

General Chemistry II Problem Set 7

1. Draw a diagram of the active site in the cyclooxygenase enzyme with an arachidonic acid molecule occupying this region. Clearly show and explain the key interactions between the enzyme and the substrate.
2. Discuss how the chemical reaction involving arachidonic acid proceeds after binding to the active site. Identify the key amino acid side-chain involved, what it does, and what happens when this residue is mutated.
3. Outline the similarities and the major differences between the two isoforms of the COX enzyme, to include the shape of the active sites. Discuss their respective functions.
4. Discuss and fully explain the differences between nonselective COX inhibitors and selective COX-2 inhibitors. Why are pharmaceutical companies investing so many resources into developing selective COX-2 inhibitors?
5. Go to a drug store or look up the recommended doses of naproxen (Aleve) and ibuprofen (Motrin) in these over the counter (OTC) medications. Convert the two recommended doses into moles. Also look up the COX-1 IC₅₀ for each of the two substances. Use these results to numerically estimate the relative potency of these medications in effectively inhibiting the COX-1 enzyme. Which would you take and why?
6. Outline the mechanism of action through which aspirin inhibits the COX enzyme. Be very specific.

