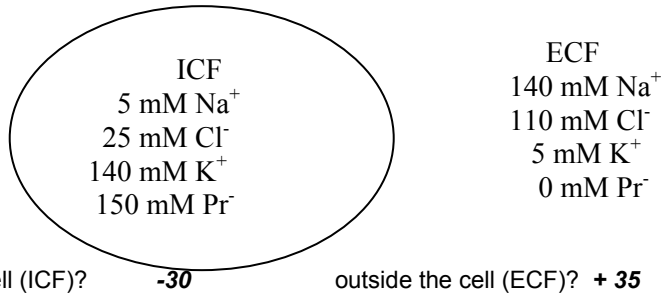
Answer the questions below about the cell diagrammed here.



1. Absolute charge inside the cell (ICF)? ***-30*** outside the cell (ECF)? ***+ 35***

2. What is the membrane potential difference (relative charge of ICF with ECF set to zero)?
   -65 ***(This means that the ICF is 65 more negative than the ECF.)***

3. What is the direction of the concentration gradient for Na+? ***into the cell*** or out of the cell
   [Molecules diffuse from high to low concentrations.]
4. What is the direction of the electrical gradient for Na+? ***into the cell*** or out of the cell
   [Ions have an electrical force to move towards the opposite charge.]
5. If the cell shown above receives a signal that causes membrane Na+ channels to open, which way will Na+ move ? ***into the cell*** or out of the cell
   (Both electrical and concentration gradients are into the cell for Na+)

6. What is the direction of the concentration gradient for Cl-.? ***into the cell*** or out of the cell
7. What is the direction of the electrical gradient for Cl-? into the cell or ***out of the cell***
   (The inside of the cell is more negative than outside so the negative charge of Cl- is repelled out.)
   [Since the forces are opposite, which is stronger and will move the ion? What do you expect the charge and magnitude of the membrane potential would be to oppose this concentration gradient?]

8. Use the Nernst equation, p.143 to determine the equilibrium potential for Cl- . This is the membrane potential differencethatwould balance the electrical gradient with the given concentration gradient.
   E_{Cl-} = (61/-1) [log (110 mM/25 mM)] = -39.3

9. If the cell shown above receives a signal that causes membrane Cl- channels to open, which way will Cl- move ? into the cell or ***out of the cell***
   The electrical force created by the membrane potential of -65 is more negative and thus stronger than the concentration gradient force at the present ECF and ICF Cl- concentrations. If the membrane potential was -39.25, Cl- would have equal electrical force to move out and concentration force to move in. The electrical for is more negative and will repel the is negatively charged Cl-.

10. What is the direction of the concentration gradient for K+.? into the cell or ***out of the cell***
11. What is the direction of the electrical gradient for K+? ***into the cell*** or out of the cell

12. What is the equilibrium potential for K+?
    E_{K+} = (61/+1) [log (5 mM/140 mM)] = -88.3

13. If the cell shown above receives a signal that causes membrane K+ channels to open, which way will K+ move ? into the cell or ***out of the cell***
    The membrane potential is not negative enough to attract the positive K+ against its concentration gradient force to more out.