



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

سرفصل های آموزشی

- مفهوم الکتروکاردیوگرافی
- انواع لیدها در ثبت الکتروکاردیوگرام و محل قرارگیری آنها
- اختلاف پتانسیل بین اندامها در لیدهای یک قطبی و دو قطبی و پره کوردیال و محل قرارگیری آنها
- مشخصات مربوط به امواج الکتروکاردیوگرام
- محاسبه تعداد ضربان قلب ، تعیین ریتم قلبی، تعیین محور قلب، اندازه موجها و طبیعی بودن یا نبودن آنها ، تعیین هیپرتروفی دهلیزها و بطن ها از روی نوار ECG

• **تعریف الکتروکاردیوگرافی (نوار قلب)**

• **کاربرد نوار قلب و نقش آن در تشخیص بیماریهای قلبی**

• تشخیص بیماریهای عروق کرونر

• آریتمی ها

• بلوک های قلبی

• پریکاردیت

• هیپرتروفی حفرات قلب

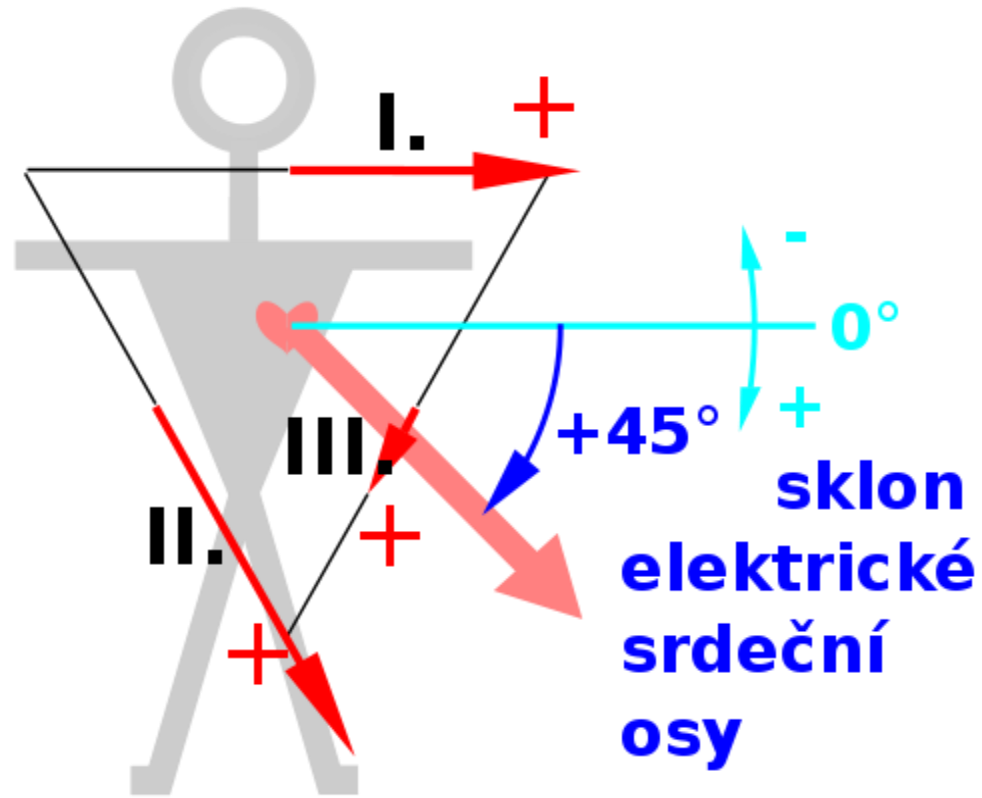
• اختلالات الکترولیتی

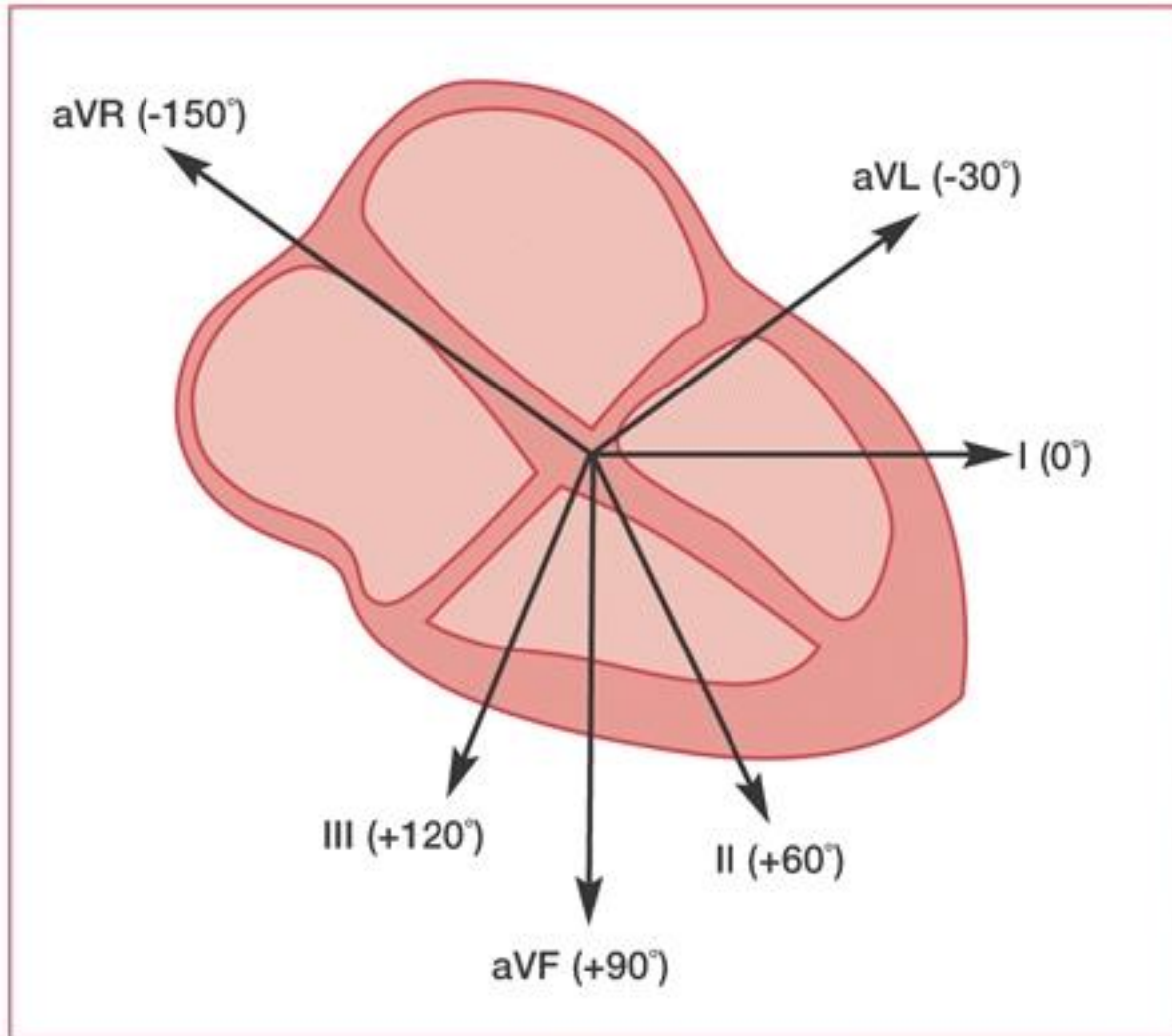
- الکتروکاردیوگراف (ECG)
- تعریف :
- دستگاهی است که بوسیله آن سیگنالهای حاصل از فعالیت الکتریکی قلب را ثبت می کنند .
- یک ECG استاندارد از ۱۲ لید تشکیل شده است :

– ۶ لید اندامی

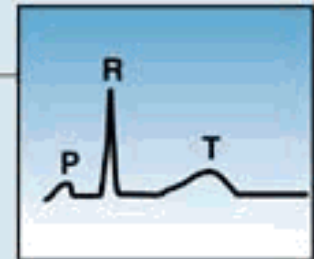
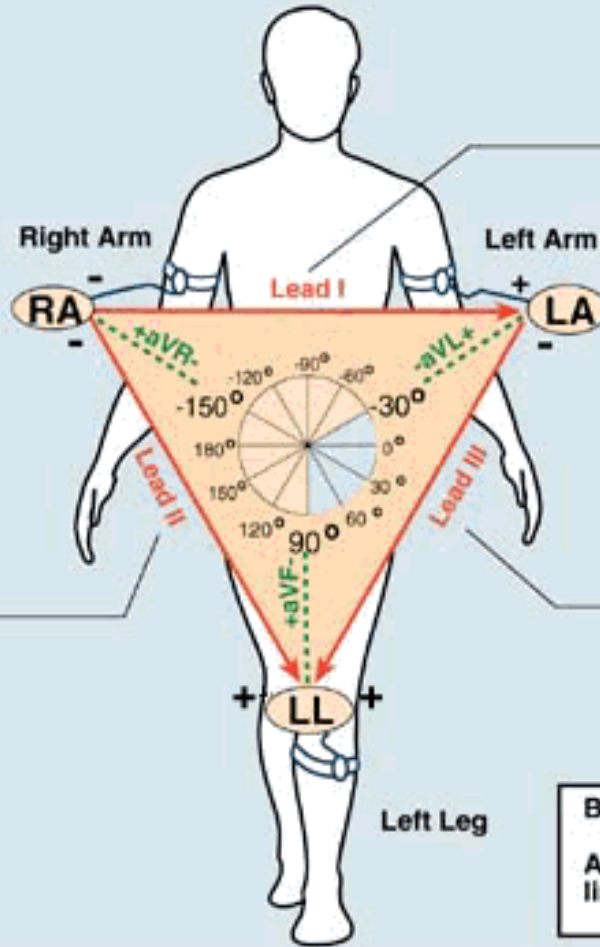
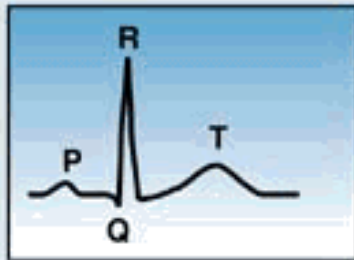
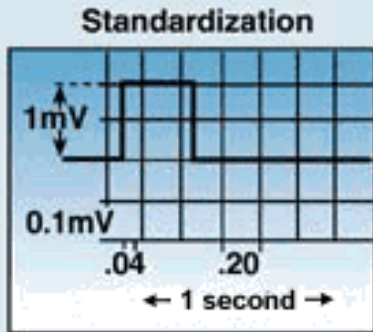
- سه لید یک قطبی (D1-D2-D3)
- سه لید دو قطبی تقویت شده (avl, avf, avr)
(augmented voltage left – foot – right)

– ۶ لید پره کوردیال (V1 تا V6)



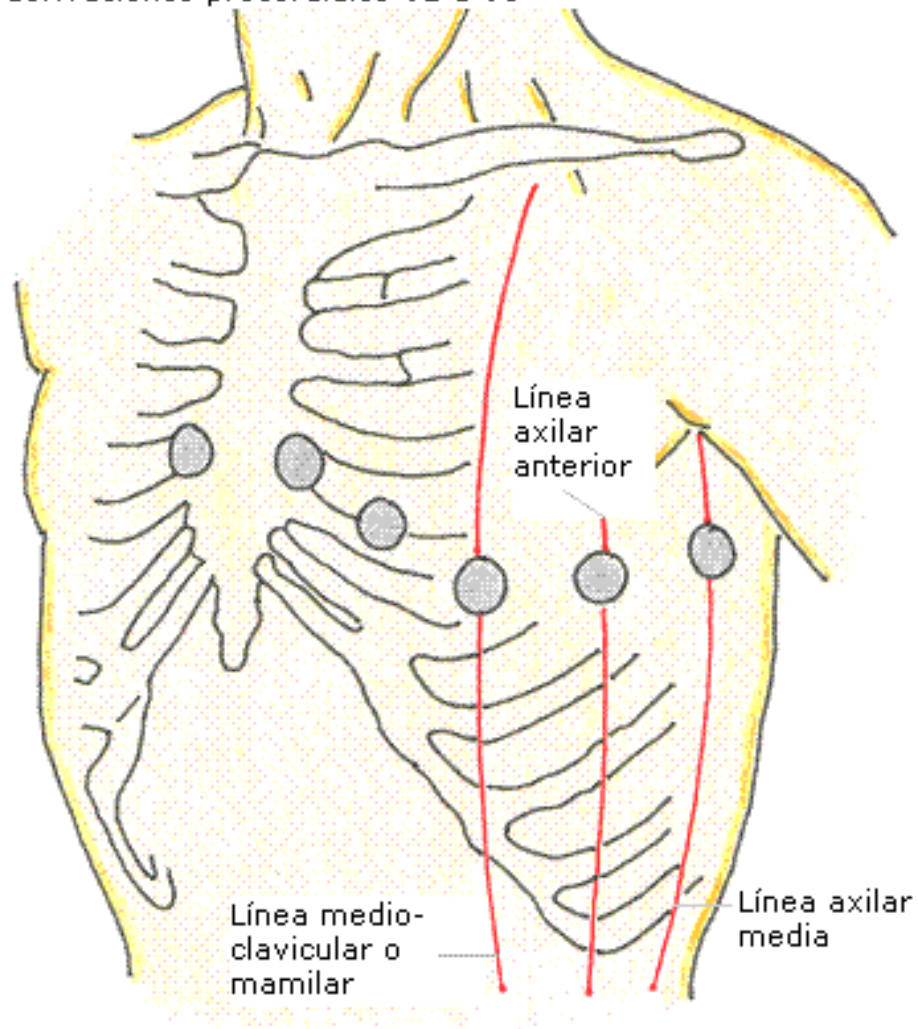


The Standard Limb Leads

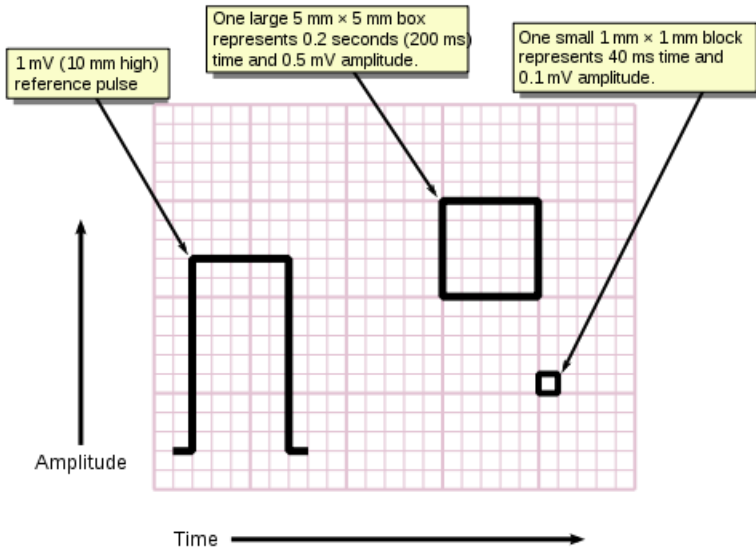


Bipolar limb leads →
Augmented unipolar limb leads →

Localización de los electrodos correspondientes a las derivaciones precordiales V1 a V6



استانداردهای نوار ECG



- سرعت استاندارد

- ولتاژ استاندارد

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continuing professional education online

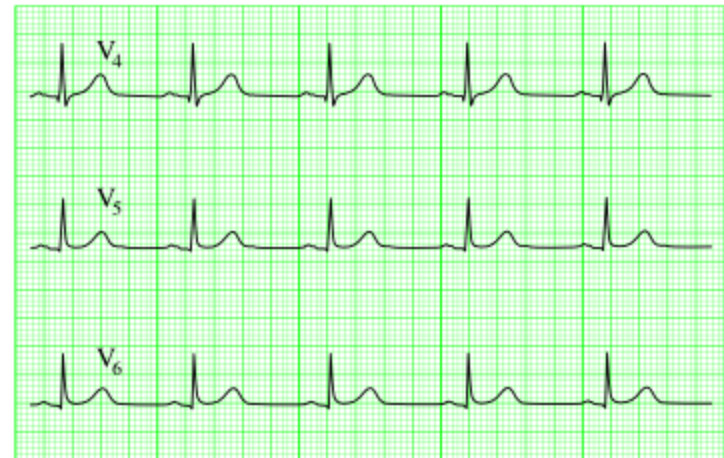
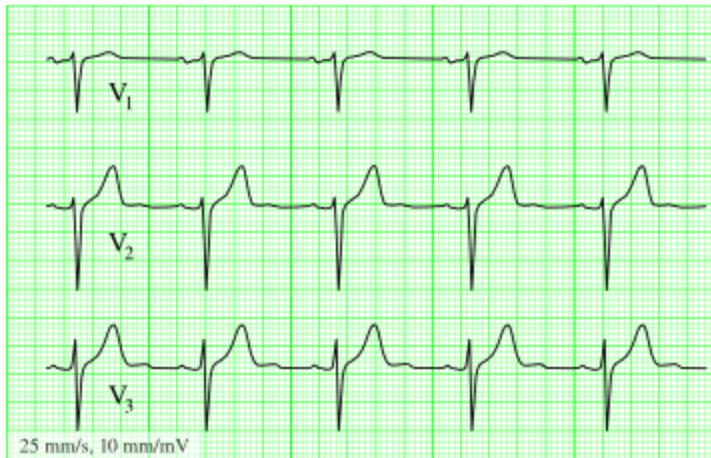
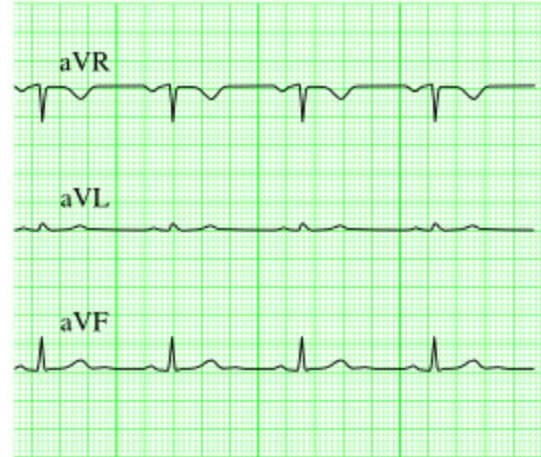
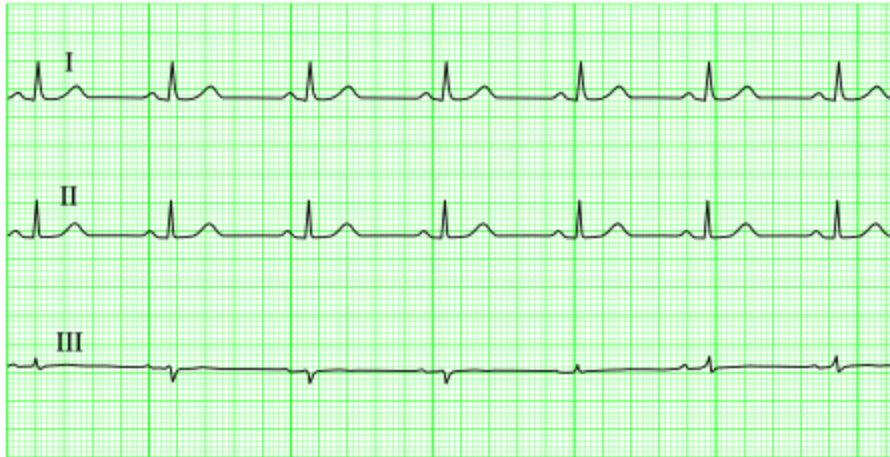
7.3. Calibration of the ECG (cont.)

Calibration is an important component of the ECG. From it we can identify if the ECG was recorded at half or double size . This is important for accurate ECG interpretation.

Normal size Half size Double size

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لیدهای غیر استاندارد

• (1) لید های V7 تا V9

- Use a 15-lead ECG when the 12-lead is normal but the history is still suggestive of an acute infarction.

• (2) لیدهای طرف راست V1R تا V6R

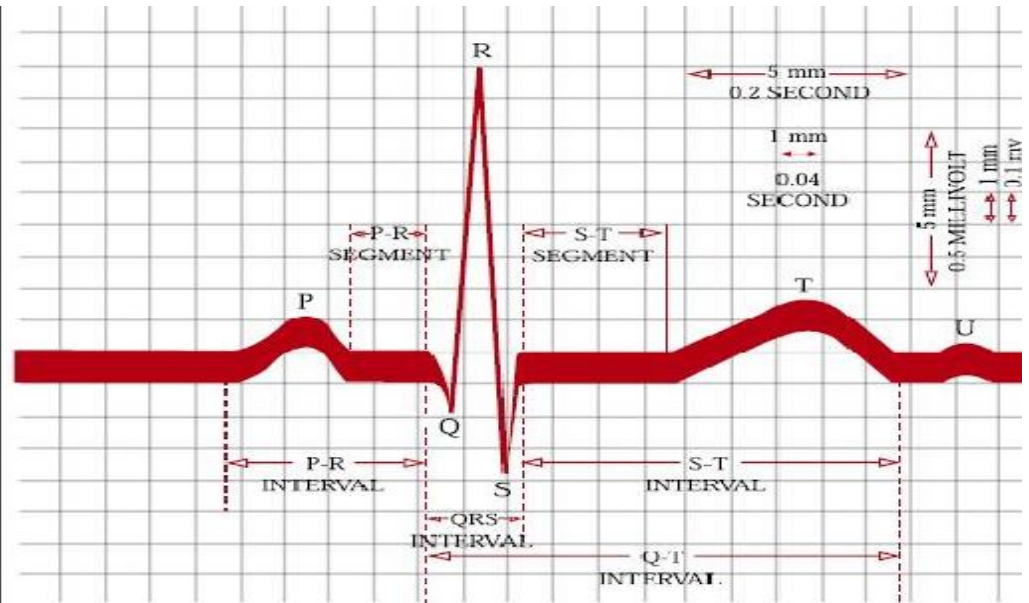
- Patients with an acute inferior MI should have right-sided ECGs to assess for possible right ventricular infarction.(19)

مشخصات موج P

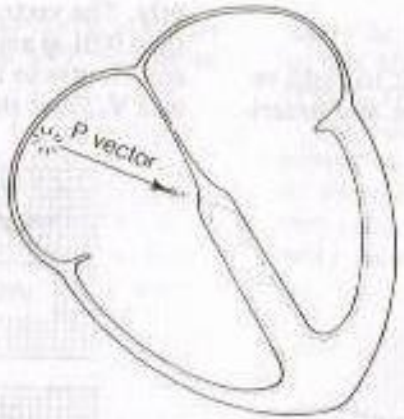
- First wave seen
- Small rounded, upright (positive) wave
- indicating atrial depolarization (and contraction)

- PR INTERVAL
 - PR SEGMENT
- (11)

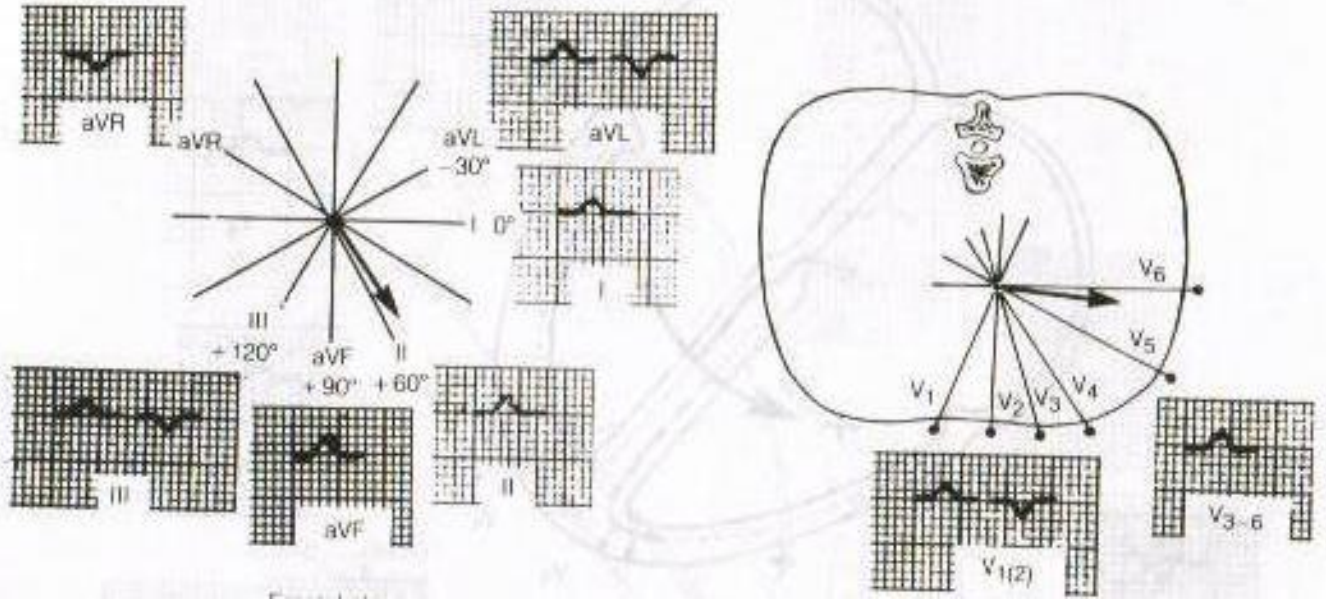
کلیک کنید

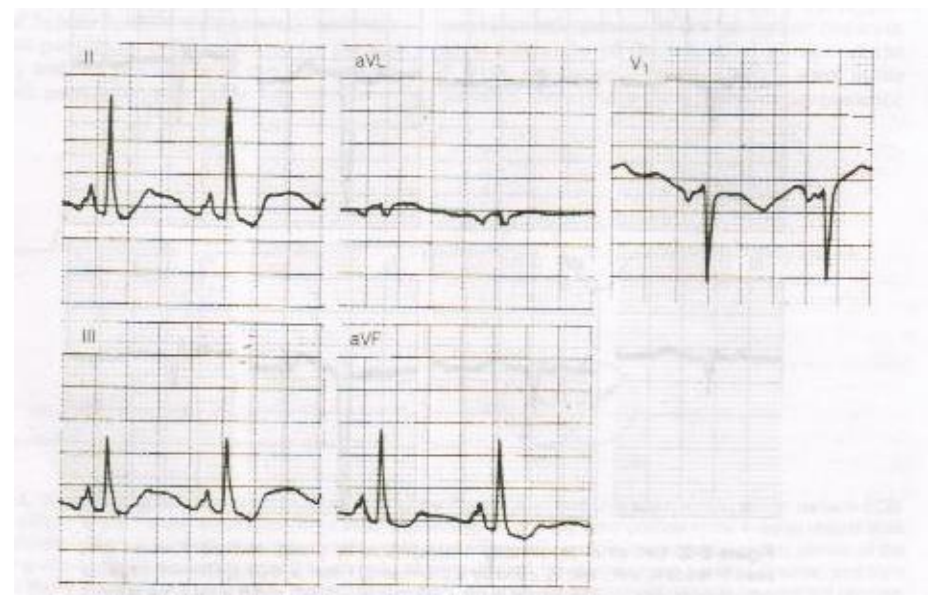
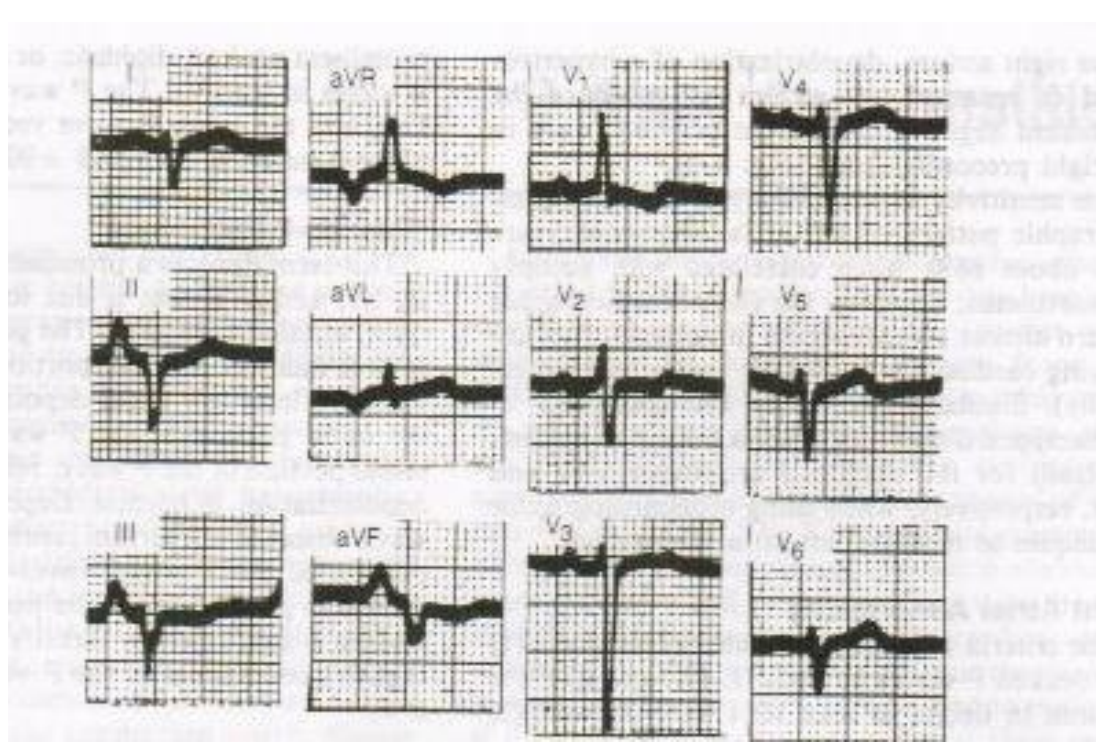


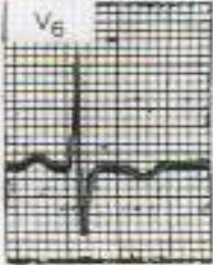
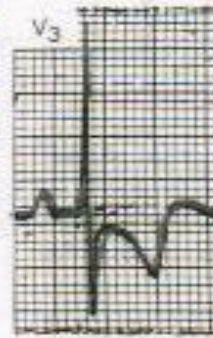
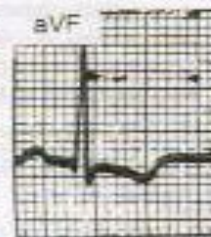
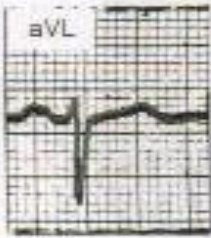
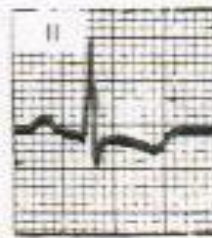
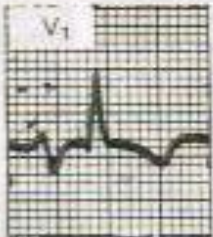
The vector of the P wave is directed towards the right and slightly anteriorly. The normal angle of the P wave is 0° . The vector is

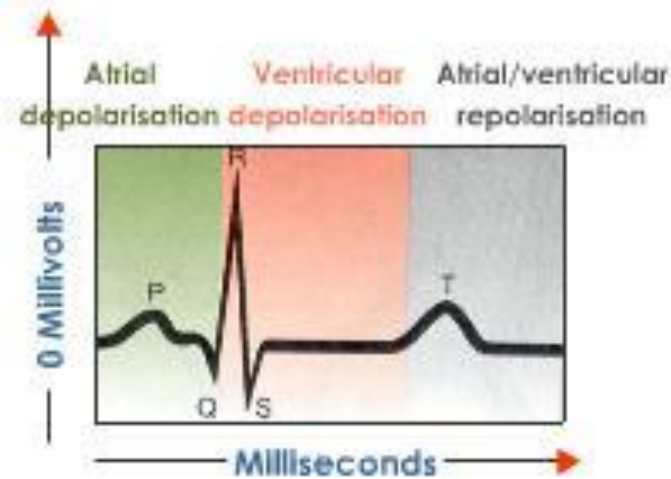
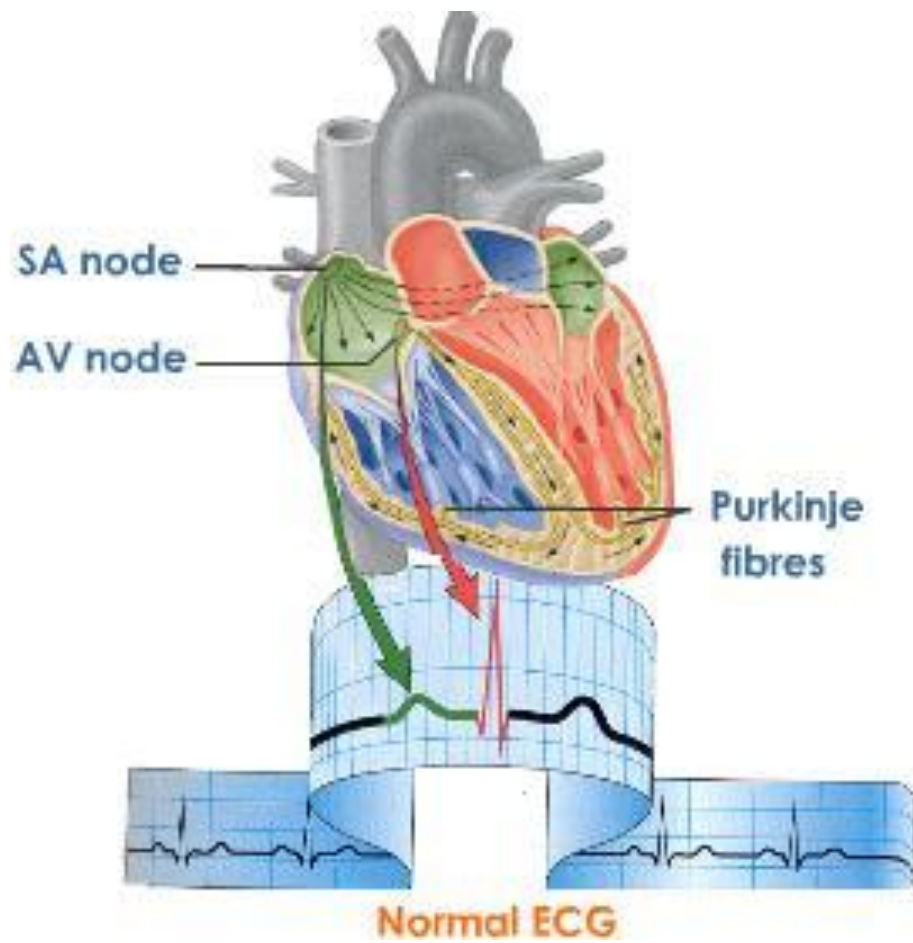


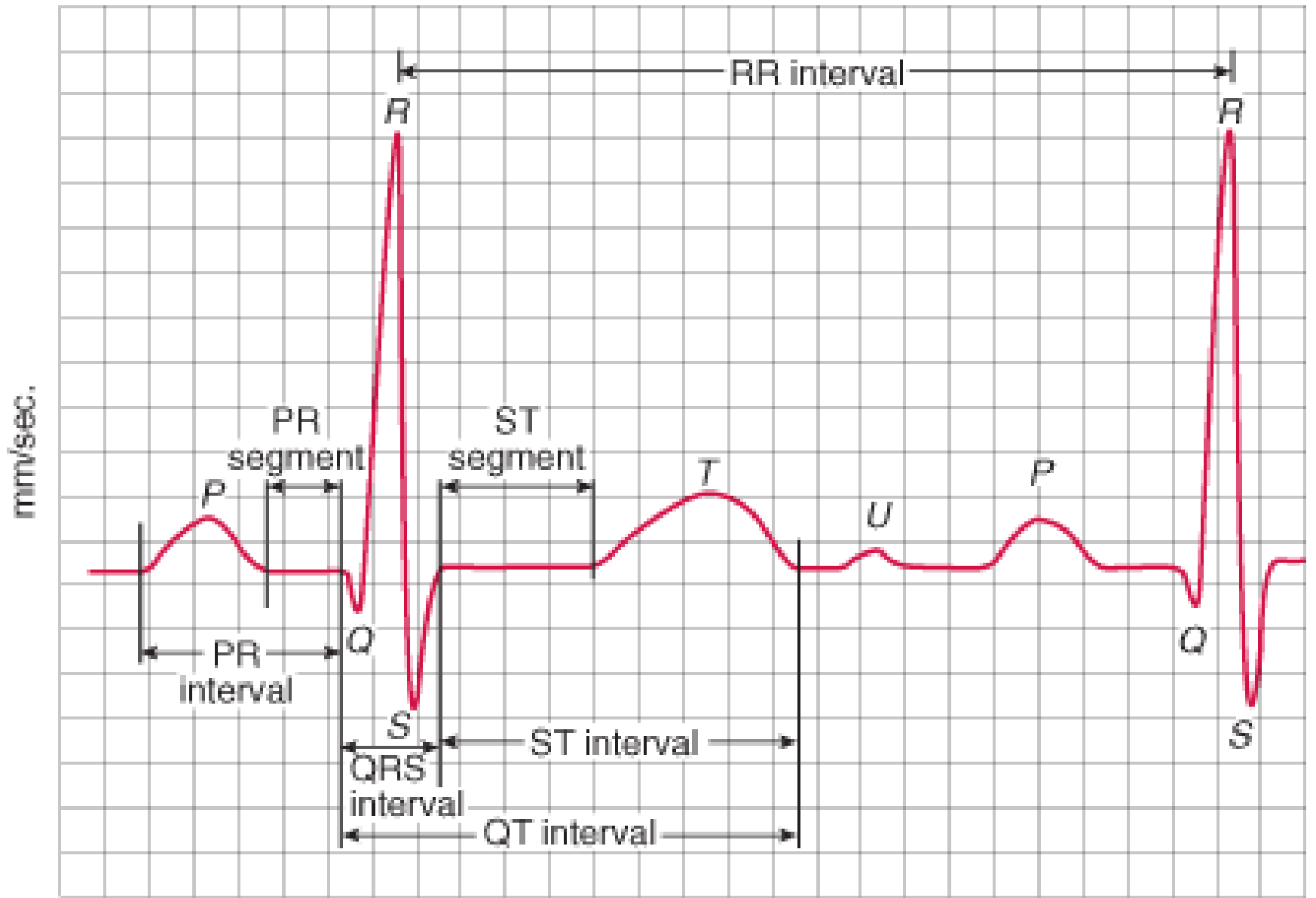
directed towards the right. The normal angle of the P wave is 0° . The vector is directed towards the right. The normal angle of the P wave is 0° . The vector is directed towards the right.





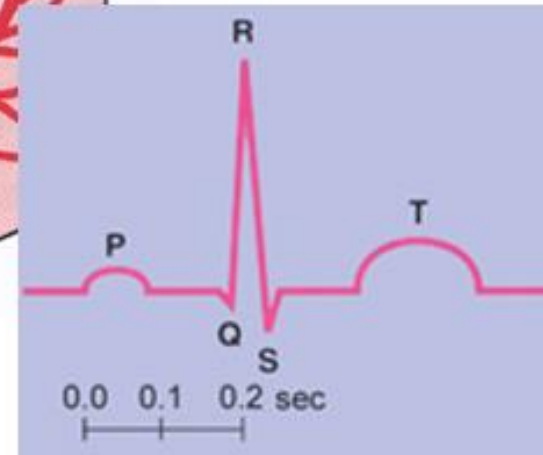
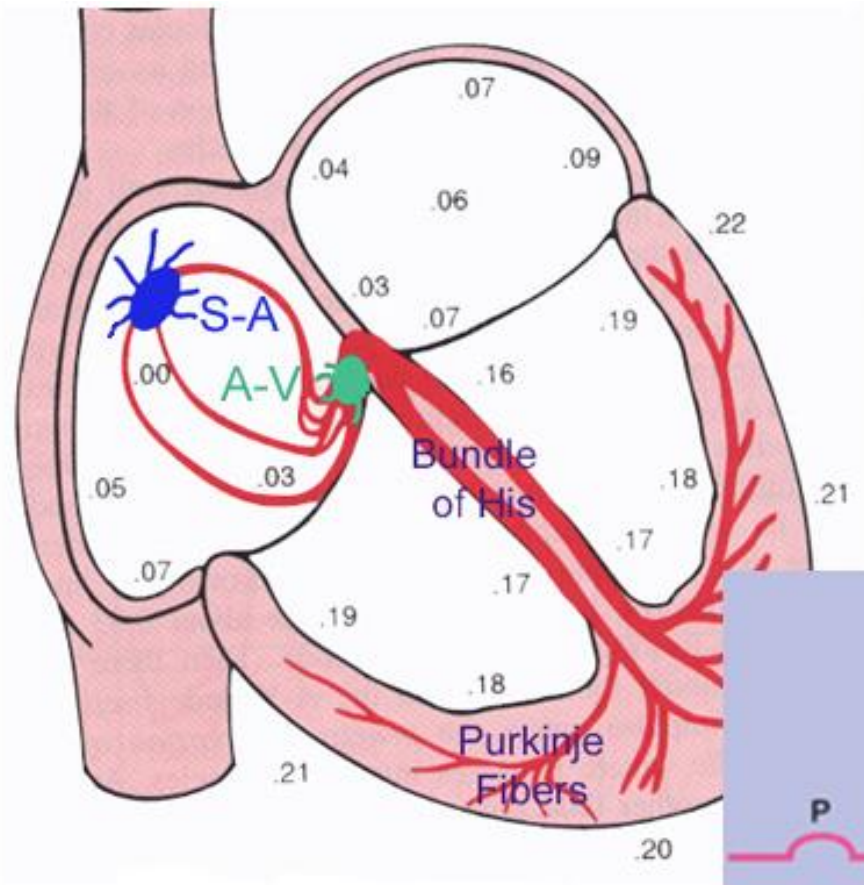






mm/mV 1 square = 0.04 sec/0.1mV

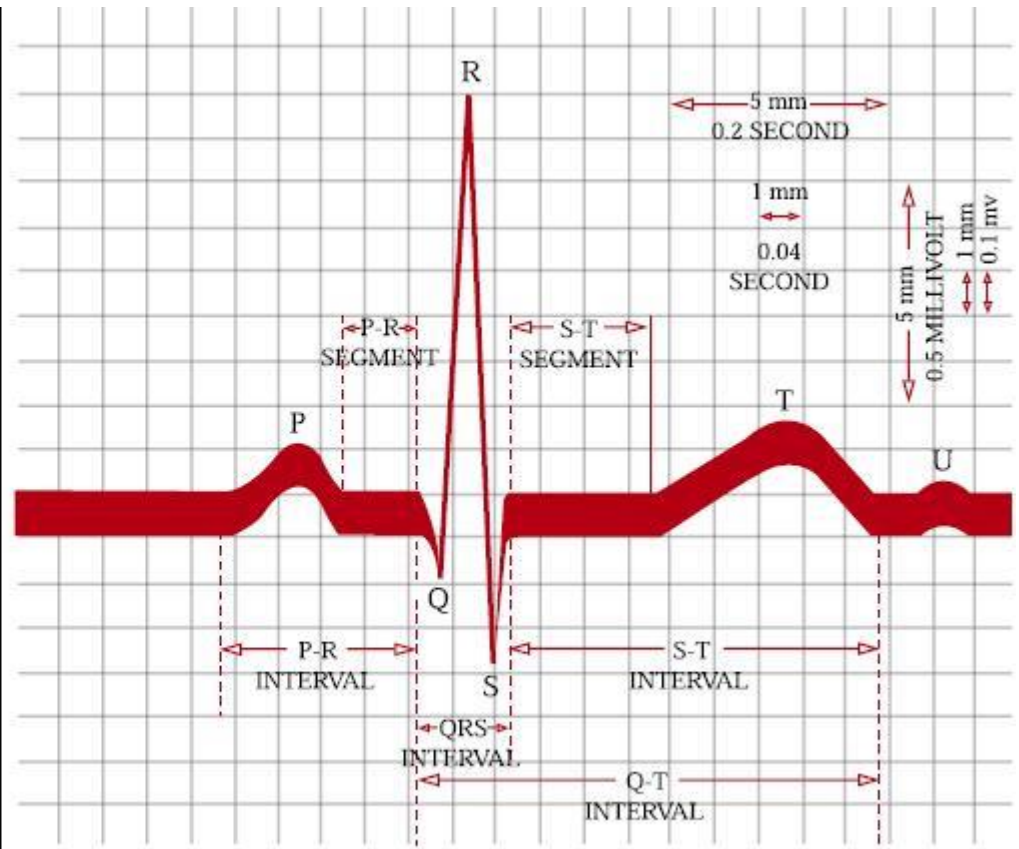
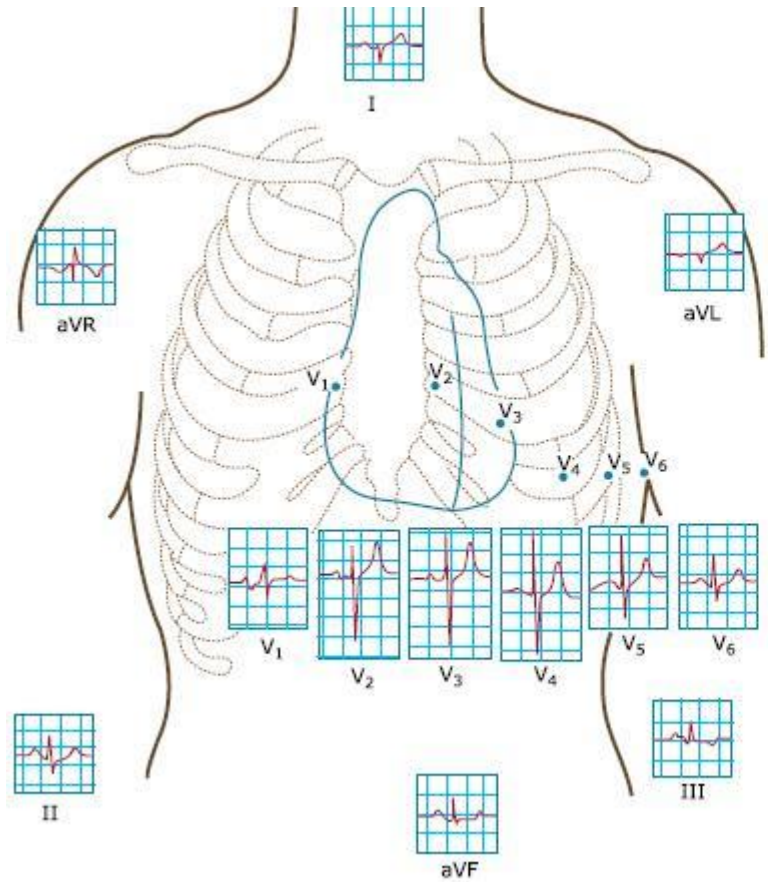


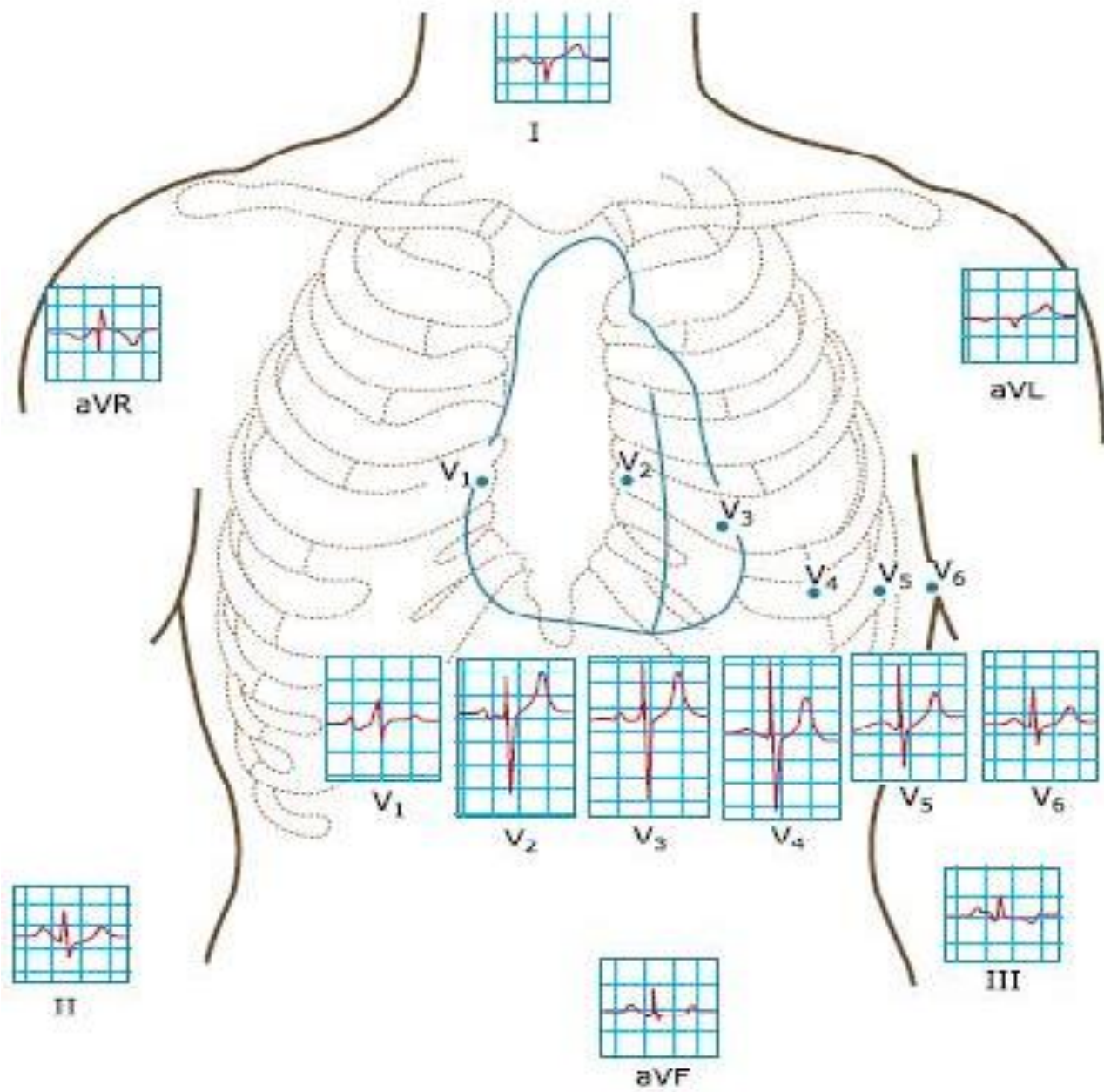


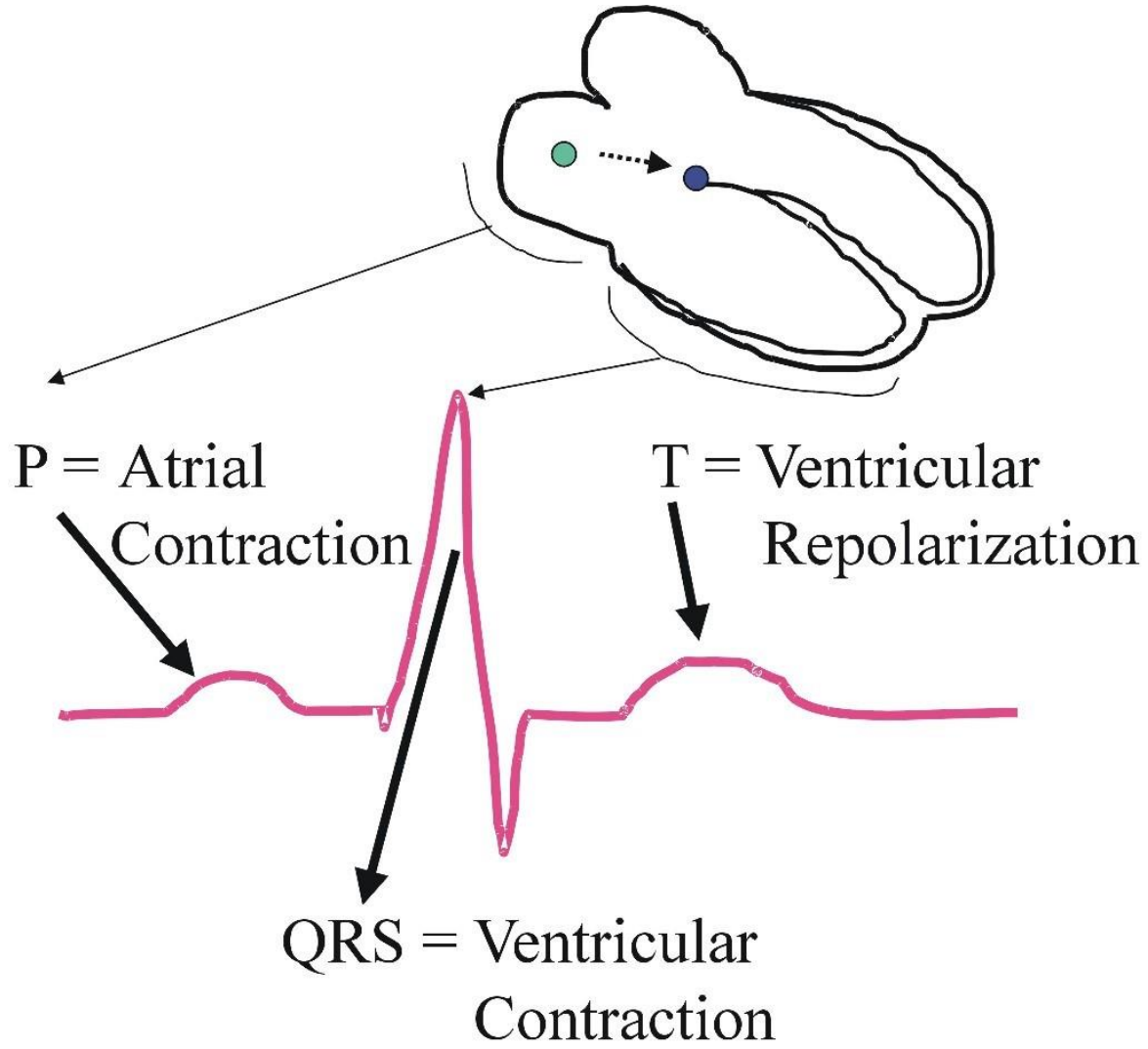
See also:
Figure 14-21

QRS کمپلکس

- Three deflections following P wave
- Indicates ventricular depolarization (and contraction)
- Q Wave: First negative deflection
- R Wave: First positive deflection
- S Wave: First negative deflection after R wave



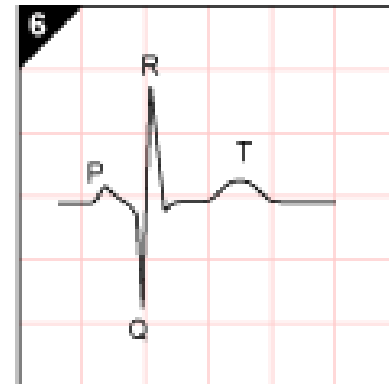
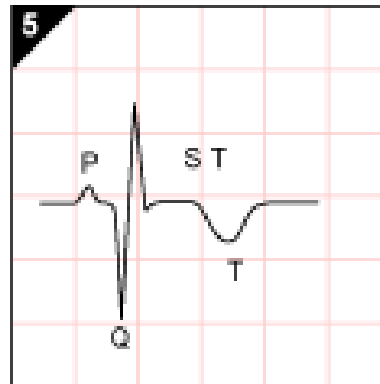
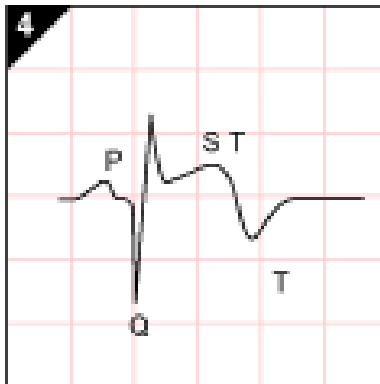
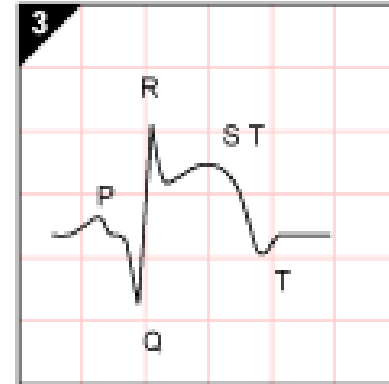
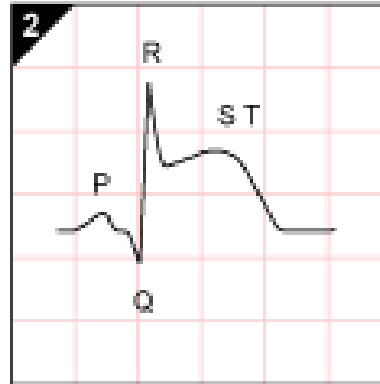
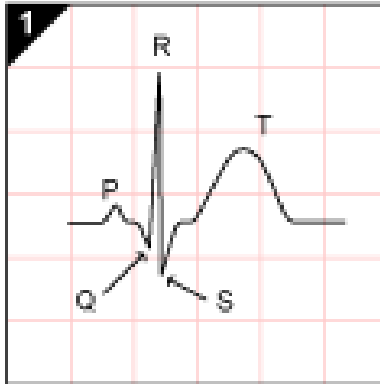




ST segment

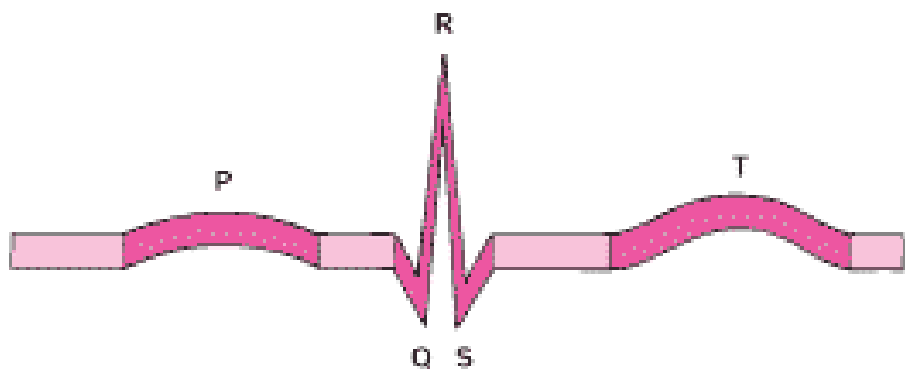
- Distance between S wave and beginning of T wave
- Measures time between ventricular depolarization and beginning of repolarization(77)

کلیک کنید



موج T

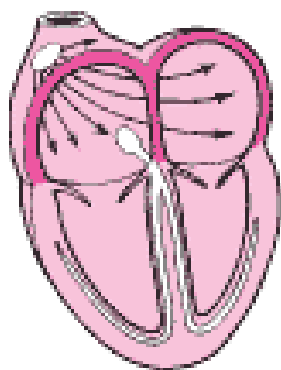
- Rounded upright (positive) wave following QRS
- Represents ventricular repolarization
- QT interval: Measured from beginning of QRS to end of T wave.
- Represents total ventricular activity.



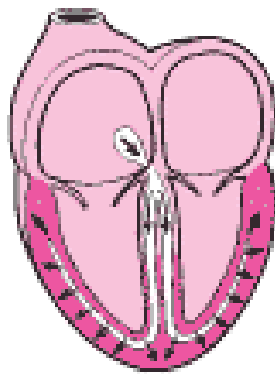
Onda P

Complejo QRS

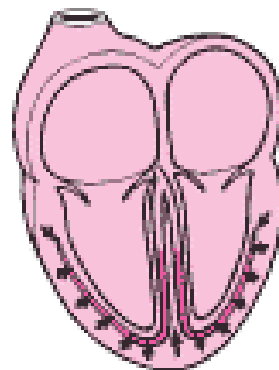
Onda T



Activación de los atrios

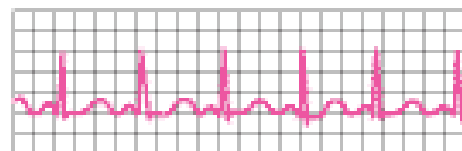


Activación de los ventrículos

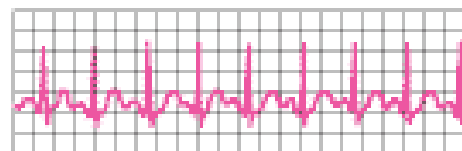


Onda de recuperación

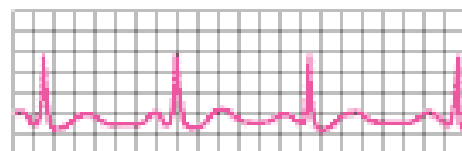
Latido normal



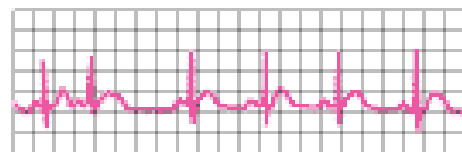
Latido demasiado rápido

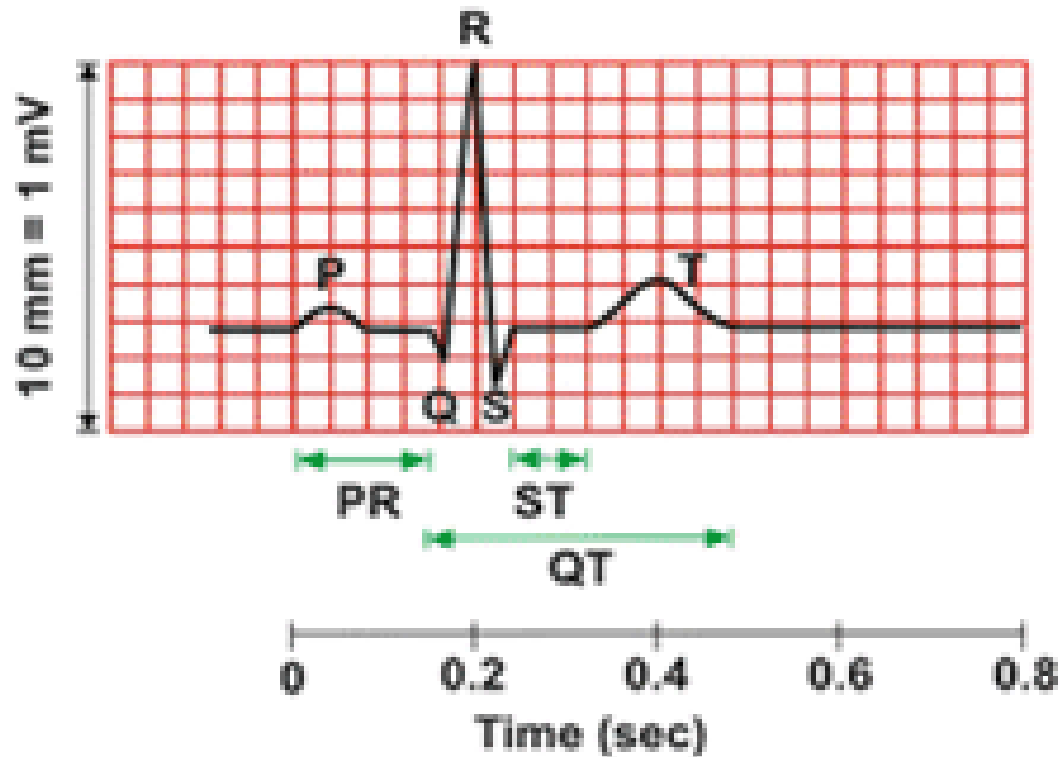


Latido demasiado lento



Latido irregular





P wave (0.08 - 0.10 s)

QRS (0.06 - 0.10 s)

P-R interval (0.12 - 0.20 s)

Q-T_c interval (≤ 0.44 s)*

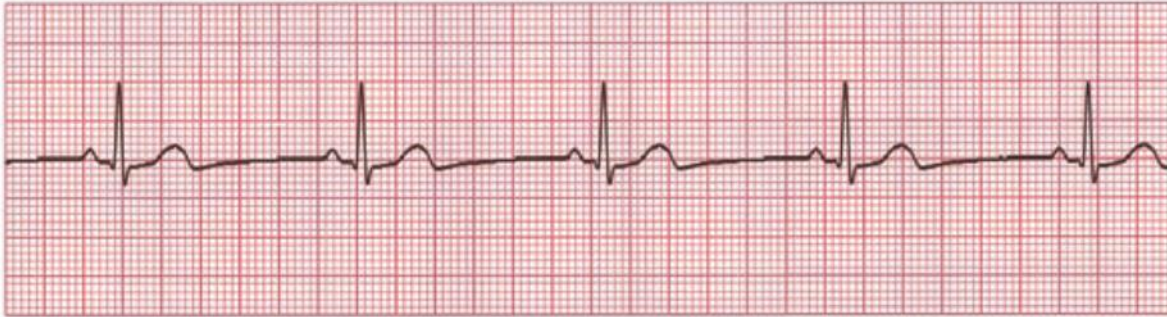
$$*QT_c = \frac{QT}{\sqrt{RR}}$$

تعیین rate

Method 1: Count Large Boxes

Regular rhythms can be quickly determined by counting the number of large graph boxes between two R waves. That number is divided into 300 to calculate bpm. The rates for the first one to six large boxes can be easily memorized.

Remember: 60 sec/min divided by 0.20 sec/large box = 300 large boxes/min. (23)



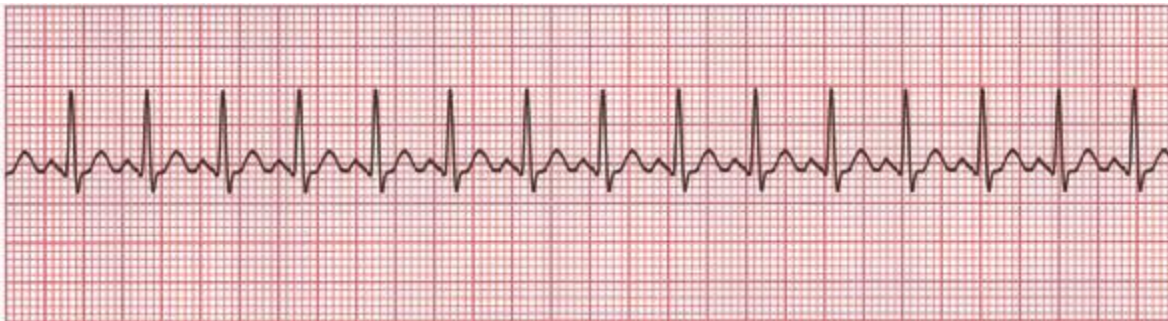
کلیک کنید

Method 2: Count Small Boxes

Sometimes it is necessary to count the number of small boxes between two R waves for fast heart rates. That number is divided into 1500 to calculate bpm. Remember: 60 sec/min divided by 0.04 sec/small box = 1500 small boxes/min.

Examples: If there are six small boxes between two R waves:
 $1500/6 = 250$ bpm.

If there are ten small boxes between two R waves:
 $1500/10 = 150$ bpm.(23)



Method 3: Six-Second ECG Rhythm Strip

The best method for measuring irregular rates with varying R-R intervals is to count the number of R waves in a 6-sec strip and multiply by 10. This gives the



Using 6-sec ECG rhythm strip to calculate heart rate. Formula: $7 \times 10 = 70$ bpm

تفسير ريثم قلب :

1) rate

The bpm is commonly the ventricular rate.

If atrial and ventricular rates differ, as in a 3rd-degree block, measure both rates.

Normal: 60–100 bpm

Slow (bradycardia): 60 bpm

Fast (tachycardia): 100 bpm

2) Regularity

Measure R-R intervals and P-P intervals.

Regular: Intervals consistent

Regularly irregular: Repeating pattern

Irregular: No pattern

- 3) P Waves
- present: Same in size, shape, position?
- Does each QRS have a P wave?
- Normal: Upright (positive) and uniform
- Inverted: Negative
- Notched: P'
- None: Rhythm is junctional or ventricular.

PR Interval

- Constant: Intervals are the same.
- Variable: Intervals differ.
- Normal: 0.12–0.20 sec and constant

QRS Interval

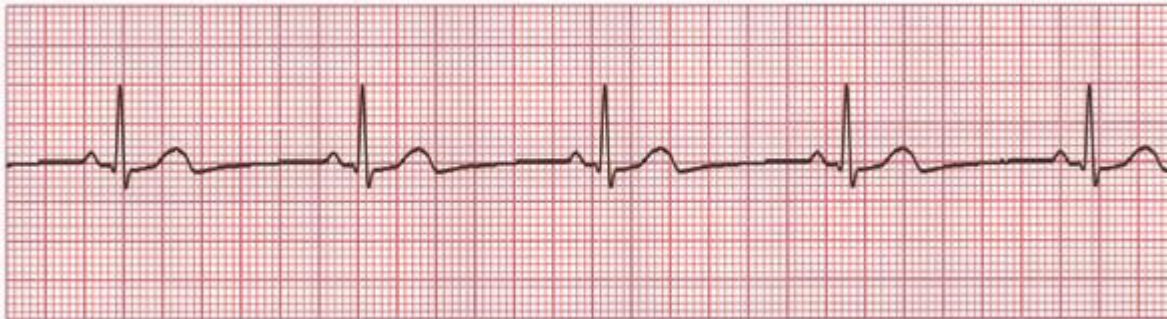
- Normal: 0.06–0.10 sec
- Wide: 0.10 sec
- None: Absent

QT Interval

- Beginning of R wave to end of T wave
- Varies with HR.
- Normal: Less than half the R-R interval



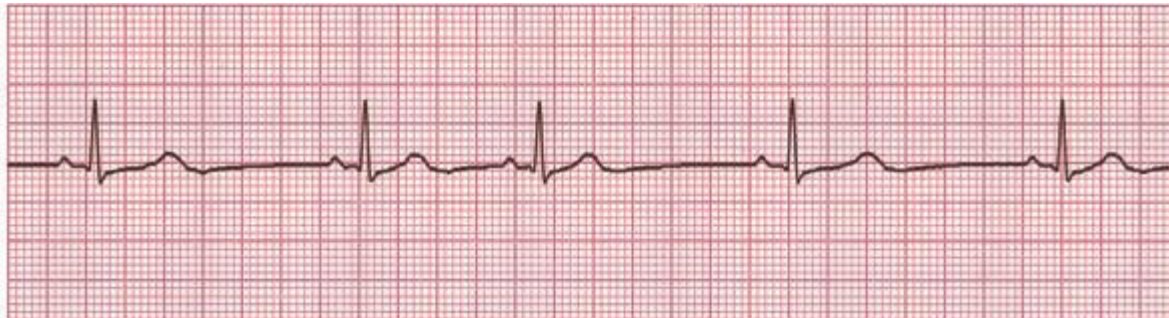
Normal Sinus Rhythm (NSR)



Sinus Bradycardia

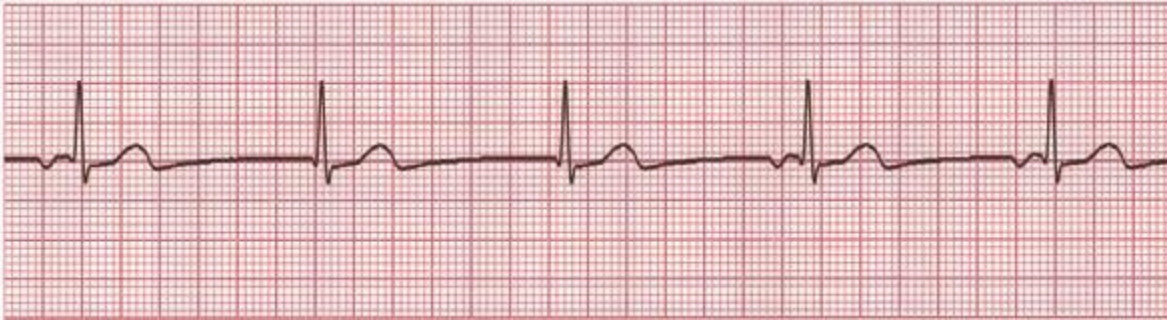


Sinus Tachycardia



Sinus Arrhythmia

1) ریتیم جانکشنال





Idioventricular Rhythm

تعیین محور قلب

Electrical Axis of the Heart

The electrical axis is the sum total of all electrical currents generated by the ventricular myocardium during depolarization. Analysis of the axis may help to determine the location and extent of cardiac injury, such as ventricular hypertrophy, bundle branch block, or changes in the position of the heart in the chest

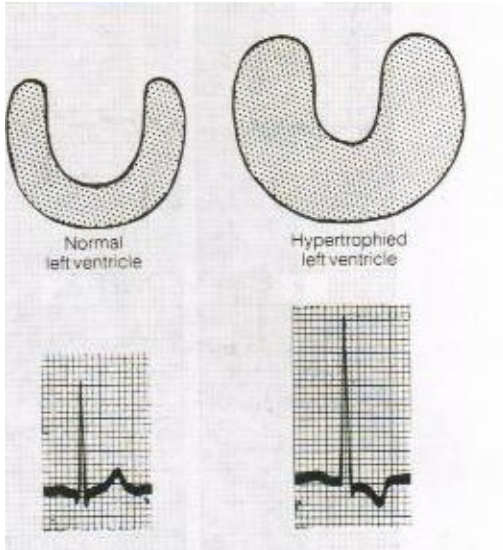
(from, e.g., pregnancy or ascites).

The direction of the QRS complex in leads I and aVF determines

the axis quadrant in relation to the heart. (صفحه 74)

کلیک کنید

تعیین هیپرتروفی بطن ها



• هیپرتروفی بطن چپ

جمع عددی ارتفاع موج R در V6 با عمق موج S در V1 بیشتر از 35 شود .

هیپرتروفی بطن راست

جمع عددی ارتفاع موج S در V6 با عمق موج R در V1 بیشتر از 10 شود .

