

You must show all equations and all work to receive any credit

1. Calculate the Nernst equilibrium potential, in mV, for the bicarbonate ion (HCO_3^-) in a cell that has an extracellular concentration of 27 mM and an intracellular concentration of 8 mM. Draw a clearly labeled diagram showing the electric potential and concentration gradient across a bicarbonate ion channel at equilibrium. Do not account for any other ions that may be present.

2. Draw the structure of an acetylcholine molecule at physiological pH of 7.4 that is situated in the active site of acetylcholinesterase. Draw a diagram and clearly show the mechanism of action that the enzyme uses to break down acetylcholine. You must show the key amino acid side chains involved to include all atoms, bonds, lone pairs for each. Clearly label the processes that occur.

3. Draw the interaction diagram of an adrenergic receptor with its ligand at the binding site; illustrate at least four separate ligand receptor interactions. Draw the complete molecular structure of both the ligand and the various side groups.

