

Exercise 21.3

Adding *freeze dried* waters

Part 1 -- Get started

Make sure Select | Synchronize is checked.

1. Open **1rx5** from **PDB** within **MOE**.
 2. **Potential Setup** lower corner menu | **Load** | **Amber14EHT**
 1. Select maximum threads.
 2. Fix hydrogens.
 3. Fix charges.
 4. OK.
- You are ready to add waters.

Part 2 -- Hydrate your protein

3. **Compute | Simulations | Dynamics**

1. Solvent Setup :
 2. Layer, Water, NaCl 0M, 4.0, Delete far, OK.
 3. Cell Setup: No periodicity (don't change it)
 4. Constrain: light bonds
 5. Rigid water
 6. Time step 0.002 ps
 7. NPA algorithm
 8. OK
4. in SEQ window: select all waters and ions.
 5. In MOE window: **EPUSIEPF***
 6. Minimize.

Now your protein is hydrated. Go to Part 3.

Freeze dried protein hydrate: remove waters that are exposed to bulk solvent or move too much

Part 3 -- Freeze dry

1. In SEQ window, select water and ions chains.
2. **Select | Selector**, Click UI (user interface)
 1. Check Selected Chains
 2. Operation: or
 3. Connectivity | Accessibility
 4. Probe radius 5.0. <---- critereon for bulk water exposure
 5. Exposed. (Some waters and ions are selected)
 6. Molecule. (Now complete water molecules are selected.)
 7. Note the number of atoms selected. Number of waters is that number divided by 3.
 8. In MOE window, Delete selected.
 9. Repeat 5-8, until...
3. No more exposed waters? Is the number of waters left less than 20? Stop. Go to Part 4.
4. Minimize.
Now your protein is freeze-dried.

Part 4 -- Molecular dynamics

5. **Select | Solvent**
6. EPUSIEPF
7. **Compute | Simulations | Dynamics**
 1. Change name to water.mdb
 2. Uncheck "rigid water"
 3. Protocol: prod {ps=250 T=500} (You may explore a higher or lower temperature if you do this a second time.)
 4. OK. If the simulation does not finish in time, **Cancel | Dynamics** when told.

Part 5 -- Find stable waters

8. Open water.c.250.mdb (opens in database viewer, DBV)
9. DBV: **File | Browse**
10. Hit the play button. Use the slider to set the speed of playback.
11. In MOE window, watch animation. Remove protein atoms and make waters **spacefill**. Waters sitting in deep energy wells move very little. Waters in shallow energy wells move alot.
12. Select the five least mobile waters and color them light blue.
13. Save the MOE file. Upload it to the homework server as Exercise 21.

