

# Ligand Preparation

Proper preparation of 3D, all-atom ligand structures is critical to modeling tasks. The preparation involves the following tasks:

1. Add hydrogen atoms.
2. Filter out unsuitable molecules based on their properties.
3. Remove unwanted molecules, such as water, small ions.
4. Neutralize charged groups, then generate ionization and tautomeric states with Epik
5. Generate stereoisomers, particularly if stereochemical information is missing.
6. Generate low-energy ring conformations.
7. Remove any badly prepared structures.
8. Optimize the geometries.

This sheet summarizes ligand preparation with LigPrep.

The screenshot shows the LigPrep window with various settings. Red arrows point from descriptive text to specific controls:

- Filter molecules by functional group count or property:** Points to the "Filter criteria file" field.
- Use this option to keep the charge state of the original molecule:** Points to the "Include original state" checkbox.
- Generate ionization states with significant population at the given pH:** Points to the "Generate possible states at target pH" radio button.
- Use this option if you have chirality information stored with the molecule:** Points to the "Retain specified chiralities" radio button.
- Use this option if your structure is 3D and you want to keep its stereochemistry:** Points to the "Generate all combinations" radio button.
- Add anionic states for binding to metals (not normally generated):** Points to the "Add metal binding states" checkbox.
- Keep the original ionization state even if it's not the most probable:** Points to the "Include original state" checkbox.
- Limit the number of stereoisomers generated. The choice of chiralities is based on natural products:** Points to the "Generate at most" value (32).
- Generate more ring conformations if the ring is flexible and likely to change conformation on docking:** Points to the "Generate low energy ring conformations" value (1).

1. Choose the source of the structures from the Use structures from option menu, and supply the file name if using a file.
2. Filter the structures by property by functional group counts—click Create to set up the filter.
3. Choose the force field. You usually only need to do this if the default doesn't cover some atom types in your ligands.
4. Choose an ionization option. Use of Epik is recommended.
5. Leave Desalt selected, to remove molecules other than the ligand.
6. Deselect Generate tautomers if you don't want to generate tautomers, for example to prepare just the original structures.
7. Choose an option for generating stereoisomers.
8. Increase the number of ring conformations if you have flexible rings that are likely to change conformation.
9. Select an output file format, and start the job.