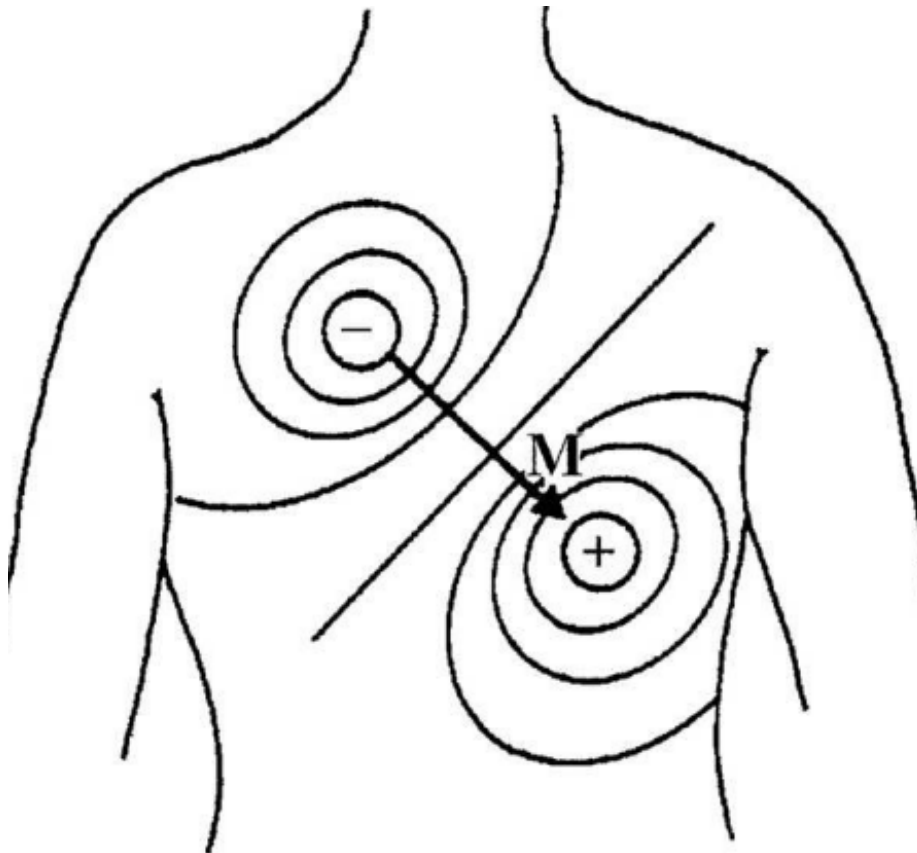# Electrocardiograph

Figure 1:

. . .

- Pairs of electrodes at different locations give different V at same t because of spatial structure of cardiac electric field
- ECG Leads - differential electrode config across the body
- Each picks up different projections of cardiac vector time waveform
- Pair of electrodes form a lead
- Lead Vector for pair of electrode locations
- Unit vector defines direction a const magnitude cardiac vector must have to generate maximal V in pair of electrodes positioned at given location
- Important to have standard positions, e.g. limbs, for clinical eval of ECG
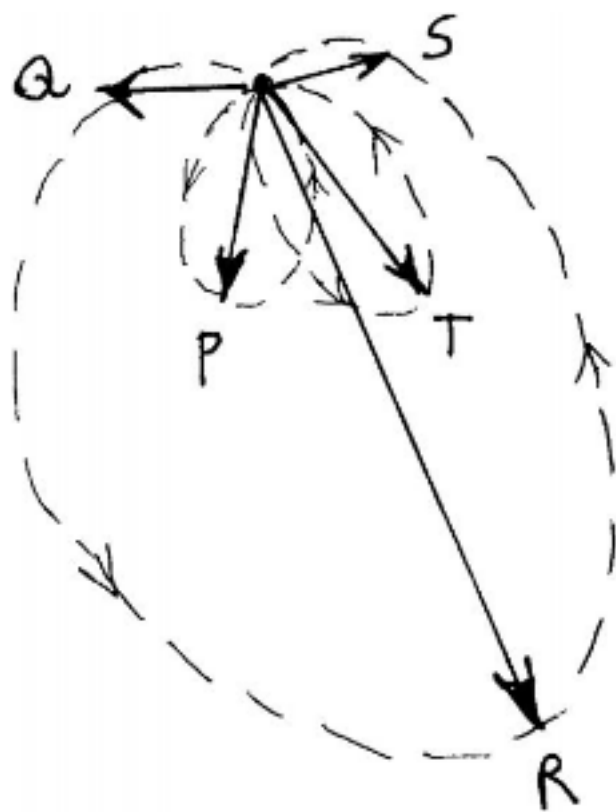
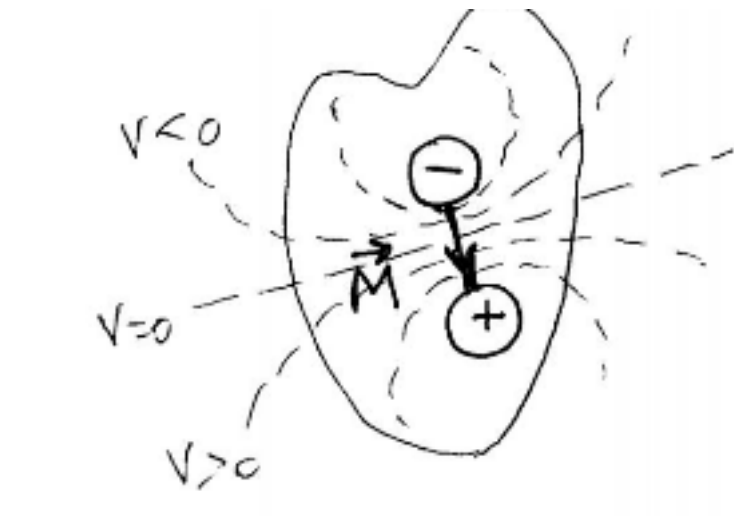- Lead vector a
- unit vector in direction $r_1 - r_2$

Figure 2:

Figure 3:
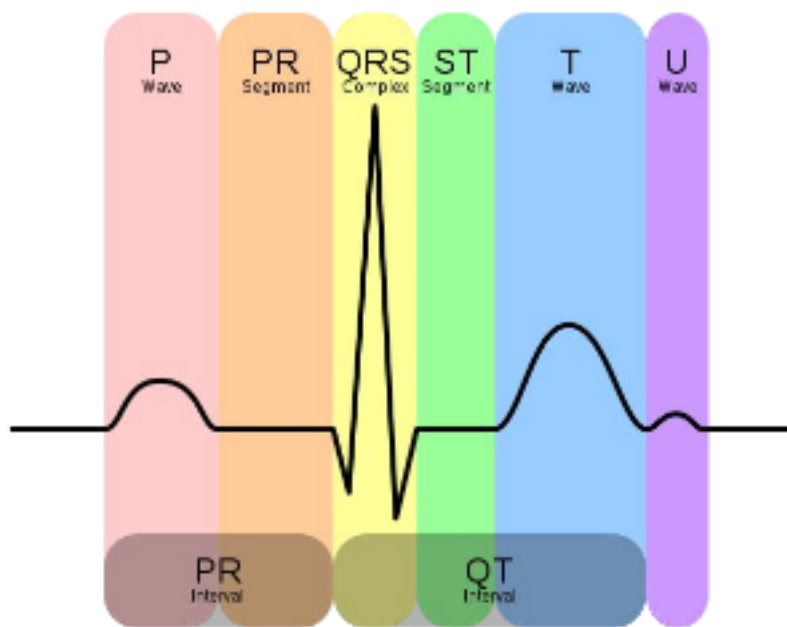

Figure 4:
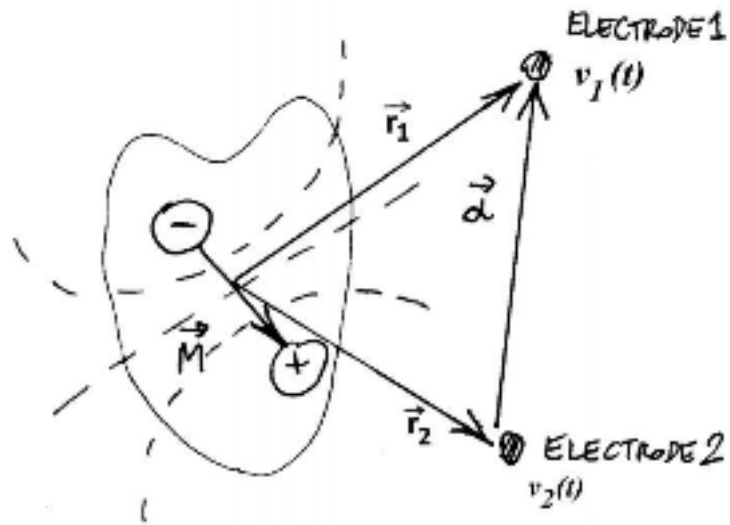
Figure 5:

- Lead Voltage
- $v_a(t) = v_1(t) - v_2(t)$
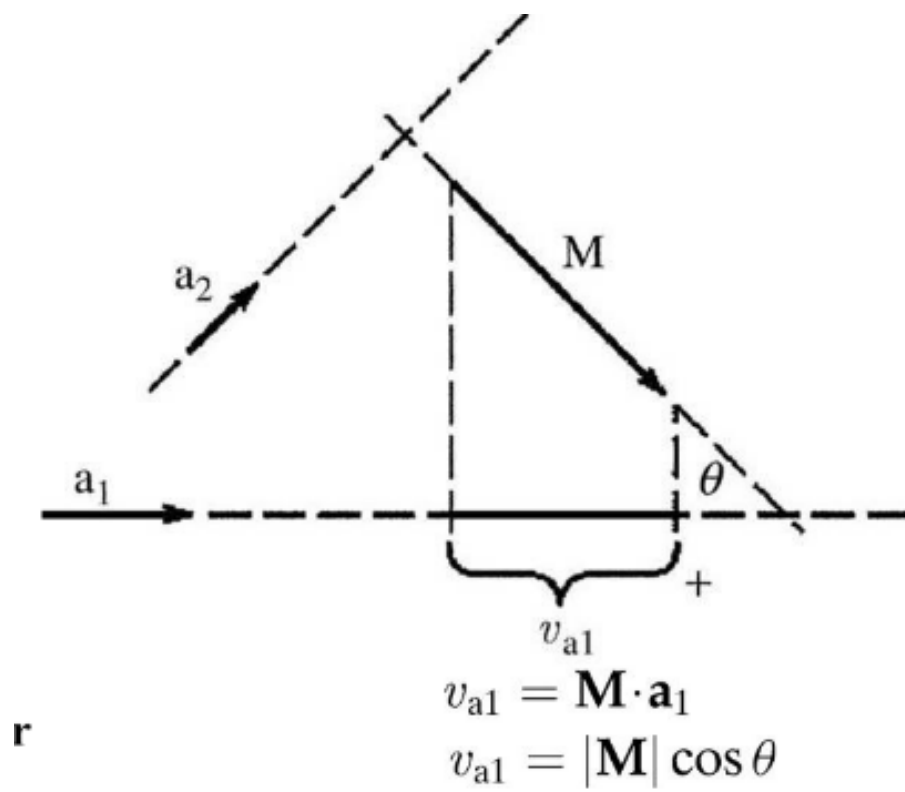- Differential V between end points of lead vector
- $v_a(t) = M(t).a$

4

$$v_{a1} = \mathbf{M} \cdot \mathbf{a}_1$$
$$v_{a1} = |\mathbf{M}| \cos \theta$$

Figure 6:

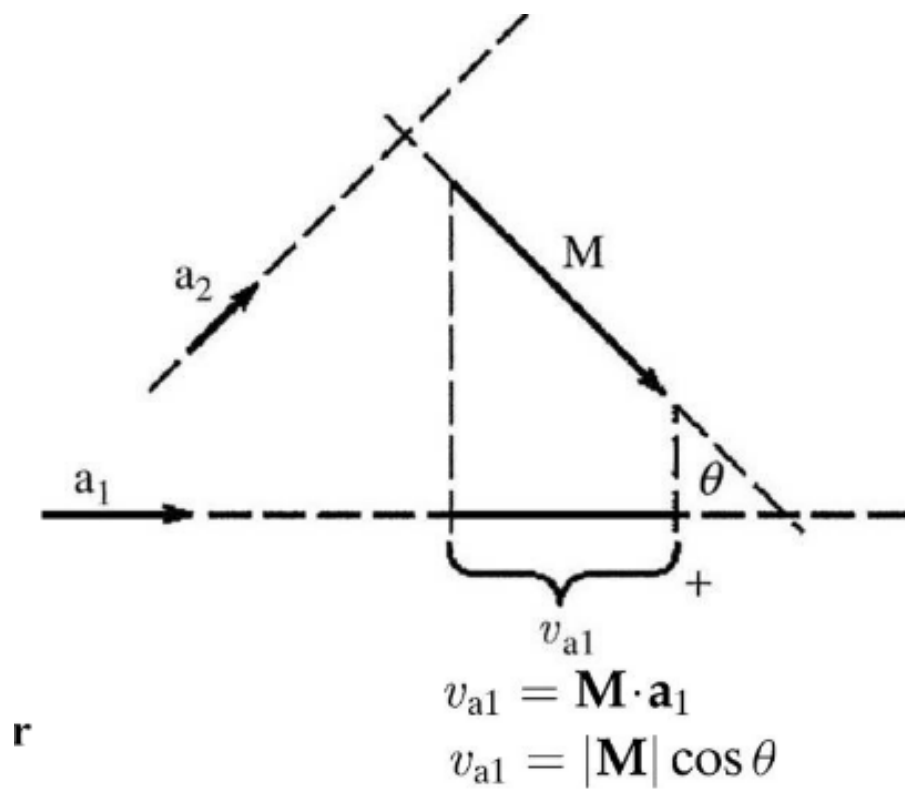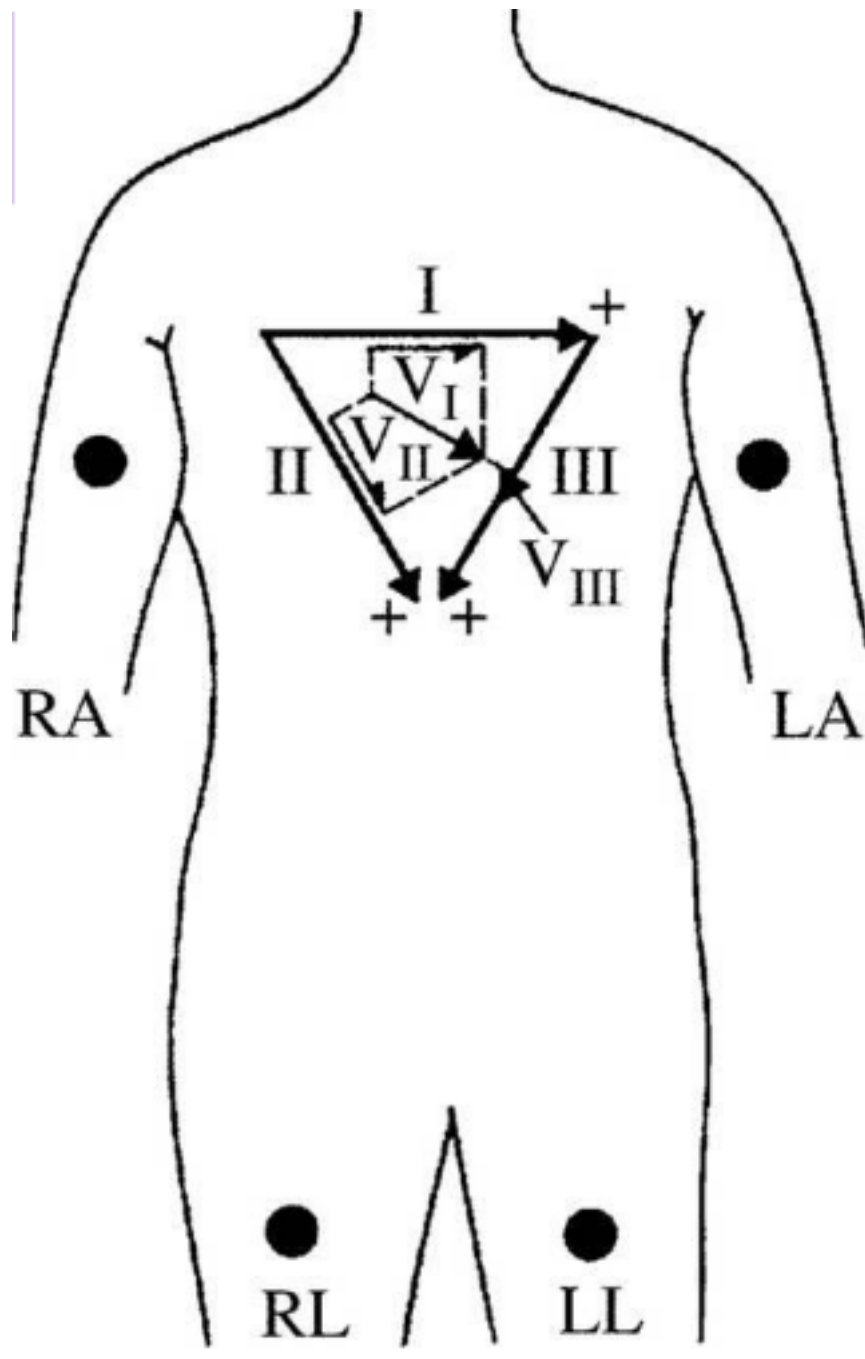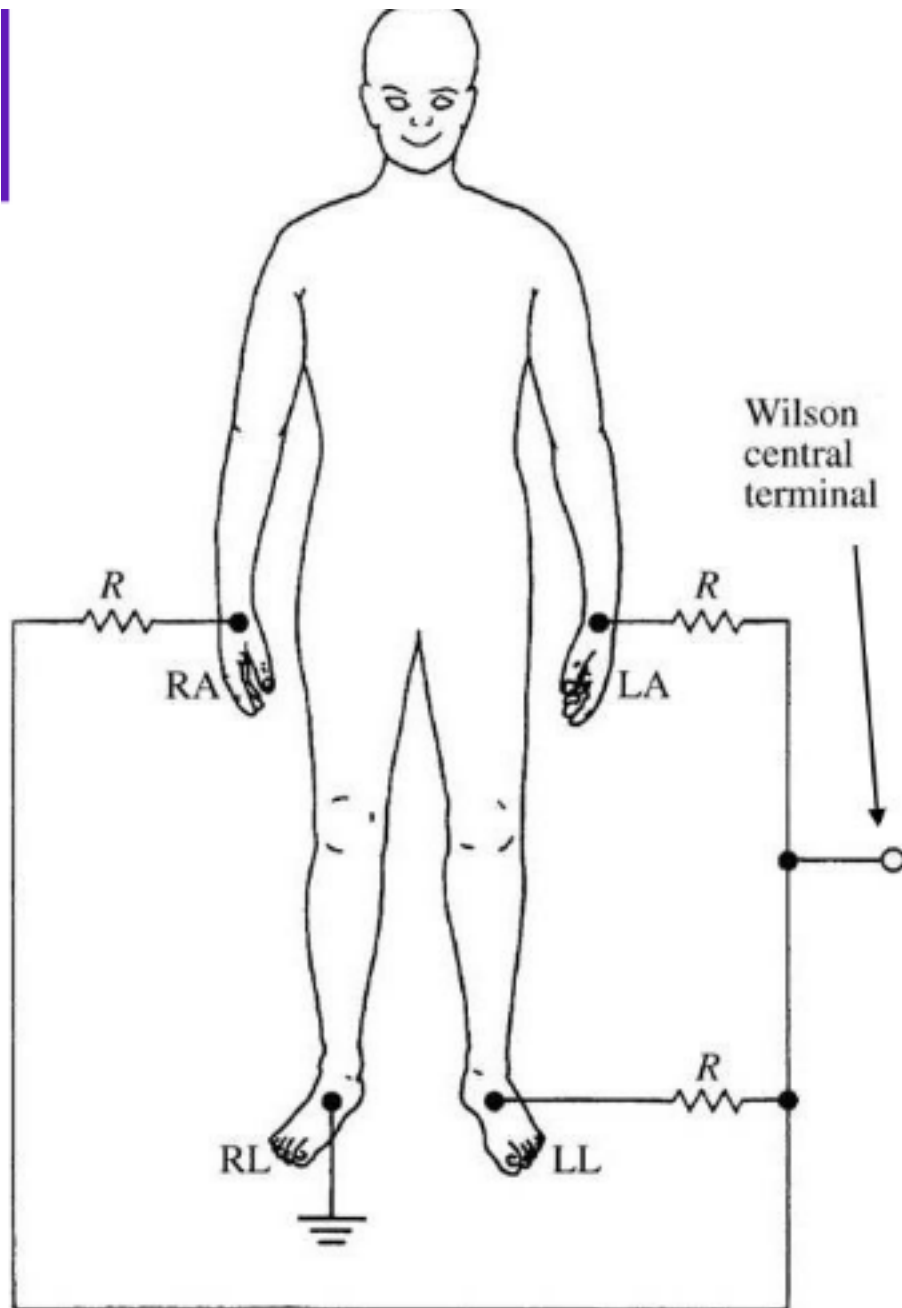$$v_{a1} = \mathbf{M} \cdot \mathbf{a}_1$$
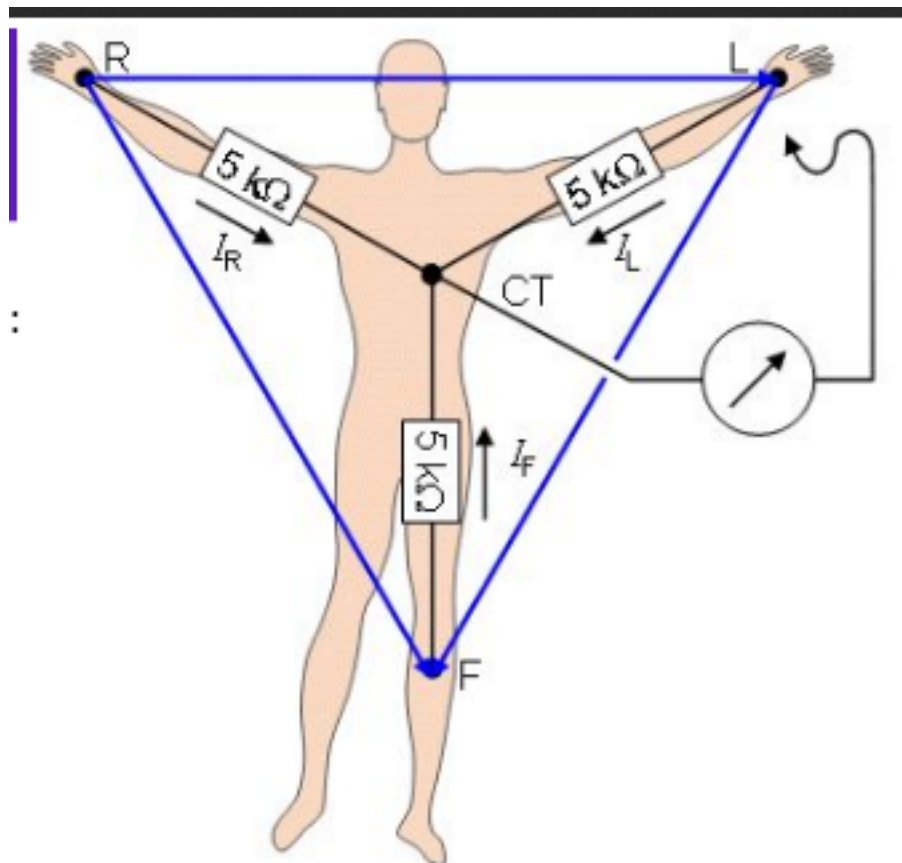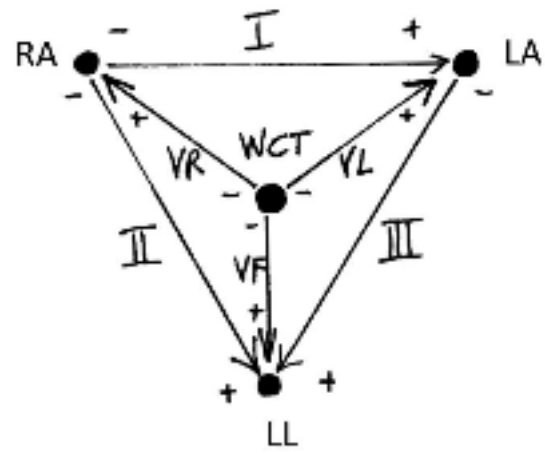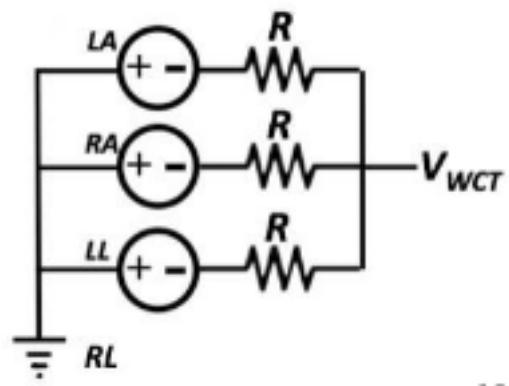$$v_{a1} = |\mathbf{M}| \cos \theta$$
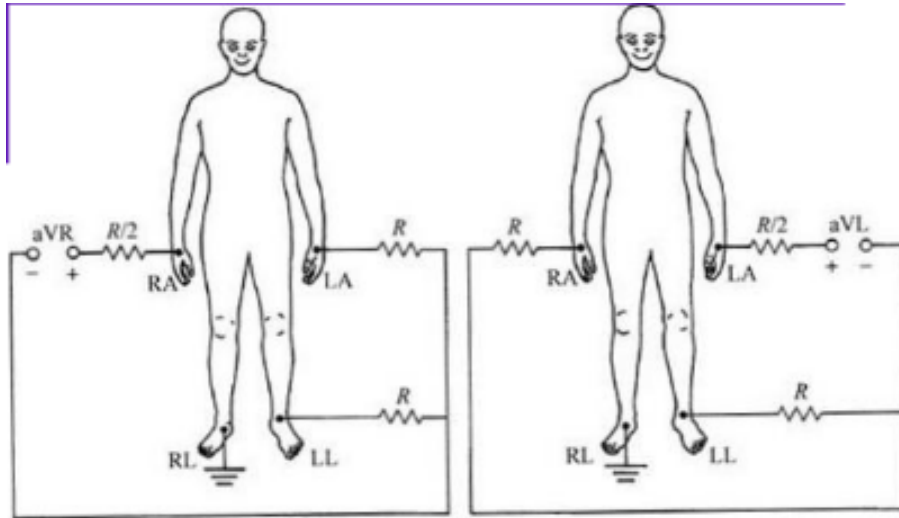
Figure 7:

Figure 8:
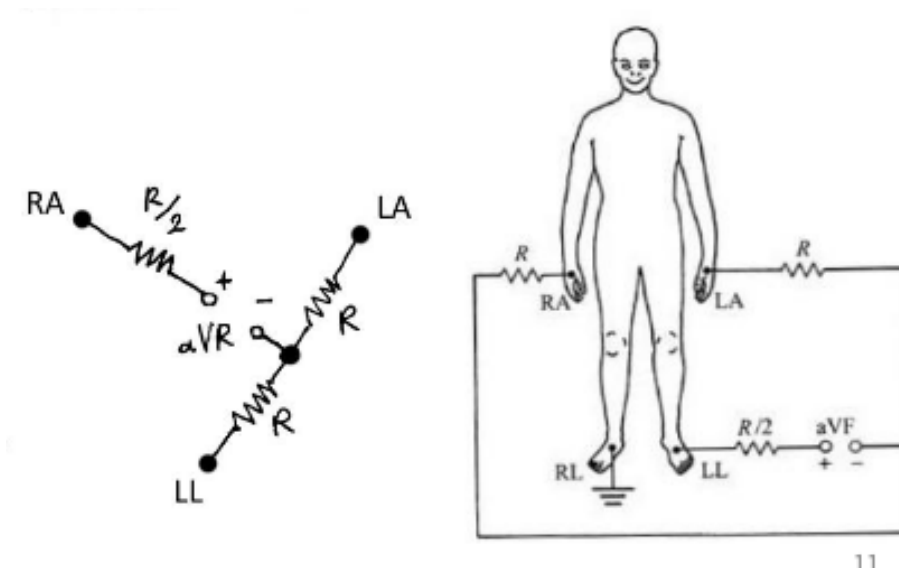
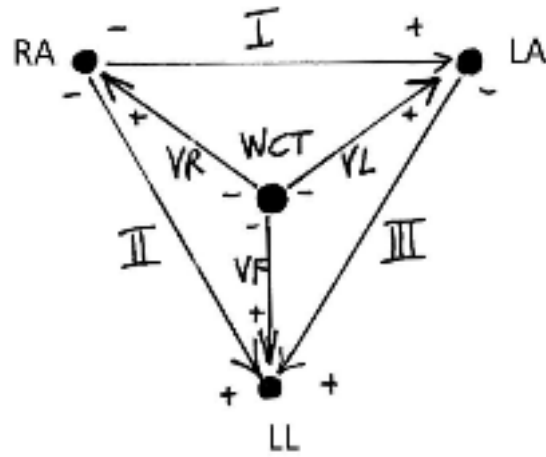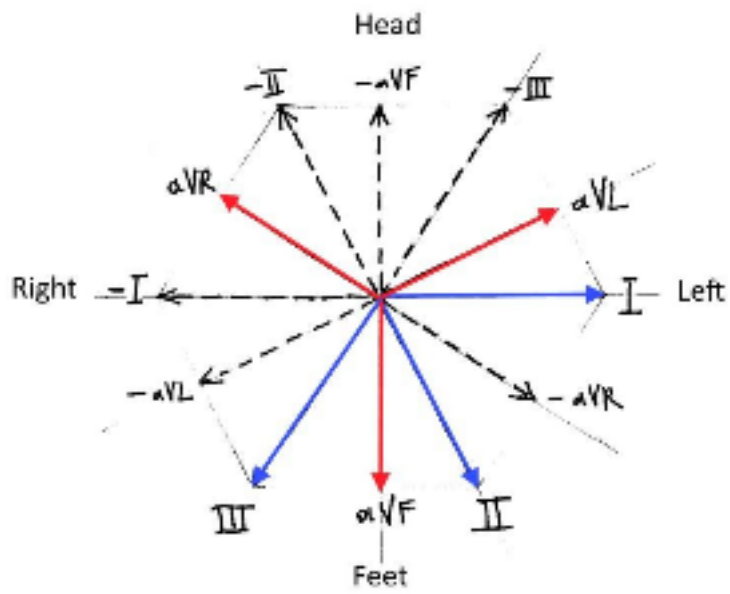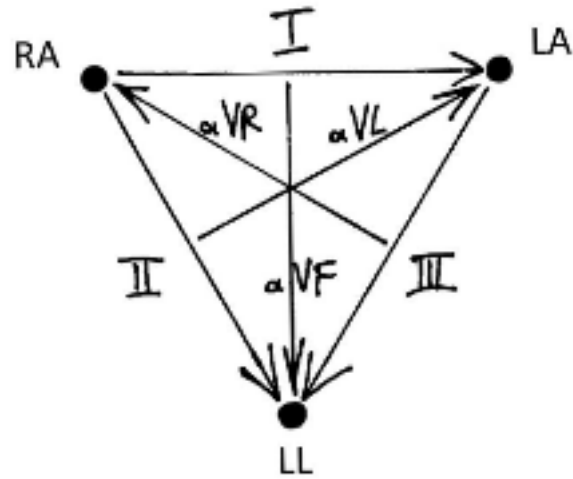Figure 9:

Figure 10:

Figure 11:

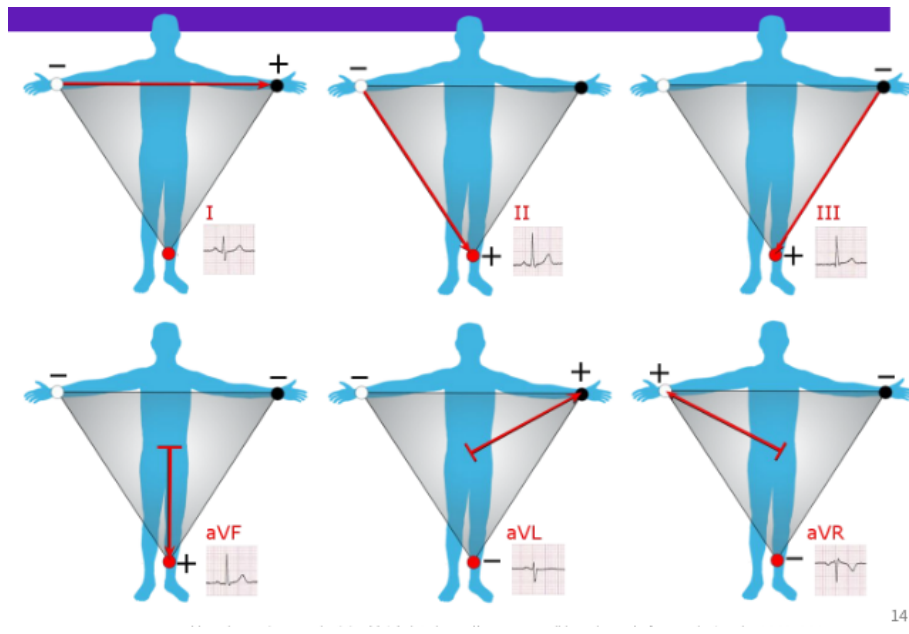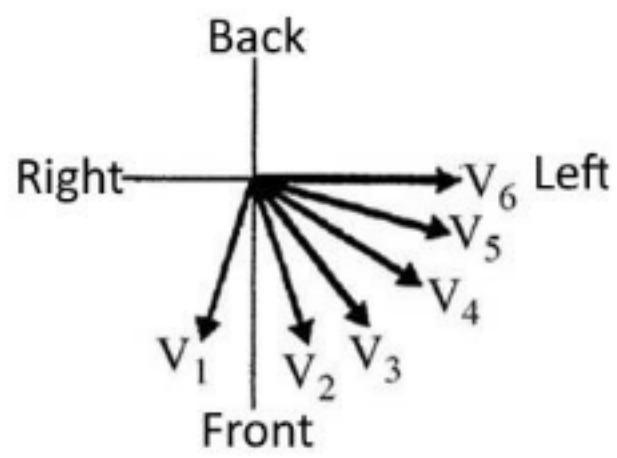Figure 12:
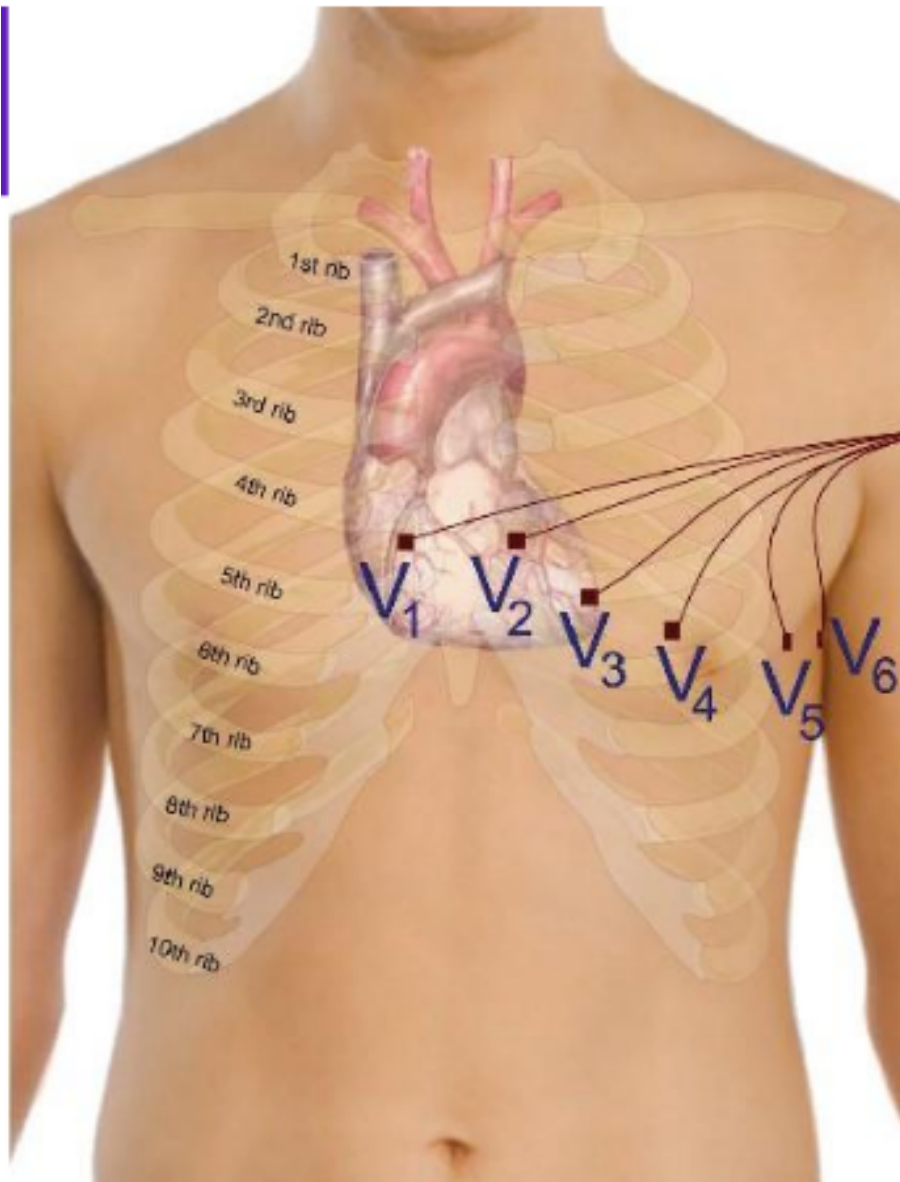
Figure 13:

Figure 14:

11

Figure 15:

Figure 16:

Figure 17:

Figure 18:

Figure 19:

14

Figure 20:

Figure 21:

Figure 22: