

PRE-SHEET  
QUESTIONS  
SESSION 1

# MEMBRANE POTENTIALS

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## Definitions and Equations

1. Define osmosis.
2. Define an ideal semipermeable membrane.
3. What are two forces that drive the movement of water?
4. What is the working definition of osmotic pressure?
5. What creates osmotic pressure?
6. Define hydrostatic pressure.
7. What is the general equation for flux?
8. Write equations for flux of water  $J_v$  and flux of non-electrolyte solute  $J_s$ .
9. Define chemical potential energy, membrane potential, electrochemical potential energy, equilibrium potential and steady state membrane potential. Write an equation for each.
10. What is the difference between equilibrium potential and steady state membrane potential?
11. What are the typical equilibrium potentials for  $\text{Na}^+$  and  $\text{K}^+$ ?
12. Define current, and how is it related to flux.
13. Write an expression for the current of an ion X across membrane.
14. Write an equation for the current generated by the movement of  $\text{Na}^+$  across a membrane. Express the equation on a  $E_m$  vs.  $I_{\text{Na}^+}$  graph. What are the significance of the slope of the line and the point at which the line intersects the  $E_m$  axis?
15. Write an expression for the total membrane current ( $I_m$ ) when the membrane has conductance for both  $\text{Na}^+$  and  $\text{K}^+$ . Express  $I_m$  on a  $E_m$  vs.  $I_m$  graph. What is the significance of the intersection point of the line on  $E_m$  axis?
16. Define resting membrane potential.
17. What is a generator potential?
18. Define adaptation.
19. True or False: An increase in  $\text{Na}^+$  conductance or a decrease in  $\text{K}^+$  conductance will lead to a decrease in the membrane potential (the membrane potential will move closer to zero).
20. What is the difference between absolute and relative refractory periods?
21. Outline the sequence of events in chemical synaptic transmission.
22. What are excitatory postsynaptic potentials (EPSP) and inhibitory postsynaptic potentials (IPSP)?
23. Discuss neuronal integration and summation.

*The Answers to this worksheet will be posted on the web on Sunday at <http://cim.ucdavis.edu/masters>*