

3.034 Problem set 2

- 1) Calculate the end-to-end length of a fully extended, zig-zag chain (all trans conformations) of polyethylene (-CH<sub>2</sub>-CH<sub>2</sub>-)<sub>x</sub> with a molecular weight of 80,000 g/mole.
- 2) You have a hydrophobic surface you want to deposit Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> on, draw a hexapeptide sequence that might service this purpose.
- 3) You have a gold surface you want to capture a small ringed based organic drug on, design a sequence that will bind the drug. Design a built in way to test that the peptide is on the gold service.
- 4) Design a tripeptide that can bind or unbind Zn<sup>+2</sup> based on its environment.
- 5) Draw the amino acid that is not optically active, draw any amino acid that has more than one chiral center
- 6)
  - What are the covalent interactions in proteins?
  - Draw an example of 2 amino acids that will interact with hydrophobic interactions
  - 2 amino acids that will form hydrogen bonds with each other
  - 2 amino acids that form ionic interactions with each other
- 7) a: Design a tetrapeptide that will not move in an electric field at pH~6.0.  
b: What would limit you from using the Henderson-Hasselbach equation to predict the exact isoelectric point of 1000 amino acid proteins?  
c: Would the pI change if you changed the solvent conditions?