1. Go to the Protein Data Bank (google it)
2. Search on the site for PDB ID “1R4R”, this should bring up a protein structure with a short strand of DNA.
   1. What is the name of the protein?
      1. Glucocorticoid receptor with DNA
   2. When was the structure deposited into the PDB?
      1. 2003 Oct 7
   3. What method was used to obtain the structure?
      1. X-ray diffraction
   4. What resolution is the structure? What does resolution mean?
      1. 3A
      2. Resolution is the measure of the quality of the data and the level of detail in the structure
   5. What is the title of the paper from which the structure is detailed?
      1. *Crystallographic Analysis of the Interaction of the Glucocorticoid Receptor with DNA*
3. Download the PDB format file
4. Open Pymol on your laptop along with the PDB file for “1R4R”
5. Change the background to white by typing in the command “bg white”
6. Find the window with sections titled “all” and “1r4r” along with letters “A S H L C”
   1. What does each letter stand for? (Click on the letter to find out)
      1. Action
      2. Show
      3. Hide
      4. Label
      5. Color
7. Click “H” on All and hide everything
8. In the “display” menu, select “sequence”. From left to right, the DNA sequence is displayed first followed by the protein sequence.
9. Click on all the DNA nucleotides in the sequence. The selection should show up in the viewing window. Under “1r4r” there should now appear a “sele” for selection. Click “A” and rename “sele” to “DNA”
10. Click “S” and show “cartoon”.
    1. Save an image of this by selecting the file menu and “Save Image as…” a PNG
11. Hide the cartoon of the DNA and show “sticks”.
    1. What are the colors of the carbon, oxygen, nitrogen, and phosphate atoms?
       1. C: green
       2. O: red
       3. N: blue
       4. P: orange
12. Under the “wizard” menu select “measurement”. To obtain a measured distance between two atoms, just click on the atoms.
    1. What unit of distance is used?
       1. Angstroms
    2. What is the distance between the backbone of the two strands at the site of any base pair in the structure?
       1. 17 A, from the phosphate of one strand to the phosphate of the other strand at a basepair
13. Make images of an AT pair and of a GC pair. Indicate which side is the major and minor grooves.
    1. the T and the G are in the major groove
    2. the A and the C are in the minor groove