The Circulatory System

Second Lecture

The Conduction system and Heart Sound

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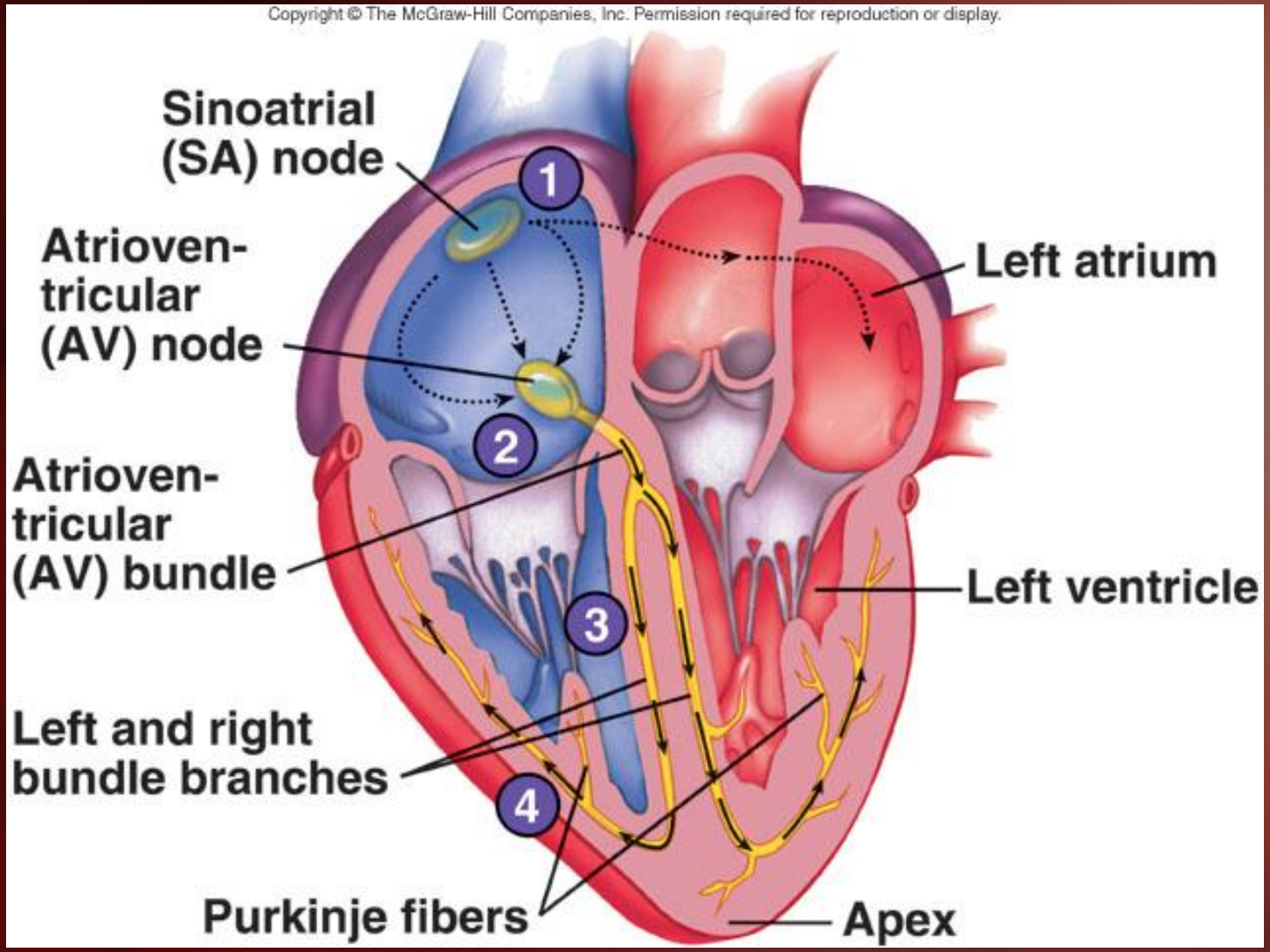
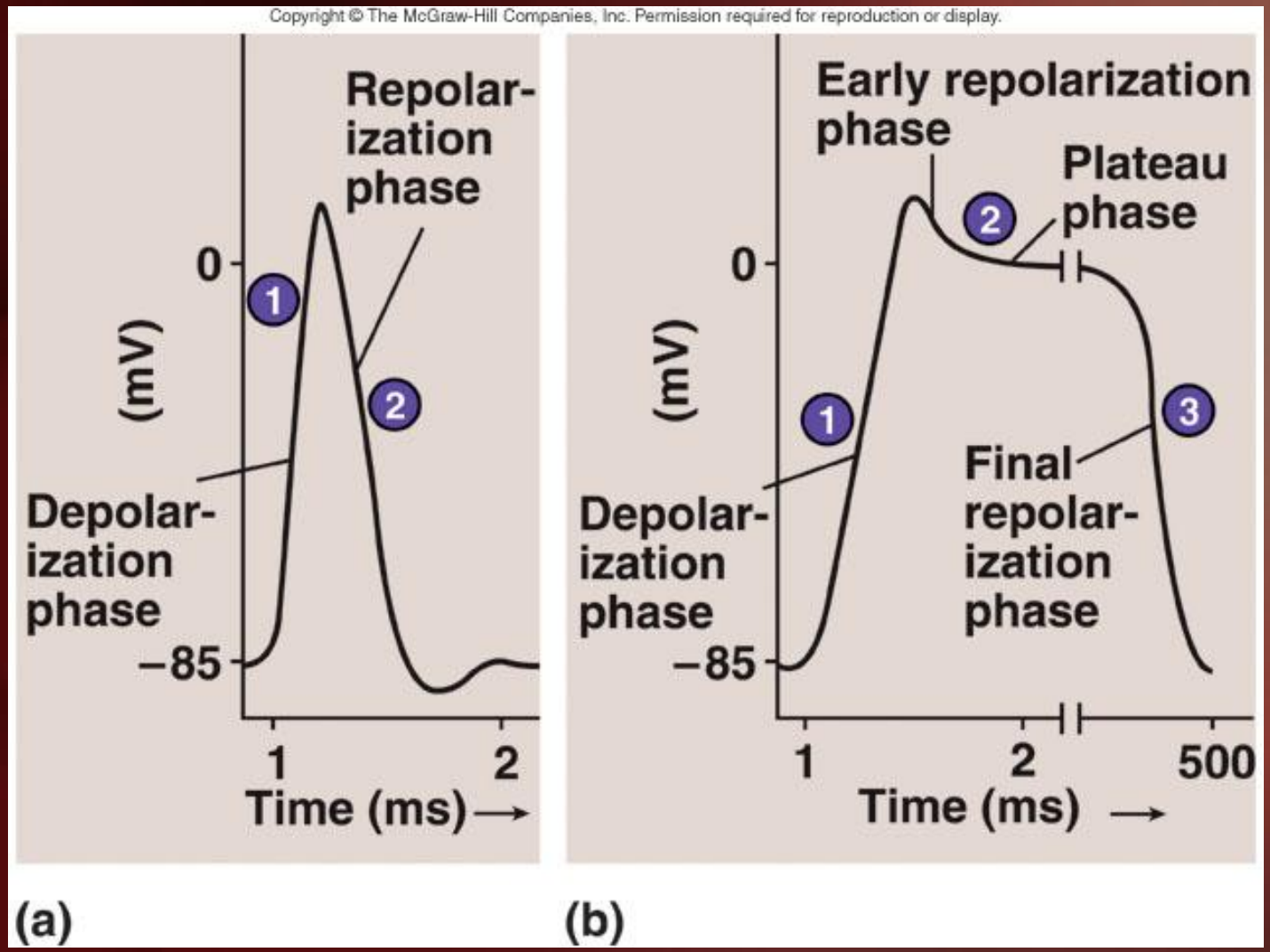
Conducting System of Heart



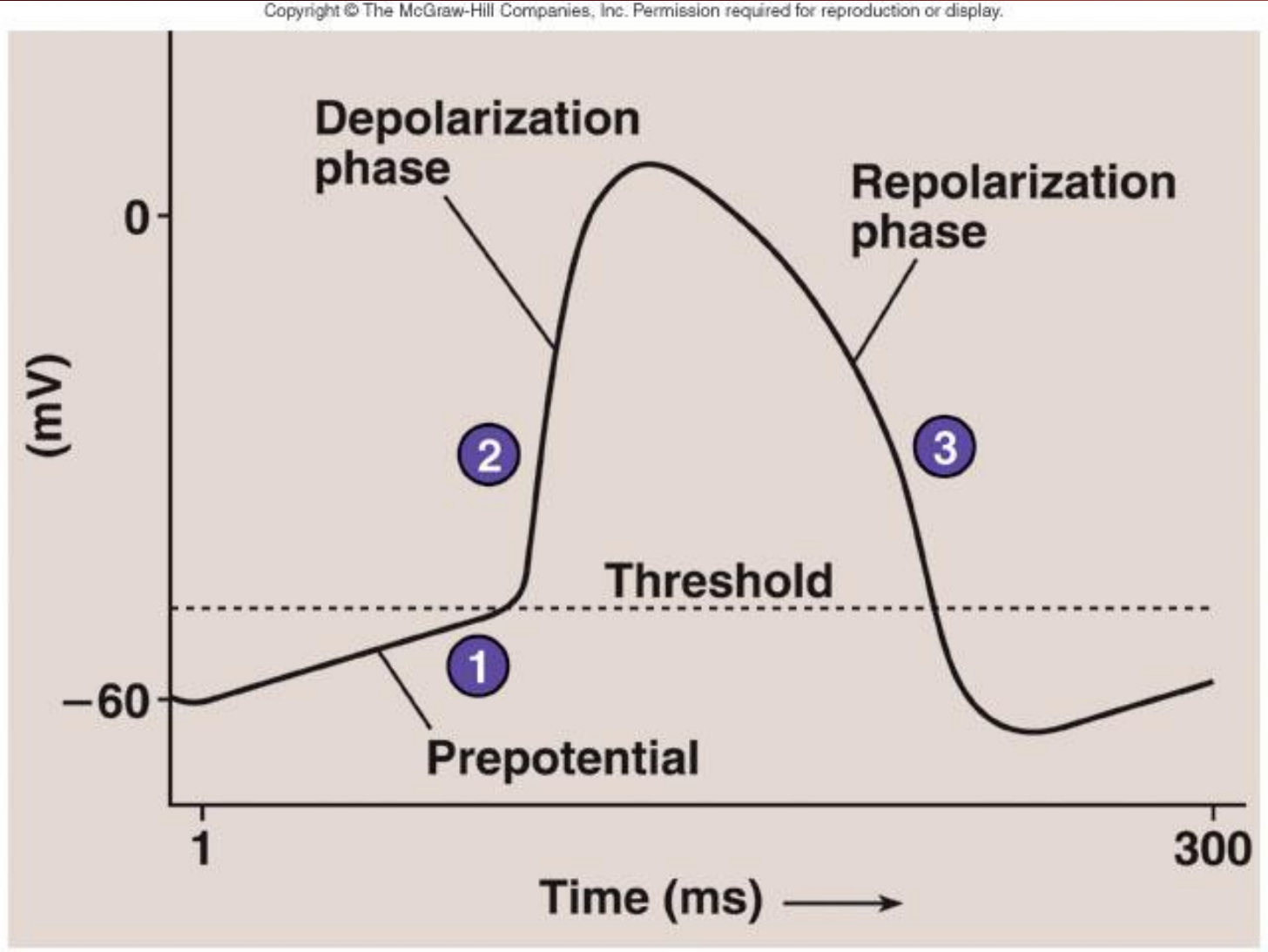
Electrical Properties

- Resting membrane potential (RMP) present
- Action potentials
  - Rapid depolarization followed by rapid, partial early repolarization. Prolonged period of slow repolarization which is plateau phase and a rapid final repolarization phase
  - Voltage-gated channels

Action Potentials in Skeletal and Cardiac Muscle



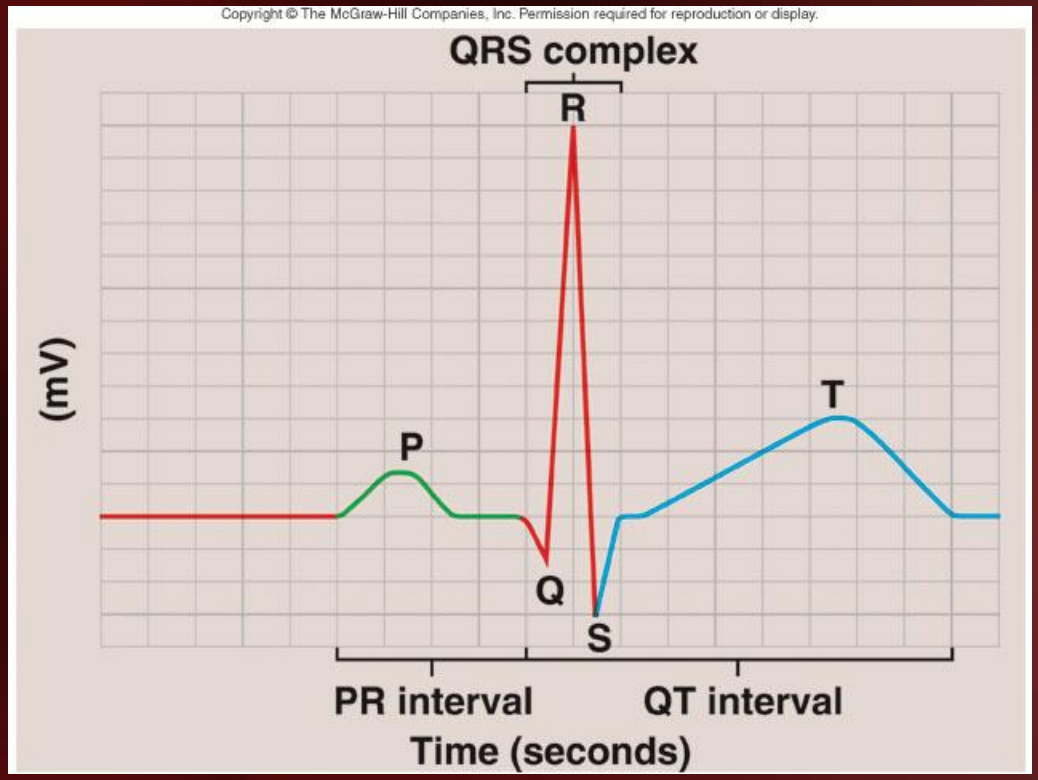
SA Node Action Potential



Refractory Period

- **Absolute**: Cardiac muscle cell completely insensitive to further stimulation
- **Relative**: Cell exhibits reduced sensitivity to additional stimulation
- Long refractory period prevents tetanic contractions

Electrocardiogram



- Action potentials through myocardium during cardiac cycle produces electric currents than can be measured
- Pattern
  - P wave
    - Atria depolarization
  - QRS complex
    - Ventricle depolarization
    - Atria repolarization
  - T wave:
    - Ventricle repolarization

Cardiac Arrhythmias

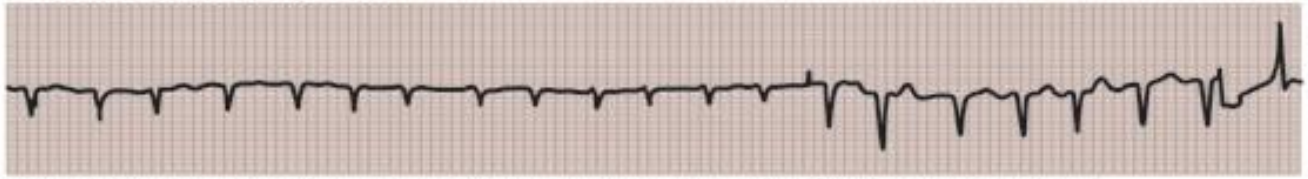
- **Tachycardia**: Heart rate in excess of 100bpm
- **Bradycardia**: Heart rate less than 60 bpm
- **Sinus arrhythmia**: Heart rate varies 5% during respiratory cycle and up to 30% during deep respiration
- **Premature atrial contractions**: Occasional shortened intervals between one contraction and succeeding, frequently occurs in healthy people

Alterations in Electrocardiogram

Complete heart block (P waves and QRS complexes are not coordinated)

Premature ventricular contraction (PVC) (no P waves precede PVC's)

Bundle branch block



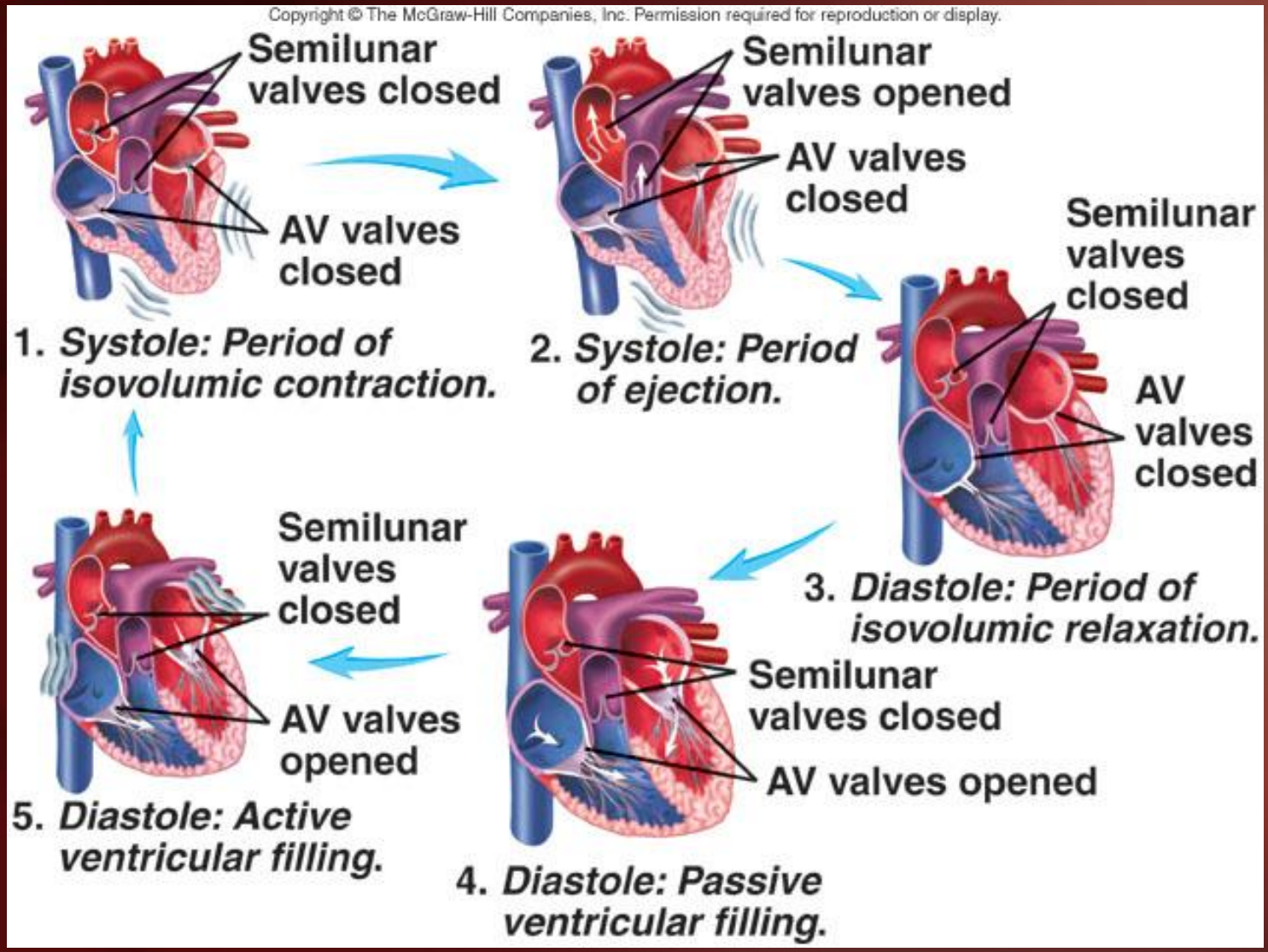
Atrial fibrillation (no clear P waves and rapid QRS complexes)

Ventricular fibrillation (no P, QRS, or T waves)

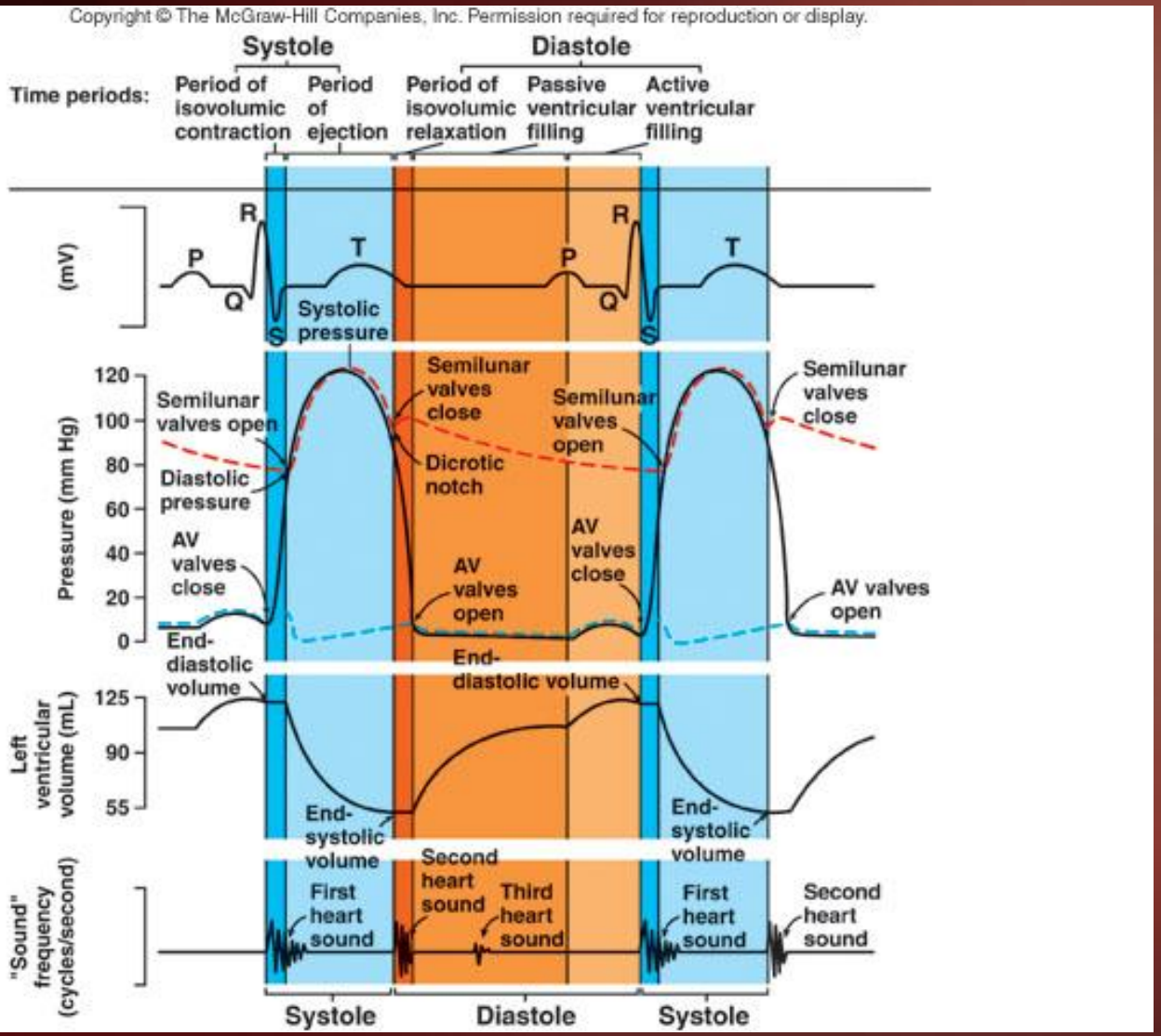
Cardiac Cycle

- Heart is two pumps that work together, right and left half
- Repetitive contraction (systole) and relaxation (diastole) of heart chambers
- Blood moves through circulatory system from areas of higher to lower pressure.
  - Contraction of heart produces the pressure

Cardiac Cycle



Events during Cardiac Cycle



Heart Sounds

- **First heart sound or "lubb"**
  - Atrioventricular valves and surrounding fluid vibrations as valves close at beginning of ventricular systole
- **Second heart sound or "dupp"**
  - Results from closure of aortic and pulmonary semilunar valves at beginning of ventricular diastole, lasts longer
- **Third heart sound (occasional)**
  - Caused by turbulent blood flow into ventricles and detected near end of first one-third of diastole


Thank You