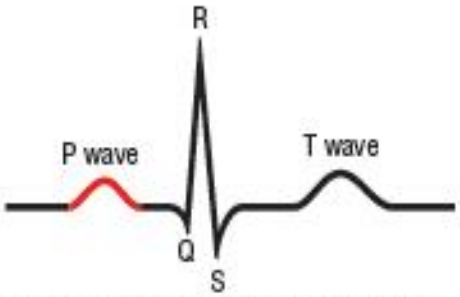
Abdel-Sater

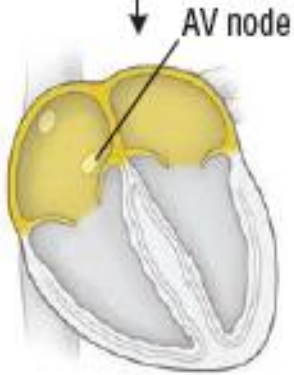


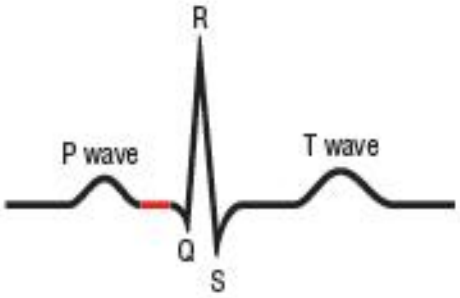
N.B

- -The recording from the body surface (*not directly on the heart*) because the body fluids are good electrical conductor.
- -Recording only for partial depolarization or partial repolarization but with complete depolarization or repolarization it produces isoelectrical line (no waves).

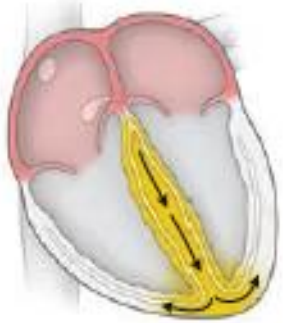


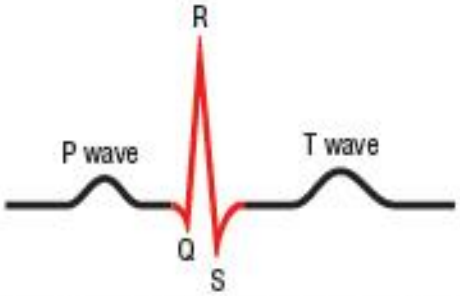
1. Atrial depolarization, initiated by the SA node, causes the P wave.



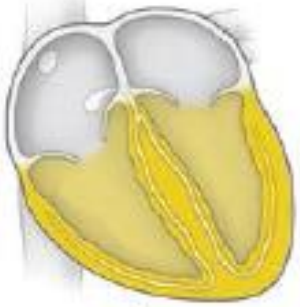


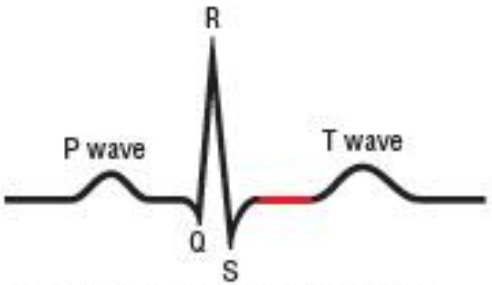
2. With atrial depolarization complete, the impulse is delayed at the AV node.



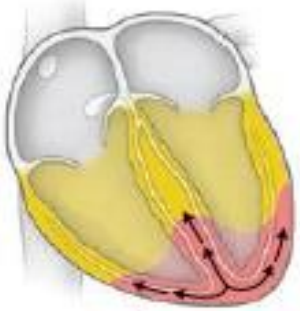


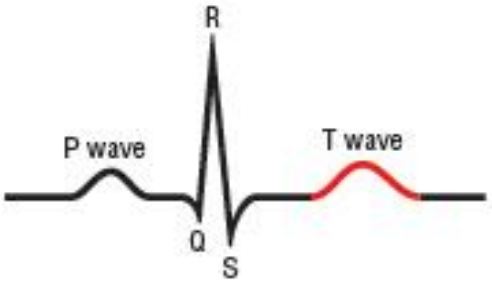
3. Ventricular depolarization begins at apex, causing the QRS complex. Atrial repolarization occurs.



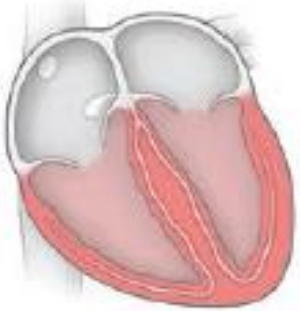


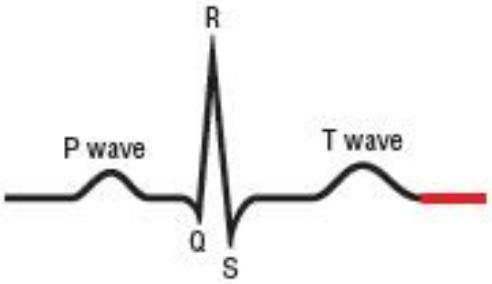
4. Ventricular depolarization is complete





5. Ventricular repolarization begins at apex, causing the T wave





6. Ventricular repolarization is complete

Depolarization Repolarization

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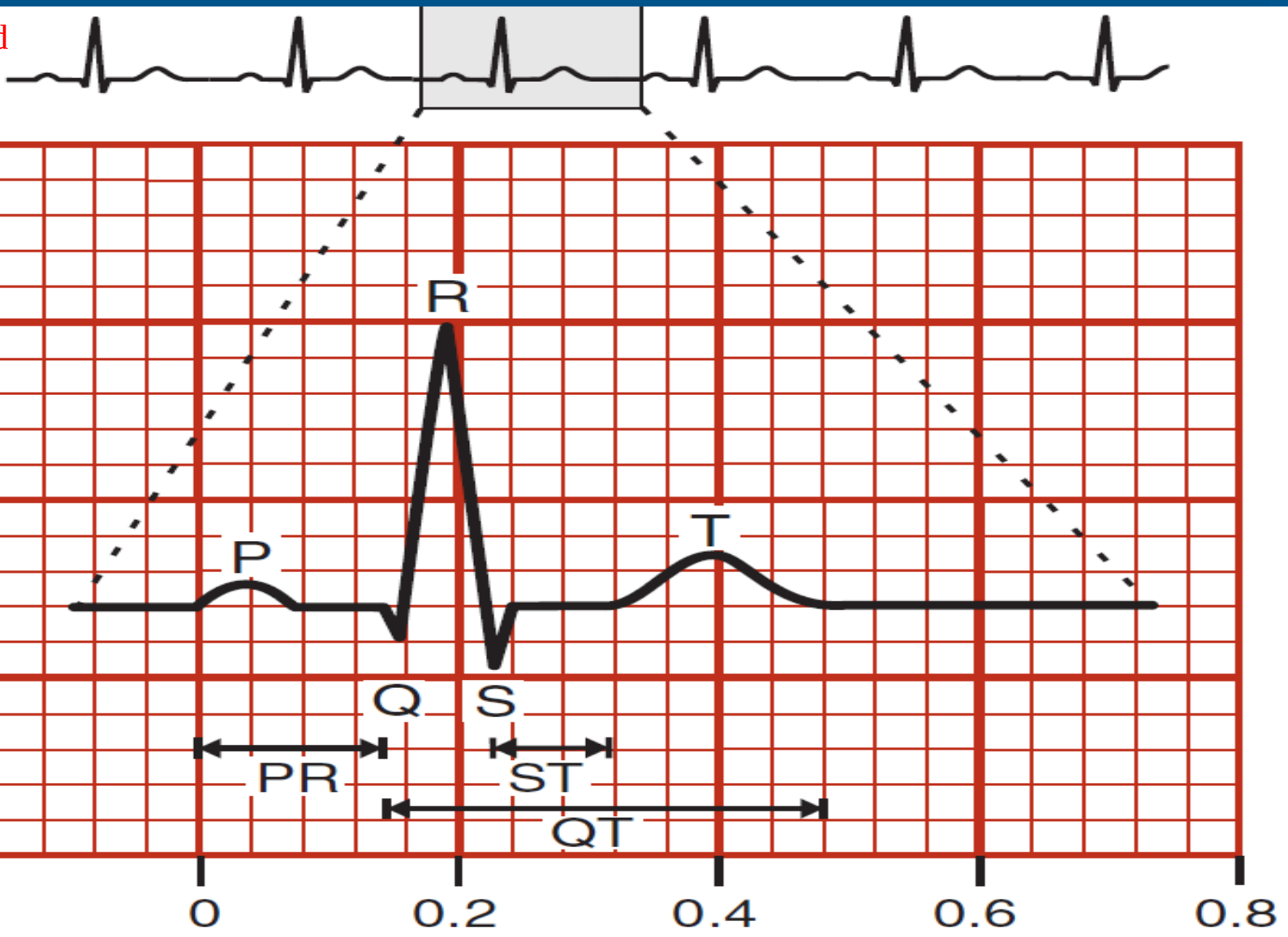
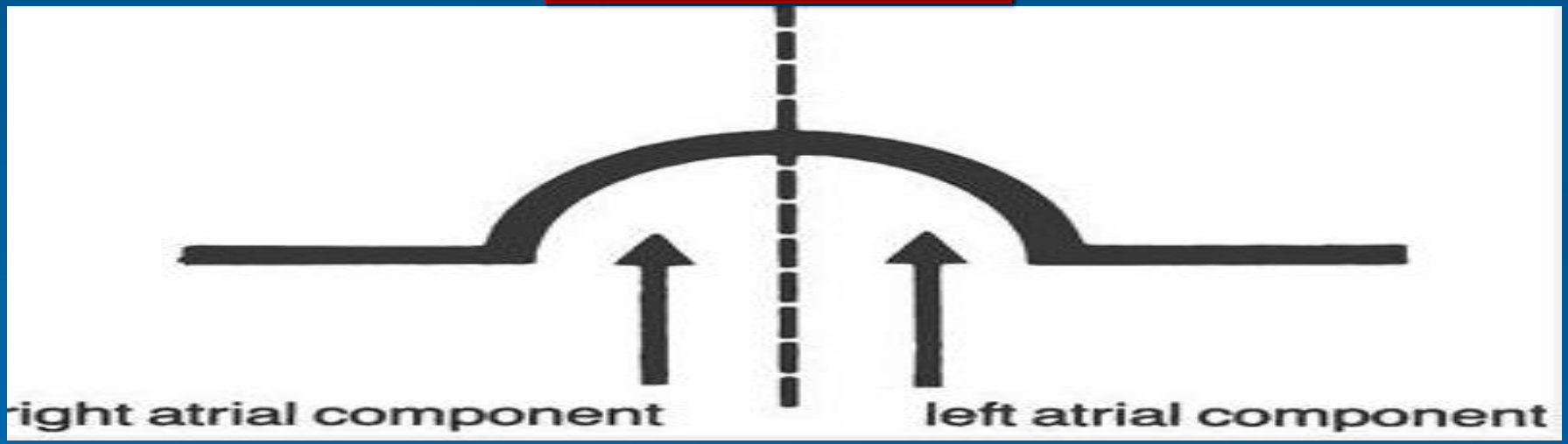


HORIZONTAL AXIS	1 Small Square = .04 sec (40 m sec)
	1 Large Square = .2 sec (200 m sec)
	5 Large Squares = 1 sec (1000 m sec)

1. P Wave



Duration: 0.1 second.

Causes: *It is due to* atrial depolarization.

Clinical Significance:

P wave is a guide to the functional activity of atria.

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2. QRS Complex

-*Duration:* 0.08 second.

-*Cause:* ventricular depolarization.

Q wave: duration (0.02 sec)

cause depolarization of interventricular septum.

R wave: duration (0.04 sec),

cause depolarization of ventricular apex & wall.

S wave: duration (0.02 sec),

cause depolarization of ventricular base.

-Clinical Significance:
a guide to the activity of ventricles

1-Prolongation of QRS complex and M shaped R wave:

-Ventricular hypertrophy.

-Ventricular extrasystole.

2-Deep Q wave

is one sign of myocardial infarction.

3. T Wave:

-*Duration:* 0.25 second.

-Amplitude: (1/2 R) positive wave.

-Cause: ventricular repolarization.

-Clinical Significance:

Inverted T wave:

-Myocardial ischemia.

- Myocardial infarction.

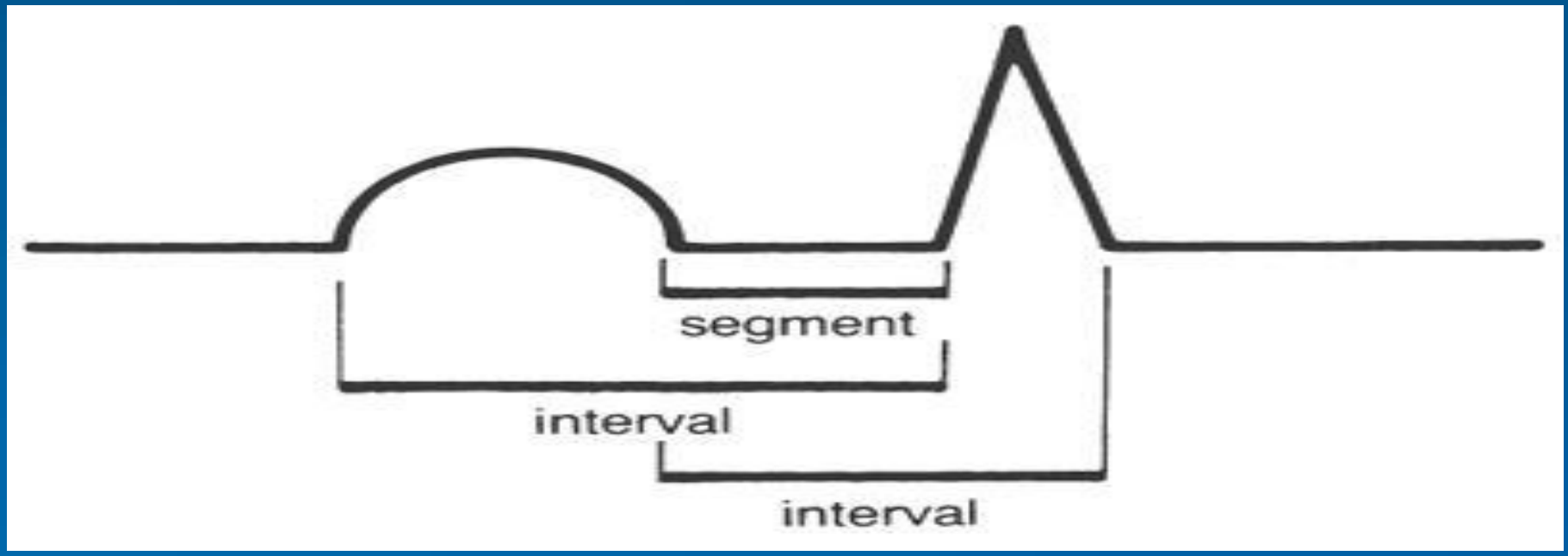
4. U Wave:

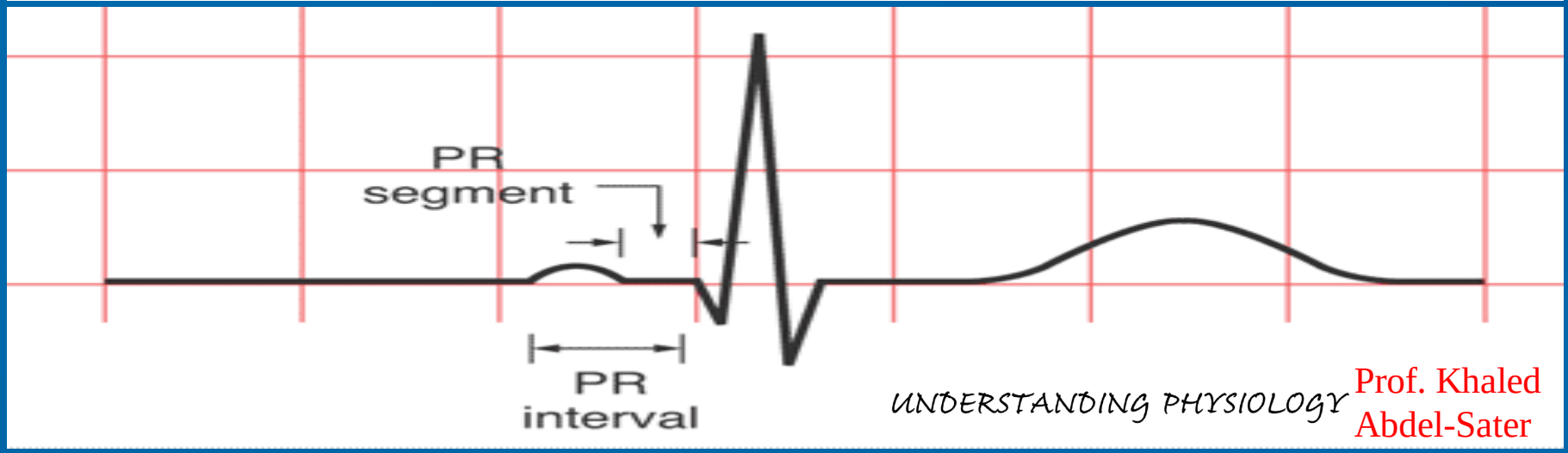
-*Duration:* 0.05 second

-*Cause:* repolarization of the papillary muscle (mainly in obese).

- Usually absent & it has no pathological significance.

Interval contains wave or more but segment is an isoelectric line contains no wave.





5. P-R Interval

-Definition: from the beginning of the P wave to the beginning of the R wave.

Duration: 0.12-0.21 second.

-Cause: AVN conduction.

Significance: if it prolonged it indicate delayed conductivity and visa versa.

Clinical Significance:

1) Prolonged P –R interval: Vagal stimulation. β -blockers. 1st degree heart block.

2) Shortened P –R interval: Sympathetic stimulation. Accelerated AV conduction.

6. S-T Segment

-*Definition:* it is the segment from the end of S wave to the beginning of T wave.

-*Duration*: 0.1 second.

-*Cause*: complete depolarization of ventricle.

-*Clinical Significance:* Normally it is isoelectric, if it displaced above or below the isioelectrical line, it indicates ischemia.

7. Q-T Interval

-*Definition*: it is the interval from the beginning of the Q wave to the end of the T wave.

-*Duration*: 0.4 second.

-*Cause*: ventricular depolarization and repolarization.

-*Clinical Significance:* It is shortened in tachycardia and hypercalcaemia and is prolonged in hypertention and hypocalcaemia.

Normal ECG Waves