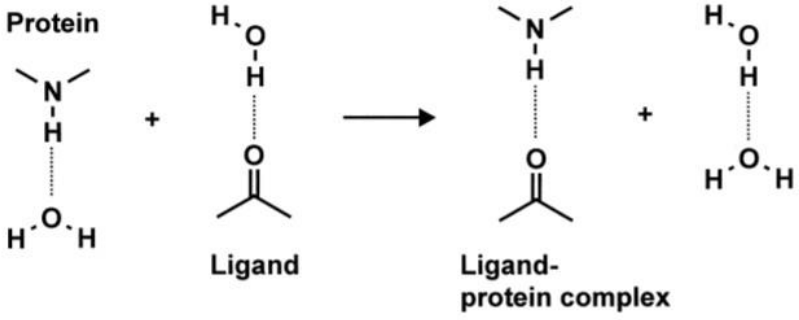
Chemical Bonding

Chemical compounds are formed by the connection of two or more atoms. A newly formed stable molecule appears when the total energy of the arrangement between atoms has lower energy than the separated atoms. The bound state implies a net attractive force between the atoms. There are several types of chemical bonds are;

- **Covalent bond (Molecular bond)**: A most important chemical bond that involves the sharing of electron pairs between atoms.
- **Ionic bond**: This type of bonding involves the complete transfer of valence electrons between atoms. It is a type of chemical bond that generates two oppositely charged ions.
- **Hydrogen bond**: *Hydrogen bonding interactions play a major role in many chemical and biological processes*.This bond is the attractive force between the hydrogen attached to an electronegative atom of one molecule and an electronegative atom of a different molecule. Usually the electronegative atom is oxygen, nitrogen, or fluorine, which has a partial negative charge. The hydrogen bond is really a special case of dipole forces. Hydrogen-bonds play a crucial role in determining the specificity of ligand binding to biological components, i.e. proteins. Therefore, the hydrogen-bonding energy functions will be described and their application will be demonstrated on molecules of pharmacological interest where hydrogen-bonds influence the binding of ligands. Life on earth depends on water, on hydrogen bonds, and on hydrophobic interactions. DNA and proteins are held together in their defined three-dimensional structures primarily by hydrogen bonds. The double helix of DNA, RNA structures, peptide and protein secondary structures, like α-helices, β sheets, β- and γ-loops, and the tertiary structures of proteins are formed by hydrogen bonds (enthalpic contributions) and by hydrophobic contacts (primarily entropic contributions).



Solvation and desolvation in the formation of a ligand-protein complex