

(VII.) Electrocardiography

Physiology

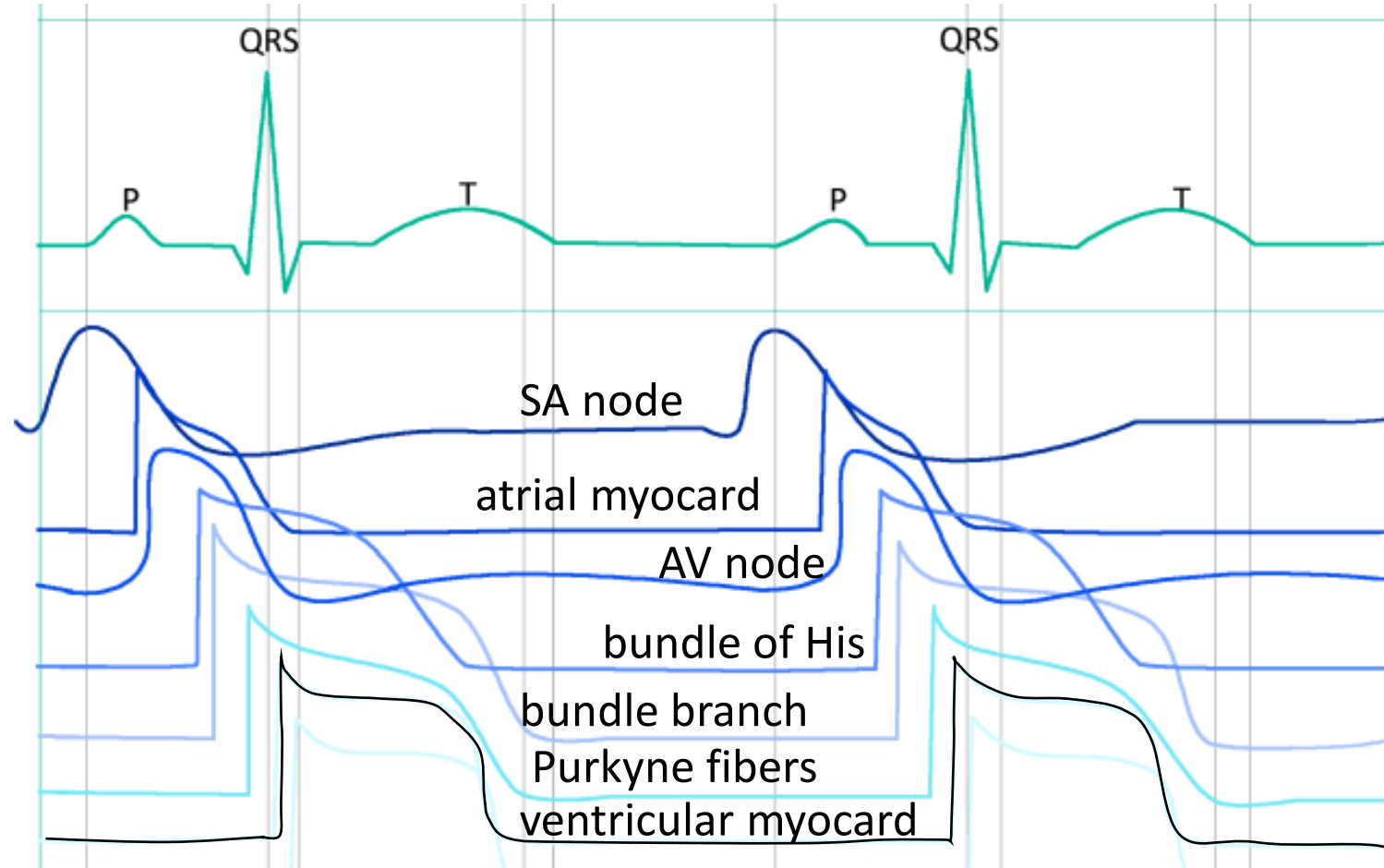
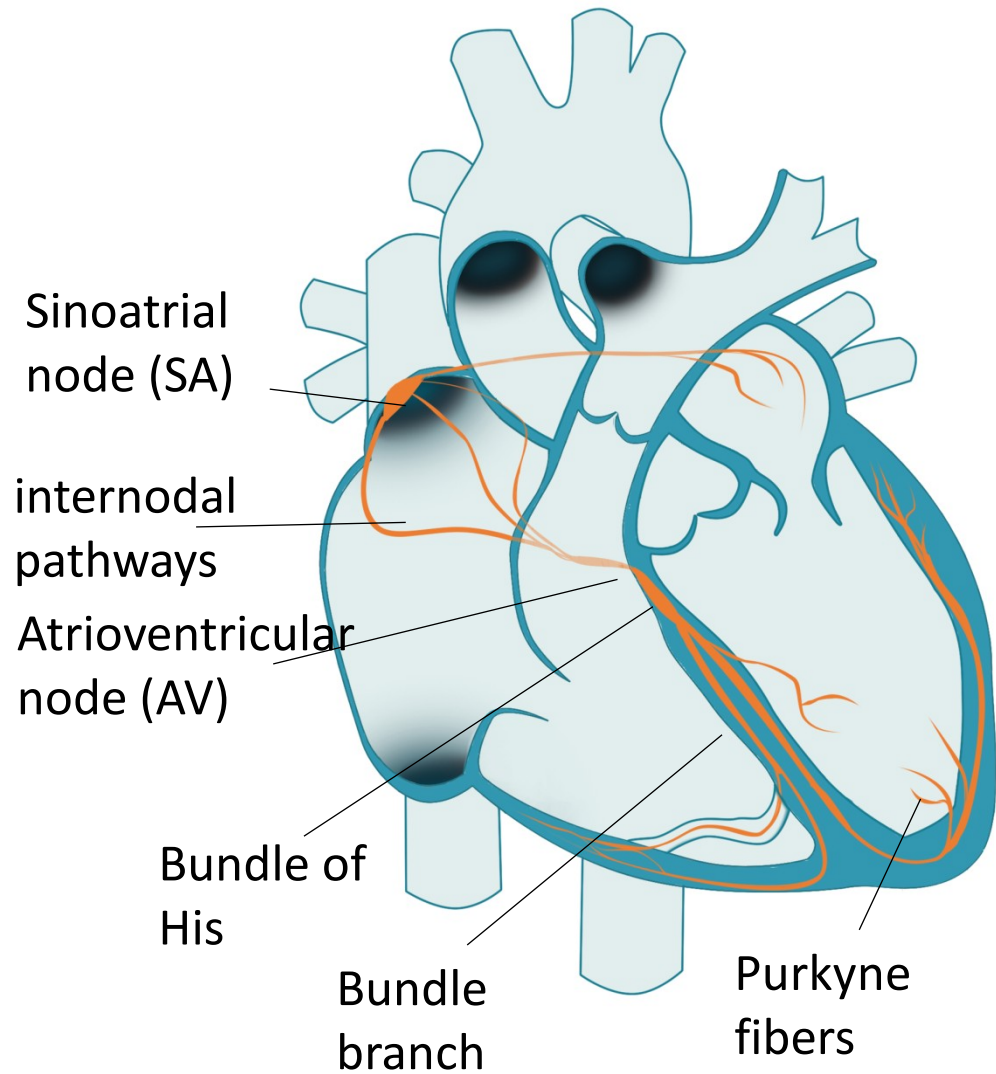
Electrocardiography

Definition: the process of recording the electrical activity of the heart

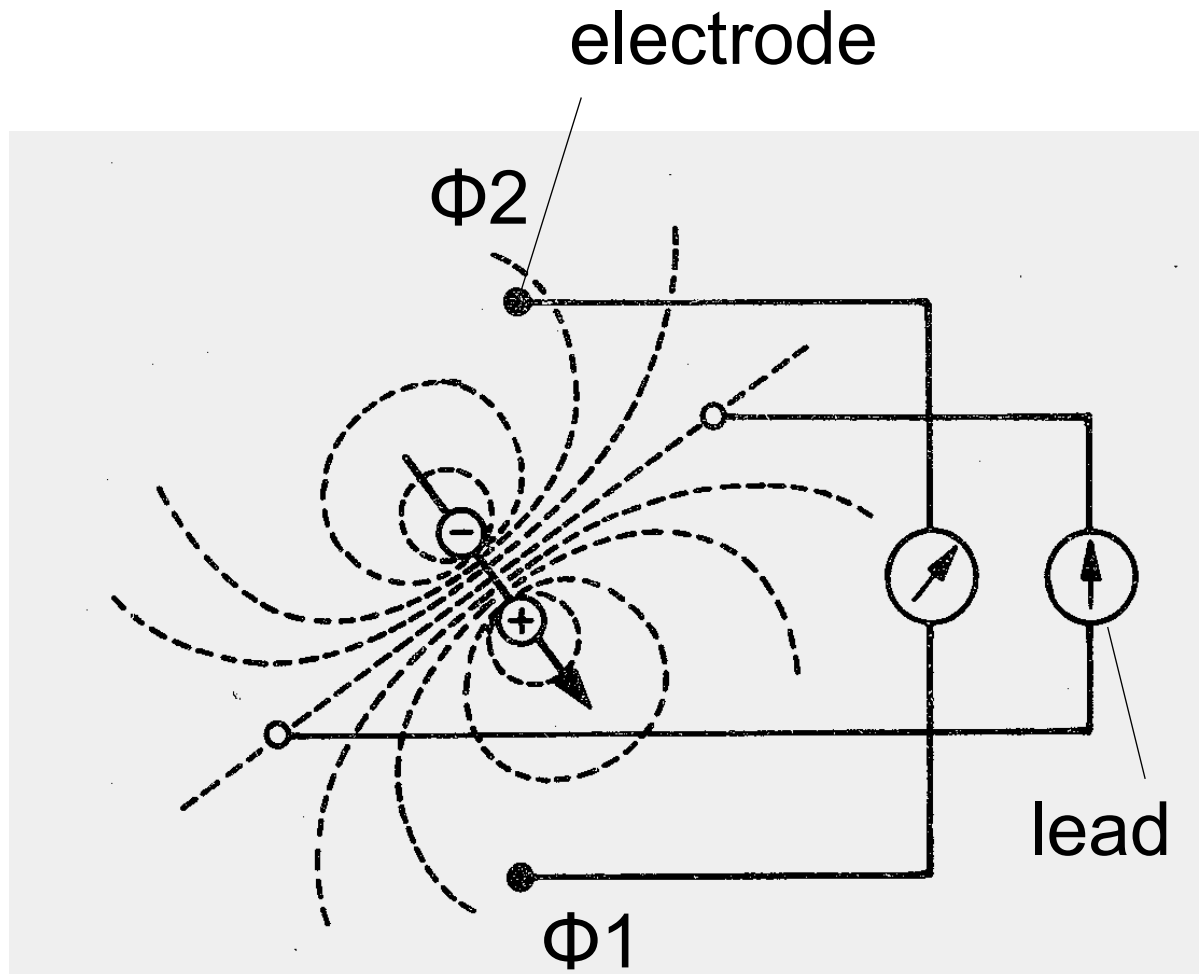
Keywords

- Specialized excitatory and conductive system of the heart
- equipment for ECG recording
- limb and chest leads
- unipolar and bipolar leads
- heart vector, electrical axis of the heart

Specialized excitatory and conductive system of the heart



Electric dipole



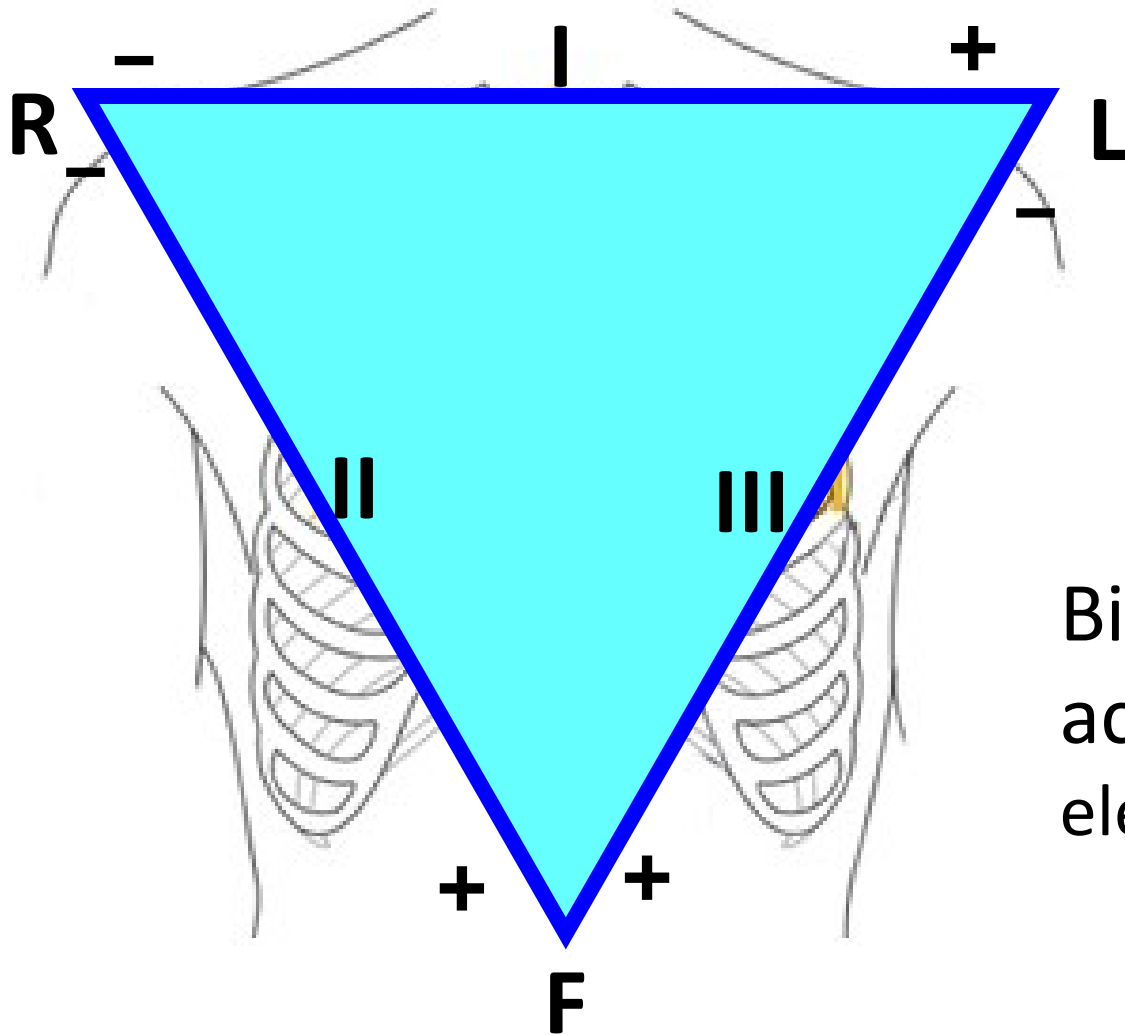
Electrode: records electrical potential (Φ)

Electric lead: connection of two electrodes

- Records voltage between electrodes
- Voltage: difference between el. potentials ($V = \Phi_1 - \Phi_2$)

Einthoven's triangle

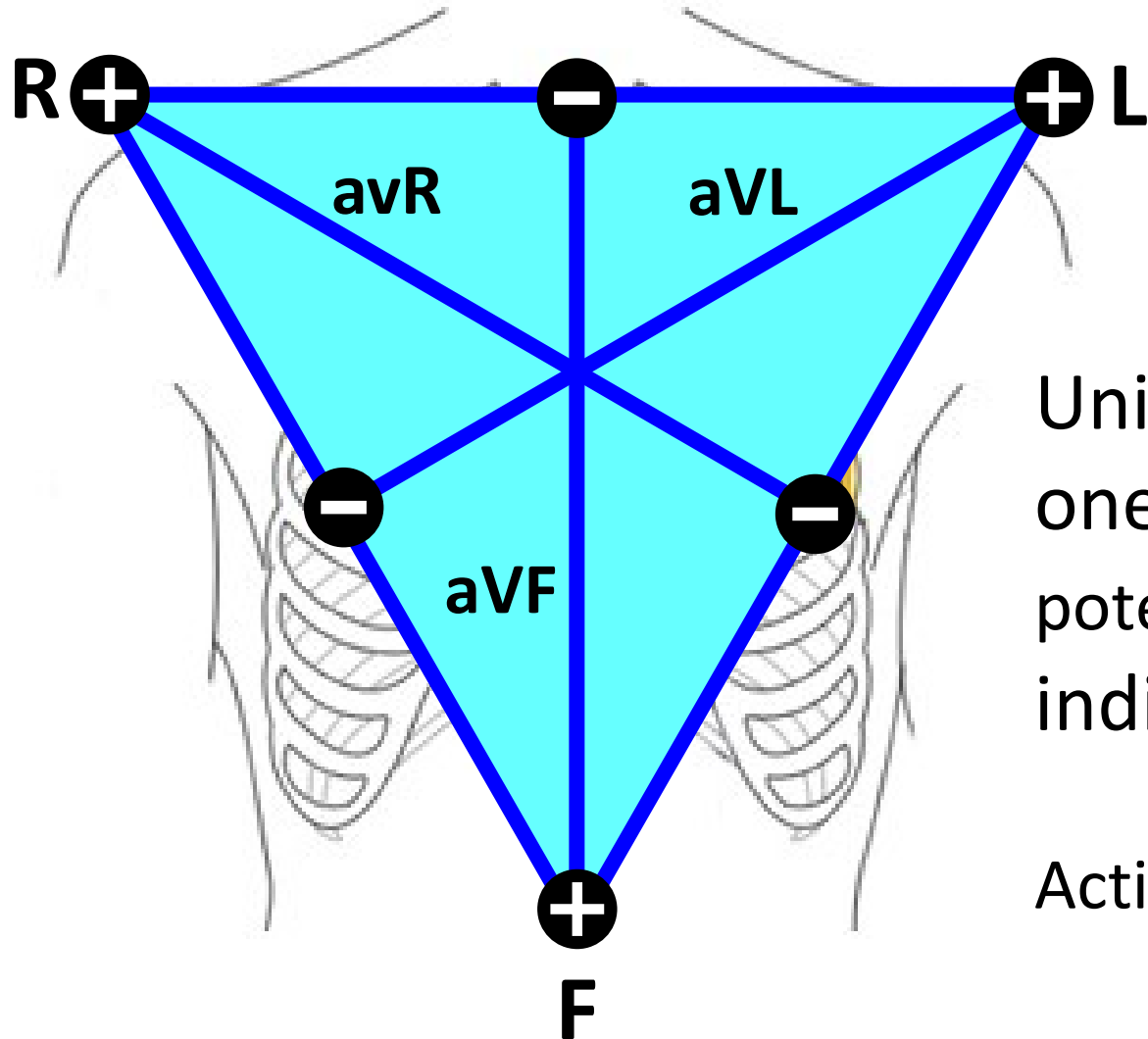
(standard, limb, bipolar leads)



Bipolar leads: both electrodes are active (variable potential en electrodes)

Augmented leads

(Goldberger's, limb, unipolar leads)

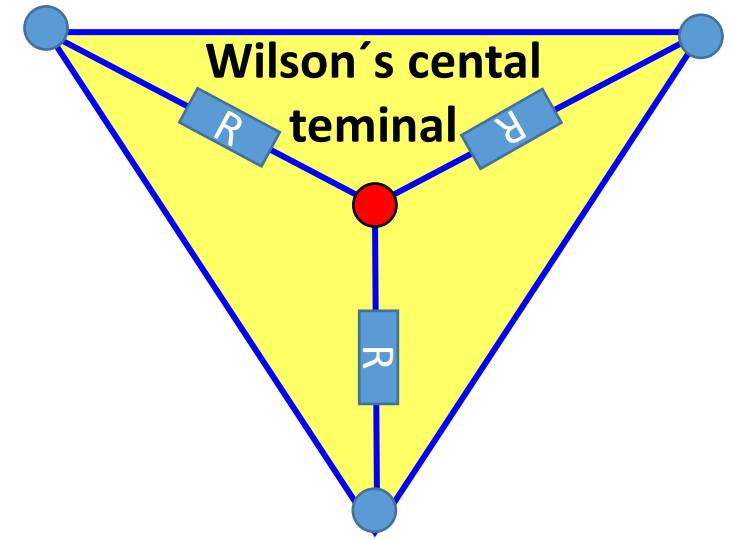
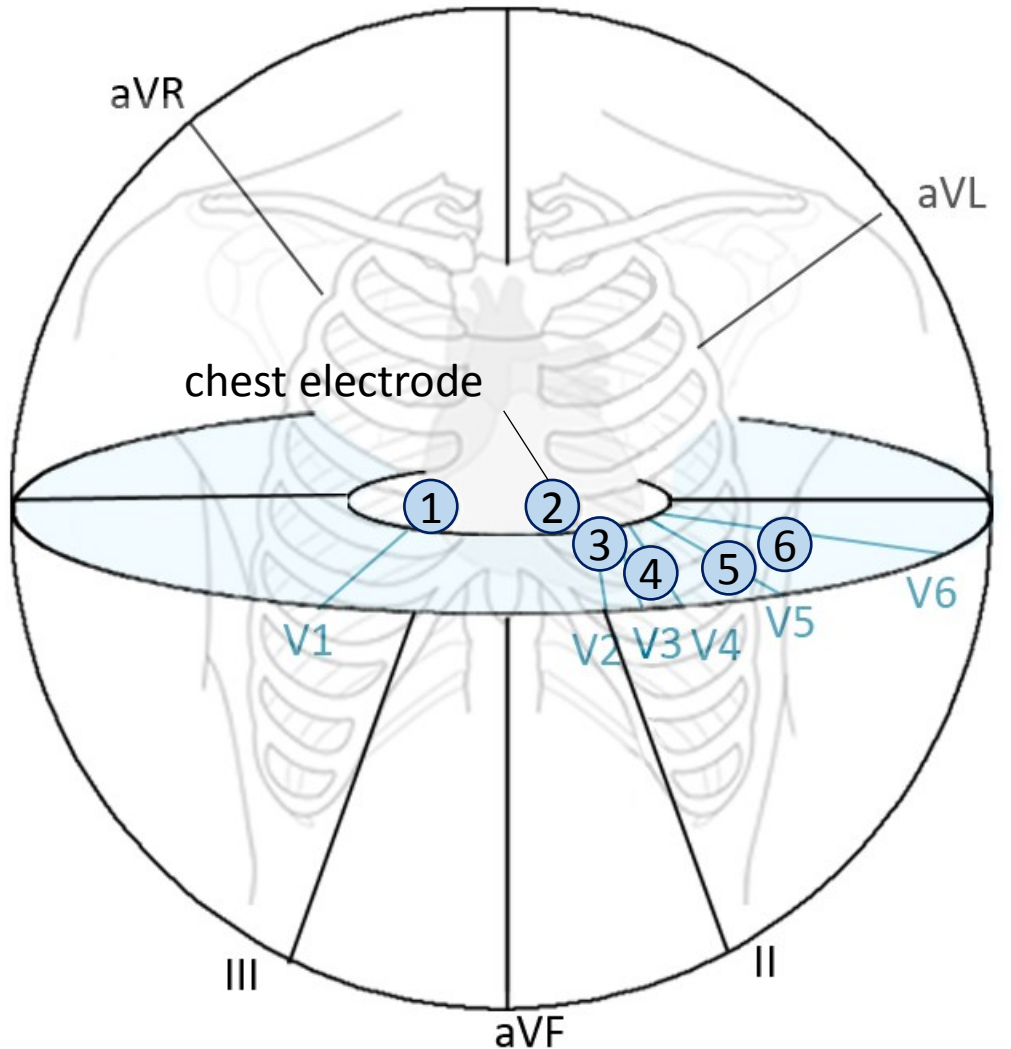


Unipolar leads:

one electrode is active (variable el. potential) and the second one is indifferent (constant el. potential)

Active electrode is always positive

Chest leads

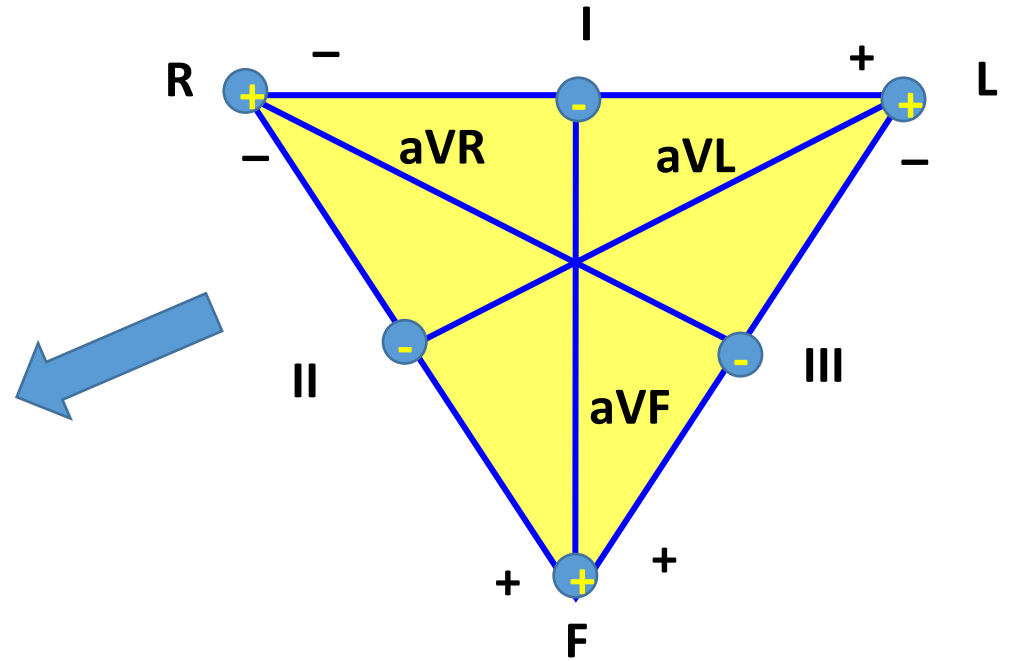
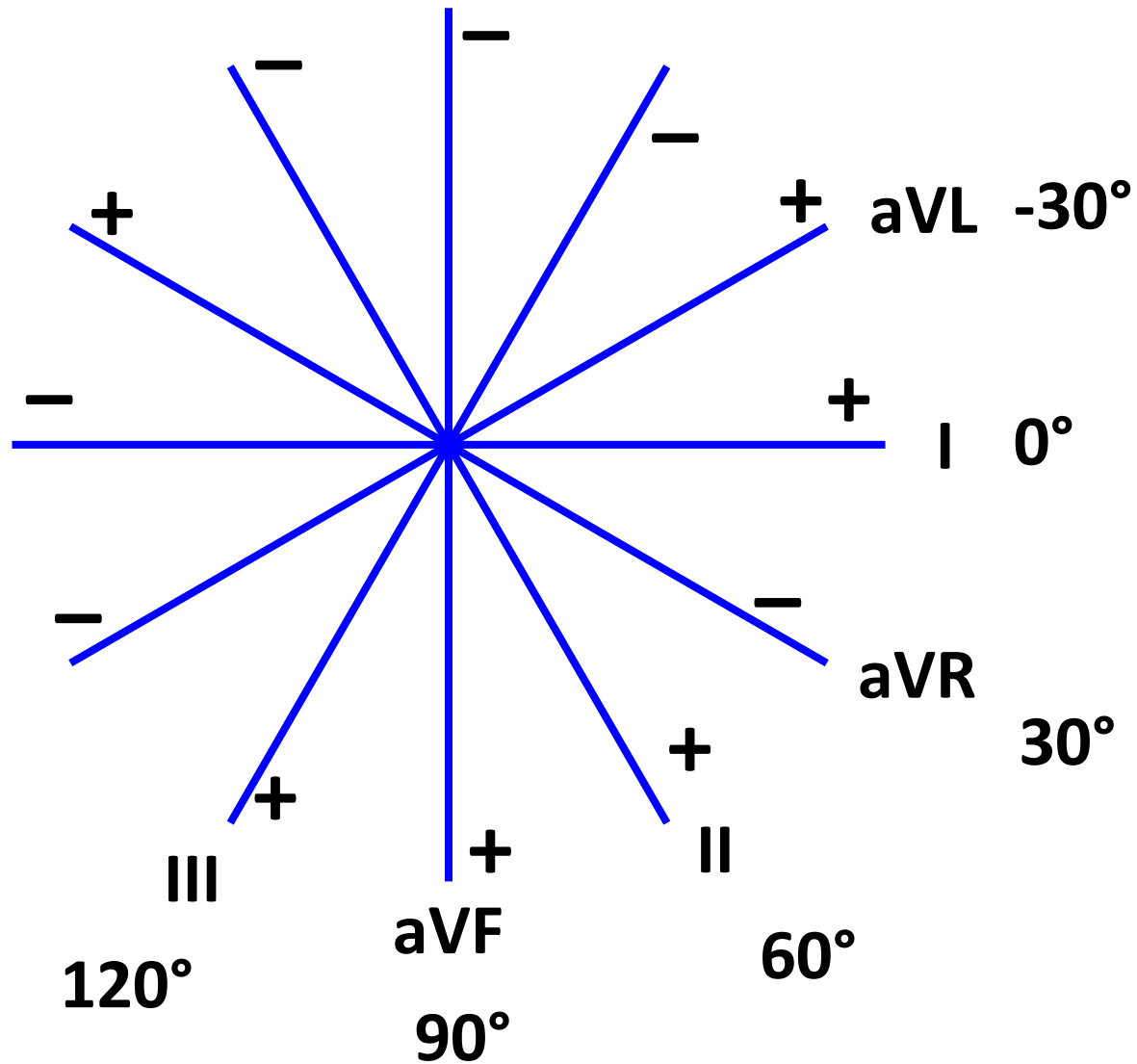


Chest electrode: connection of chest electrode and Wilson's central terminal

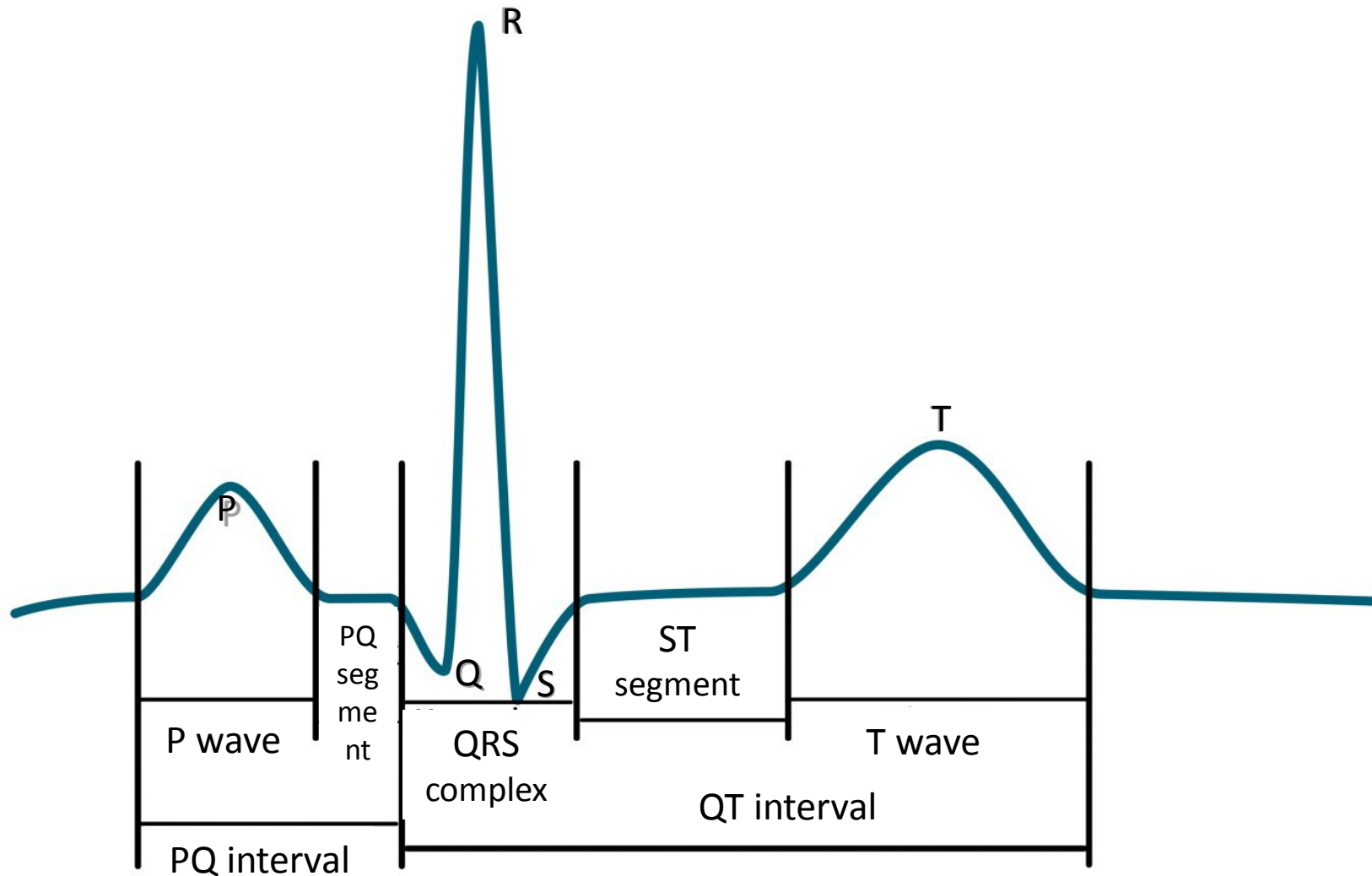
Unipolar leads:

chest electrodes are active (positive) and Wilson's central terminal is indifferent (el. potential 0 mV, electrically centre of the heart)

Leads according to Cabrera



ECG description



name	Norm
P wave	80 ms
Interval PQ (PR)	120-200 ms
Segment PQ (PR)	50-120 ms
Q	-
QRS	80-100ms
R	-
S	-
segment ST	80-120 ms
Interval QT	≥ 420 ms
wave T	160 ms

formula:



is on RR interval – correction of

Electrical axis of heart

Average deviation of QRS complex in each lead

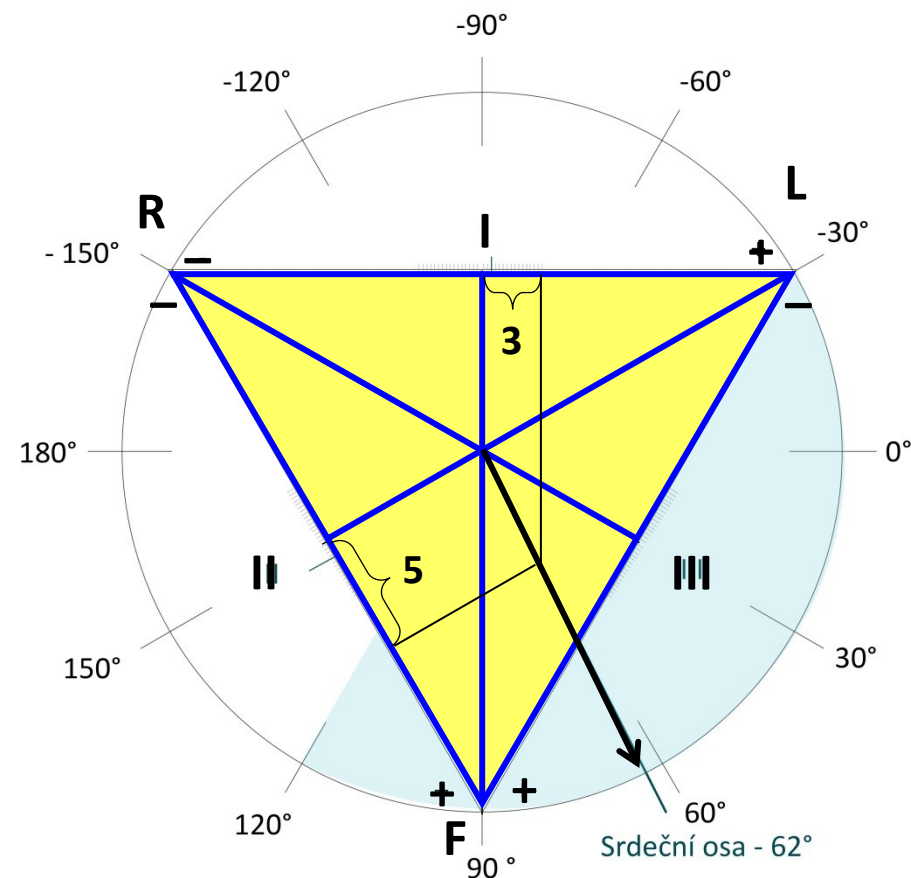
1. ORS of I,II and III lead



2. Sumation of QRS complex

I	II	III
Q = -1	Q = -1	Q = 0
R = 5	R = 6	R = 4
S = -1	S = 0	S = 0
3	5	4

3. Drawing in triangle



Physiological interval: -30 - 110

Diagnostic use of ECG

Arrhythmia: irregular heartbeat

Fibrillation: is the rapid, irregular, and unsynchronized activity of cardiac muscle fibers



Atrial fibrillation

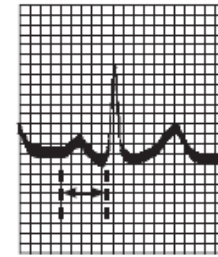
(absence of P, „jagged“ isolinia, irregular RR, HR 80 – 180 bpm)



Ventricular fibrillation

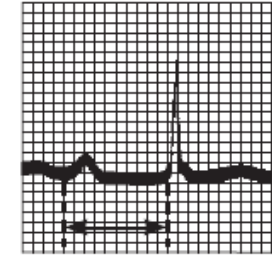
(heart cannot pump, brain damage after 3 – 5 min)

Atrioventricular block: conduction between the atria and ventricles of the heart is impaired



PR = 0.16 s

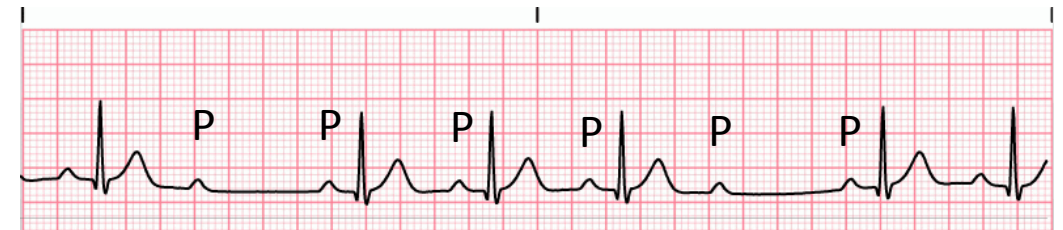
Normal complex



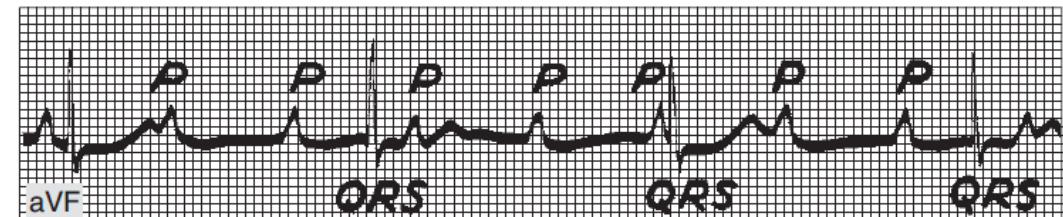
PR = 0.38 s

AV block I. degree

AV block
II. degree



AV block
III. degree



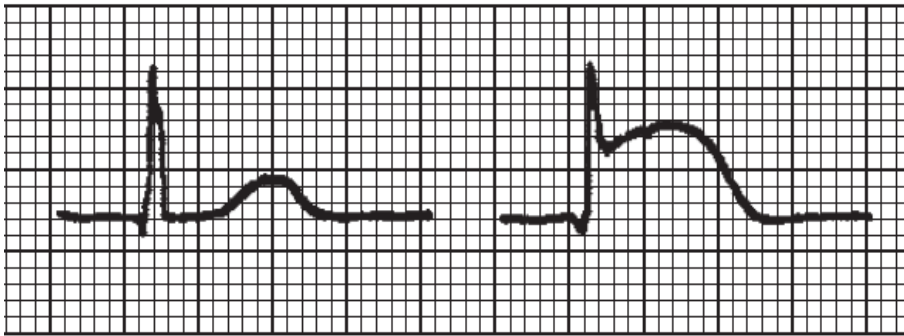
Complete heart block. Atrial rate, 107; ventricular rate, 43

Diagnostic use of ECG

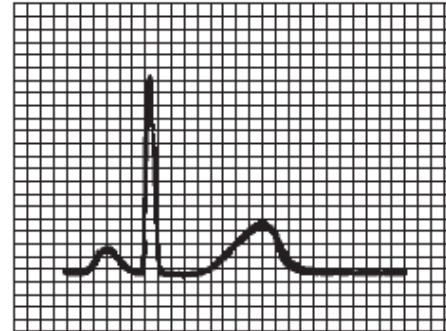
Myocardial ischemia, heart-attack

A

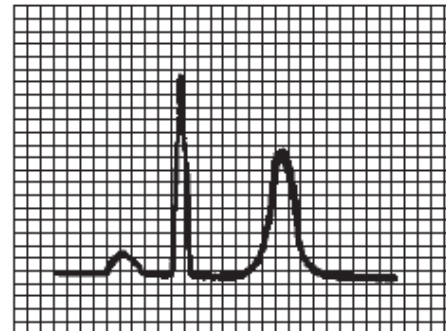
B (ST elevation)



hyperkalaemia



Normal tracing (plasma K^+ 4–5.5 meq/L).



Hyperkalemia (plasma K^+ >7.0 meq/L).

Diagnostic use of ECG

24-hour monitoring of ECG (Holter)

