3.034 Problem set 2

1) Calculate the end-to-end length of a fully extended, zig-zag chain (all trans conformations) of polyethylene (-CH2-CH2-)x with a molecular weight of 80,000 g/mole.

2) You have a hydrophobic surface you want to deposit Ca₃(PO₄)₂, 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 Zn²⁺ 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?