

# Cardiac Cycle of an Action Potential Overview

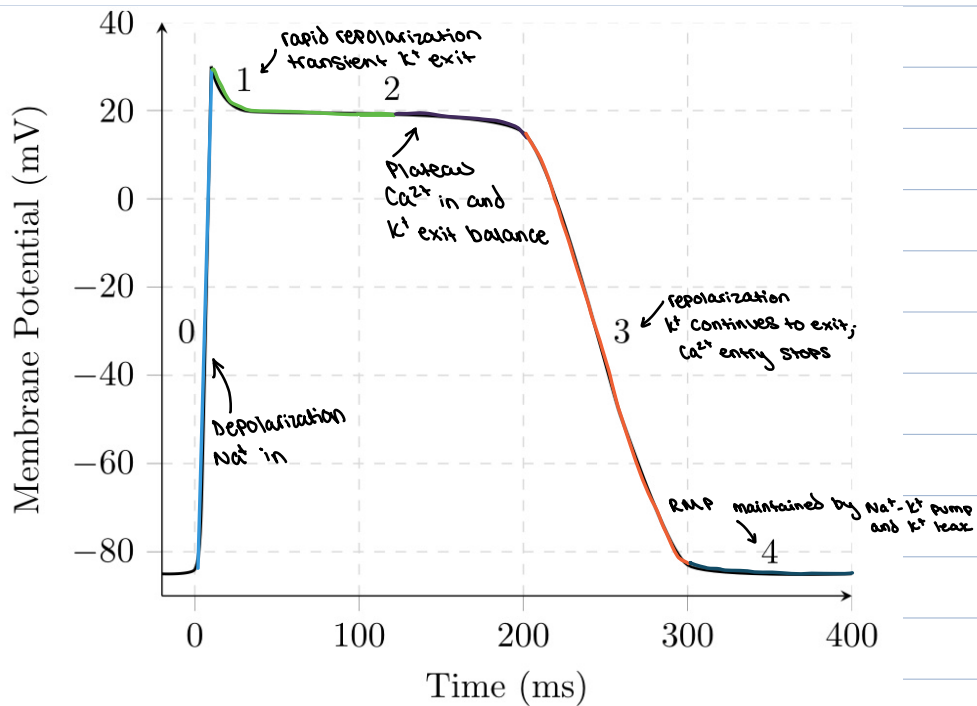
Phase 0: Depolarization (cell gets less negative) rapid entry of  $\text{Na}^+$

Phase 1: Rapid/early repolarization, early and transient  $\text{K}^+$  exit

Phase 2: Plateau:  $\text{Ca}^{2+}$  entry and  $\text{K}^+$  exit electrically balanced

Phase 3: Repolarization  $\text{K}^+$  continuing to exit;  $\text{Ca}^{2+}$  entry stops

Phase 4: Resting membrane potential  $\text{Na}^+ - \text{K}^+$  pumps and  $\text{K}^+$  leak maintains it



## Resting Membrane Comparison (at diastole phase 4)

**Ventricular Myocyte**

Working myocytes RMP  $\approx -80 - 90 \text{ mV}$

- $\text{K}^+$  leak channels ( $\text{K}^+$  leaves)
- $\text{Na}^+ - \text{K}^+$  pump ( $2\text{K}^+$  in  $3\text{Na}^+$  out)

**SA Node**

Nodal cells RMP  $\approx -50 \text{ to } -60 \text{ mV}$

- No  $\text{K}^+$  outward leak channels
- Slow drift of RMP towards threshold
- Funny current ( $I_f$  inward)  $\text{K}^+$  and  $\text{Na}^+$  trigger  $\text{Ca}^{2+}$  inward current
- Spontaneous generation of APs

**SLOW AP!**  
Propagates through heart

**FAST AP!** Working myocytes, bundle branches, Purkinje fibers