

CARDIOVASCULAR PHYSIOLOGY: HEART, PART II

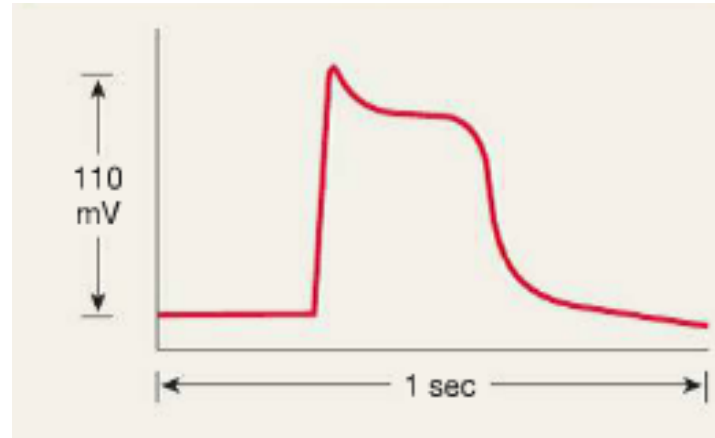
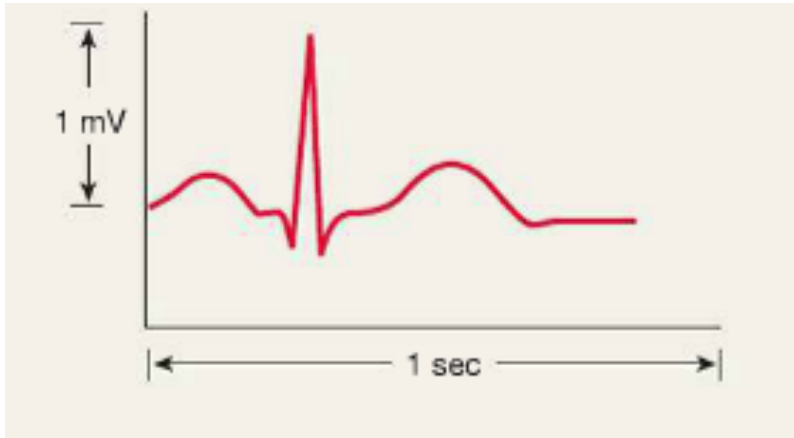
Engineering Physiology I

BME 365R

Lecture 23

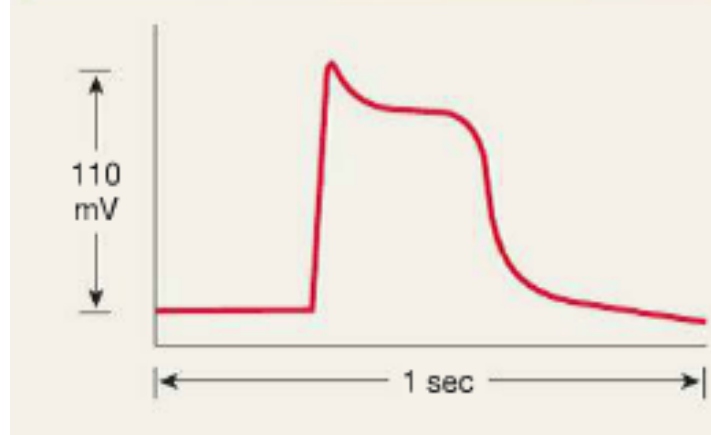
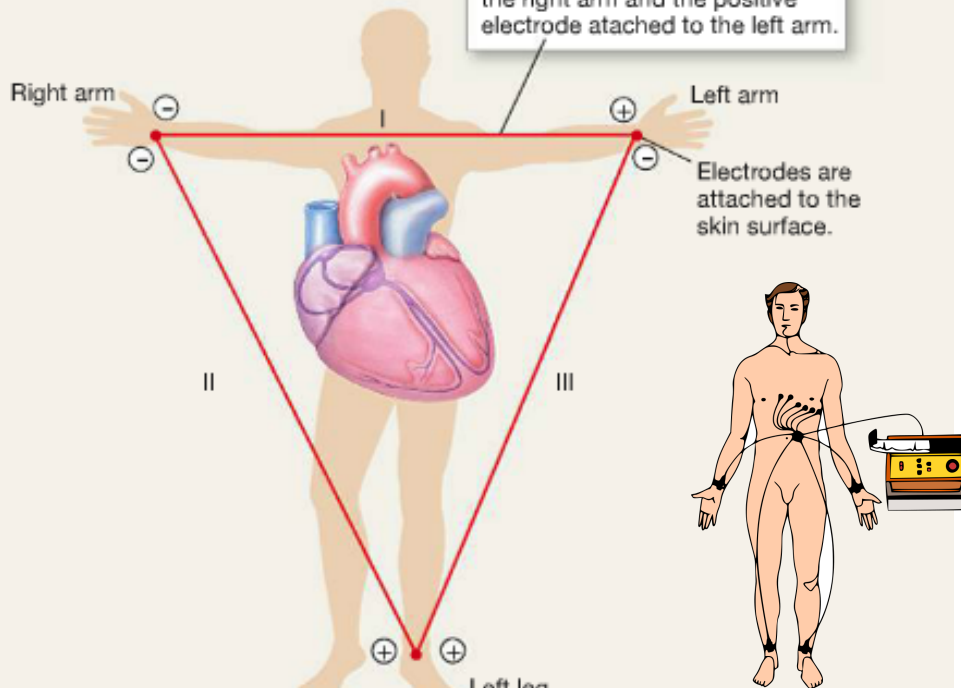
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Electrocardiogram, ECG

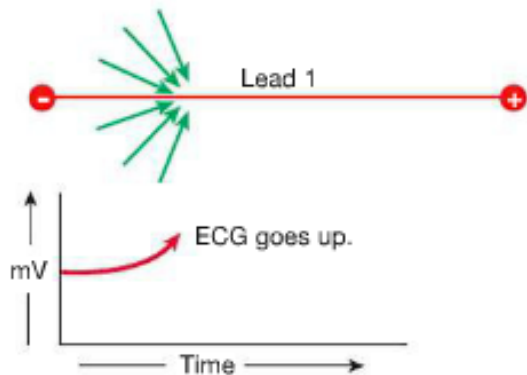


(b) Einthoven's triangle. ECG electrodes attached to both arms and the leg form a triangle. Each two-electrode pair constitutes one lead (pronounced "lead"), with one positive and one negative electrode. An ECG is recorded from one lead at a time.

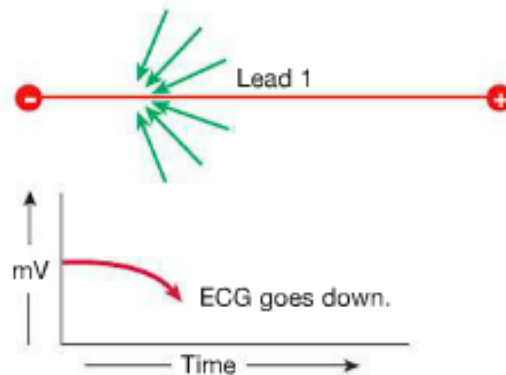
Lead 1, for instance, has the negative electrode attached to the right arm and the positive electrode attached to the left arm.



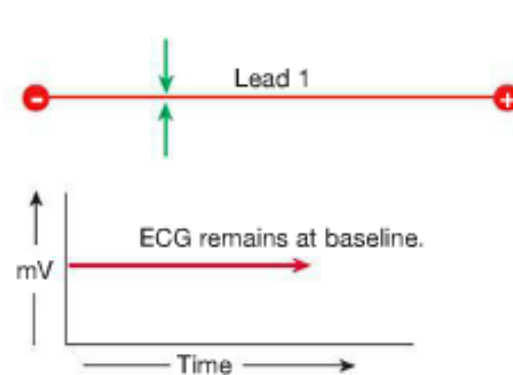
An upward deflection on an ECG means the current flow vector is toward the positive electrode.



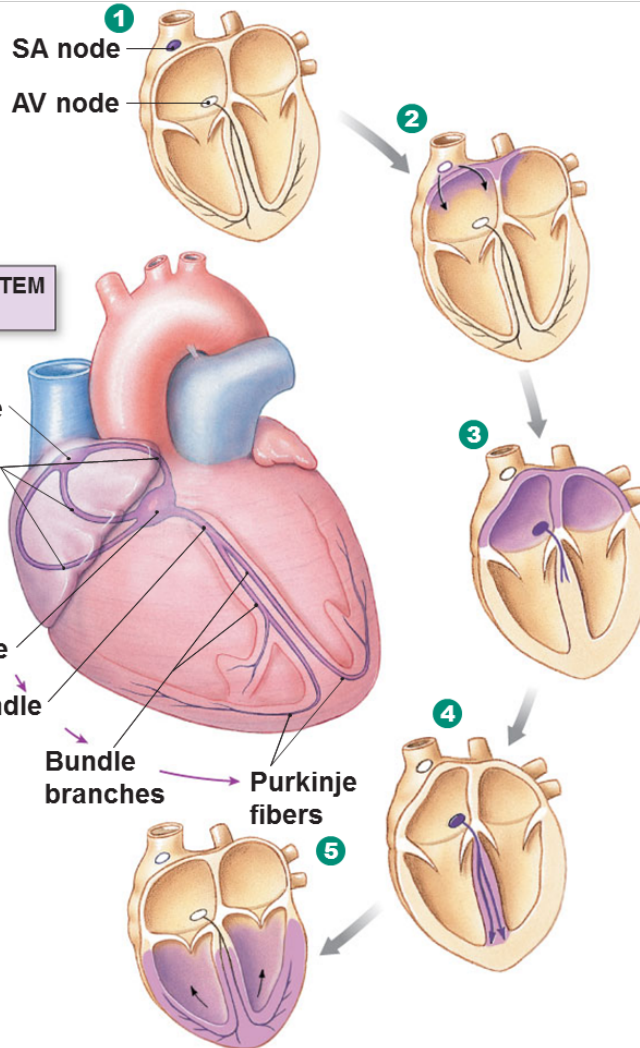
An downward deflection means the current flow vector is toward the negative electrode.



A vector that is perpendicular to the axis of the electrode causes no deflection (baseline)



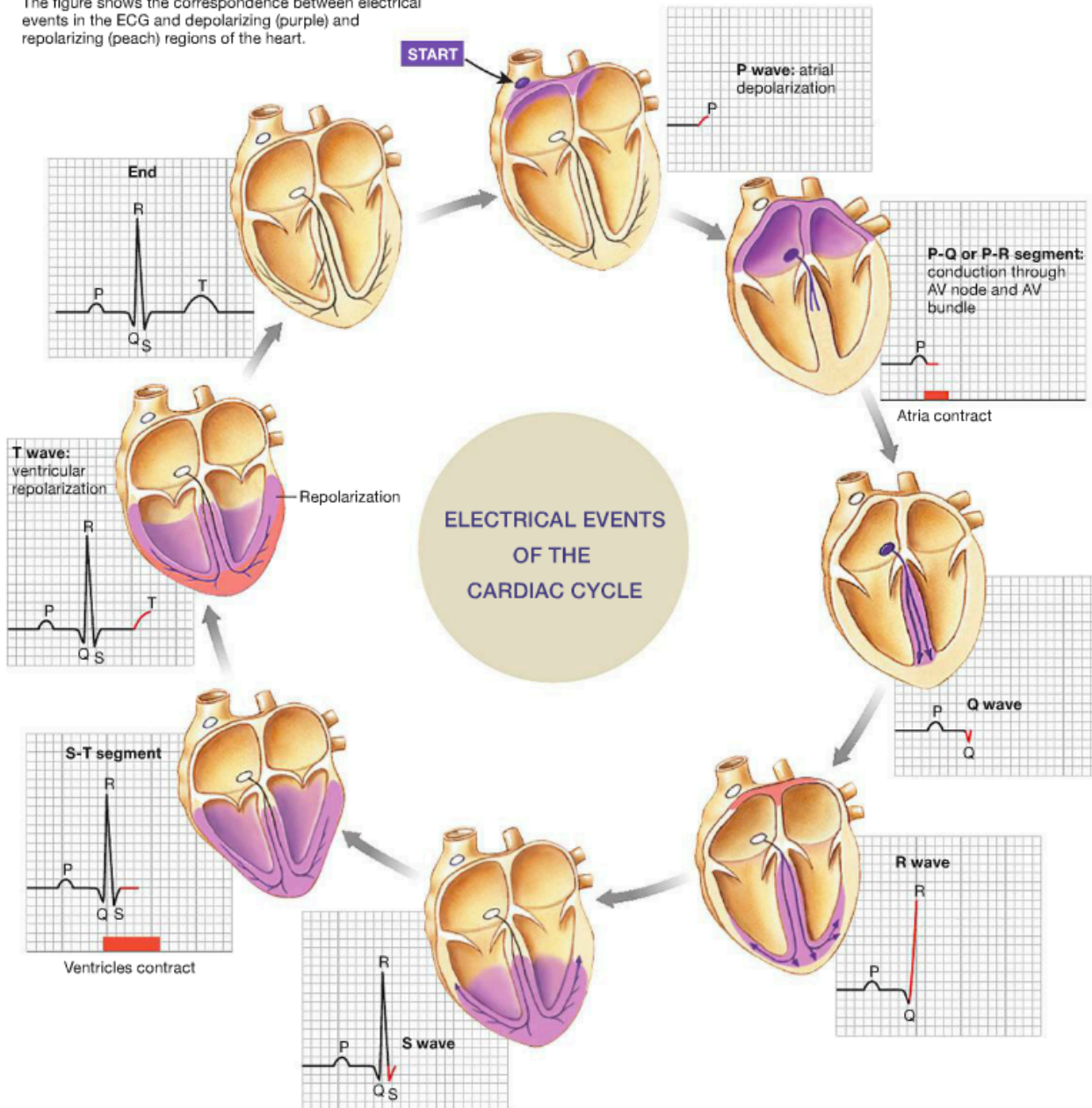
Electrical conduction in the heart: “Action”

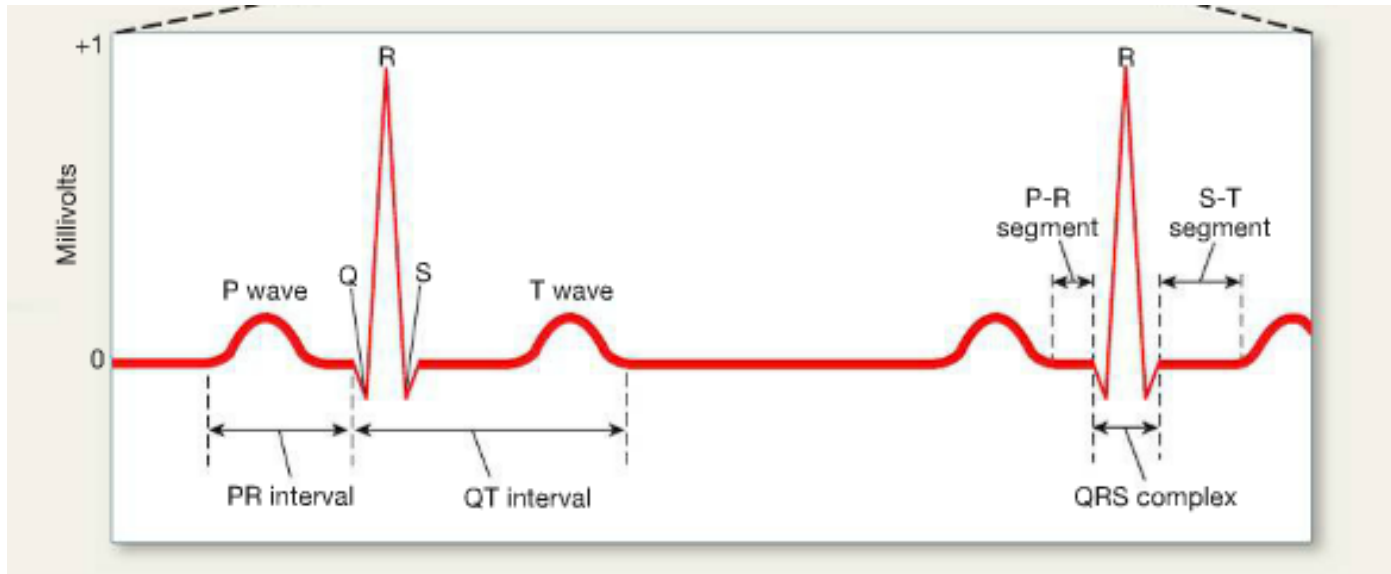


- 1 SA node depolarizes.
- 2 Electrical activity goes rapidly to AV node via internodal pathways.
- 3 Depolarization spreads more slowly across atria. Conduction slows through AV node.
- 4 Depolarization moves rapidly through ventricular conducting system to the apex of the heart.
- 5 Depolarization wave spreads upward from the apex.

- **Sinoatrial (SA) node: 70 impulses/min**
- **Atrioventricular (AV) node: (50 impulses/min)**
- **AV bundle**
- **L and R bundle branches**
- **Purkinje fibers: (30-40 impulses/min)**

The figure shows the correspondence between electrical events in the ECG and depolarizing (purple) and repolarizing (peach) regions of the heart.





P wave= atrial depolarization

P-R segment= conduction through the AV node and AV bundle

QRS complex= ventricular depolarization

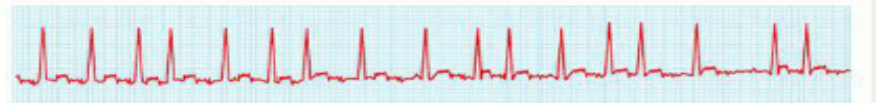
T wave= ventricular repolarization

T-P= electrical rest

(h) Normal and abnormal ECGs. All tracings represent 10-sec recordings.



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