Use the following information to answer the following questions. SHOW ALL WORK

1. $[K^+]_{\text{outside}} = 18 \text{ mM}$ $[K^+]_{\text{inside}} = 300 \text{ mM}$ $P_K = 10$

2. $[Na^+]_{\text{outside}} = 300 \text{ mM}$ $[Na^+]_{\text{inside}} = 38 \text{ mM}$ $P_{Na} = 1$

1. The Nernst Equation can be used to determine the potential difference for a single ion

   \[ E_{\text{ion}} = \frac{58}{z} \log \frac{[\text{ion}]_{\text{out}}}{[\text{ion}]_{\text{in}}} \]

   A. What is the potential difference at the cell membrane for Potassium ions?

   B. What is the potential difference at the cell membrane for Sodium ions?

2. The Goldmann Equation can be used to determine the resting potential when more than one ion is involved.

   \[ E = 58 \log \frac{P_K [K^+]_o + P_{Na} [Na^+]_o}{P_K [K^+]_i + P_{Na} [Na^+]_i} \]

   A. What is the resting potential for this cell?

   B. Use this information to graph an action potential. Label $E_K$, $E_{Na}$, Resting potential, Threshold, Depolarization, Repolarization, Hyperpolarization, absolute refractory period, relative refractory period
Match the description with the number on the graph (1, 2, 3 → 9)

_____ Depolarizing stimulus
_____ K⁺ is rapidly leaving the cell
_____ K⁺ channels are not fully closed and the cell hyperpolarizes
_____ Rapid Na⁺ entry depolarizes cell
_____ Resting membrane potential
_____ Voltage gated K⁺ channels open
_____ Voltage gated K⁺ channels are closed and the Na/K pump is restoring the resting potential
_____ Voltage gated Na⁺ channels open