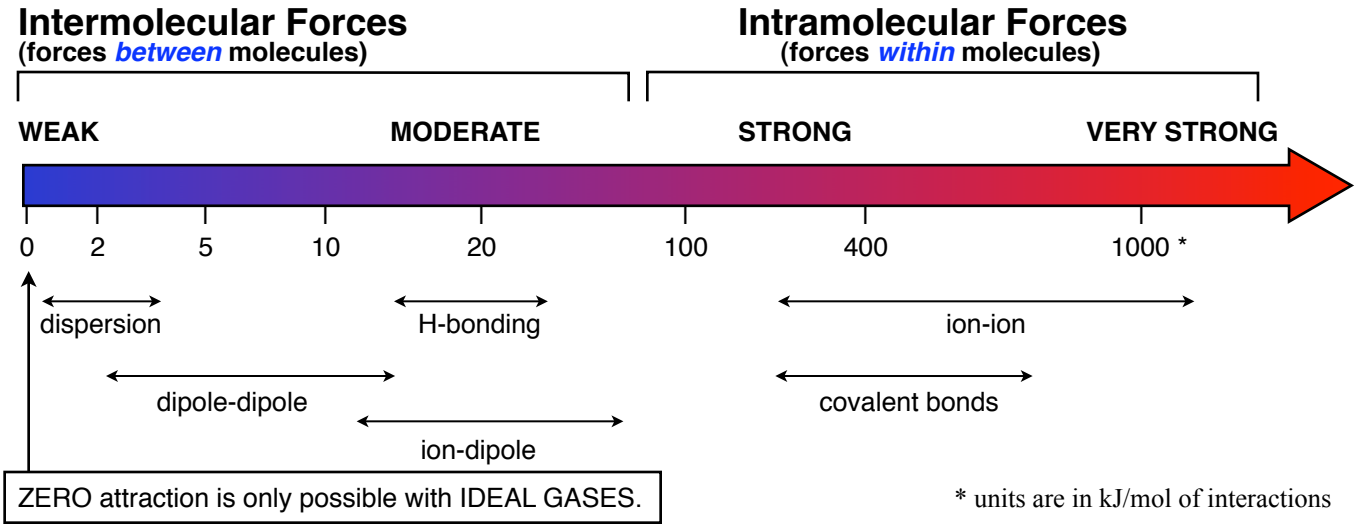
Intermolecular and Intramolecular Forces

Do realize in the following diagram that dispersion forces are capable of much more when the molecule containing them increases in size. Polarizability will increase considerably with a molecule's surface area (size). One should always access what the conditions are as to which force is the governing force and what its magnitude is.



* units are in kJ/mol of interactions

All interactions are inversely proportional to the distance in some way ($1/r^n$). Below are the proportionalities for the various interactions shown above.

Dipole-Dipole Interaction

$$E_\mathrm{P} \propto -\frac{\mu_1 \mu_2}{r^3}$$

(non-rotating, solid phase)

note: this is also for H-bonding

Dipole-Dipole Interaction

$$E_\mathrm{P} \propto -\frac{\mu_1^2 \mu_2^2}{r^6}$$

(fast rotating, gas & liquid)

London Dispersion Forces

$$E_\mathrm{P} \propto -\frac{\alpha_1 \alpha_2}{r^6}$$

Ion-Dipole Interaction

$$E_\mathrm{P} \propto -\frac{|q|\mu}{r^2}$$

Ion-Ion Interaction

$$E_\mathrm{P} \propto \frac{q_1 q_2}{r}$$