Review 06

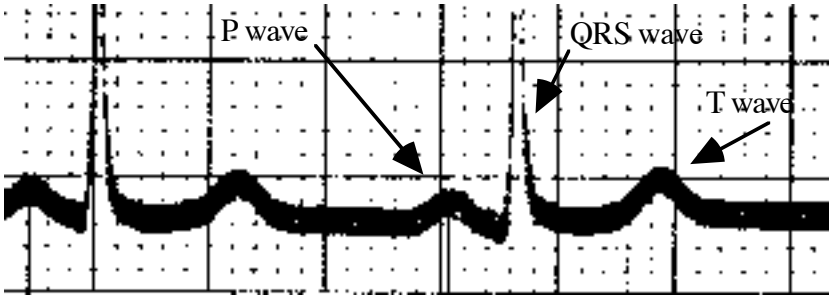
Circulatory system

- **Coronary Circulation (within heart muscle tissue)**
  Aorta->Coronary Arteries->Arterioles->Capillaries->Venuoles->Coronary Vein->R. Atrium (via Coronary Sinus)
- **Origin of heartbeat**
  Significant differences between skeletal and cardiac muscle
  Cardiac muscle fibers:
  - **twitch independently at own rates**
  - **branched and interconnected in such a way that message to contract shared between all fibers; most rapidly contracting fiber drives rate of all other fibers = PACEMAKER**
  - **because of interconnections, signal from one fiber to contract sweeps thru entire muscle mass, causing contraction of entire mass**
- **Signal from SA node is electrical ("wave of depolarization") and triggers contraction of muscle**
- **Events of contraction:**
  - **wave of depolarization sweeps across surface of muscle fibers**
  - **electrical activity penetrates down into fibers, which**
  - **causes release of Ca^{++} inside fibers, which**
  - **results in activation of contractile apparatus, which**
  - **results in contraction of muscle fiber**

Pacemakers.....set pace of an action..... in heart = SA Node

- **Events of heartbeat**
  SA Node sends out wave of depolarization, followed by contraction of atria from top down
  AV Node carries wave of depolarization into ventricles (bundle of HIS and bundle branches), followed by contraction of ventricles from tips upward

Electrocardiogram (EKG or ECG): measurement of heart's electrical activity using electrodes on the skin



Review 06, con't

P WAVE = depolarization of atria (triggers *contraction* of atria)
QRS WAVE = depolarization of ventricles (triggers *contraction* of ventricles)
T WAVE = repolarization of ventricles (reflects *relaxation* of ventricles)

Heart blocks
- Problem with the conduction pathway from atria to ventricles
- Identified by abnormal relation between P and QRS waves
  - Ventricles have own pacemaker region, loafs along at ≈ 35 – 40 BPM; pacemaker used to electrically stimulate ventricles to speed them up

Heart attacks
- Atherosclerosis--thinning of lumen of arteries due to calcification and accumulation of fatty deposits
- Thrombosis--plugging of coronary artery by blood clot
- Myocardial infarction--death of cardiac tissue due to lack of blood circulation
- Evidences of heart attack in electrocardiogram

Regulation of *rate* of heartbeat
- Autonomic nervous system—"automatic functions in body"
  - Sympathetic nerves release NOREPINEPHERINE at SA node, which
    - binds with protein in SA node membranes, which
    - increases frequency of depolarizations from node, which
    - increases rate of heartbeat
  - Parasympathetic nerves release ACETYLCHOLINE at SA node, which
    - binds with DIFFERENT protein in SA node membranes, which
    - decreases frequency of depolarizations from node, which
    - decreases rate of heartbeat