Intermolecular Forces – Solids, Liquids, Phase Changes

Define-

intramolecular forces:

intermolecular forces:

phase:

phase change:

Types of phase changes –
condensation:

vaporization:

melting:

fusion:

freezing:

sublimation:

deposition:

What two enthalpy changes sum to the heat of sublimation?

The Clausius-Clapeyron equation –

What is the Clausius-Claperyon equation used for?

Examples:
The vapor pressure of ethanol is 115 torr at 34.9˚C. If ΔH_{vap} of ethanol is 40.5 kJ/mol, calculate the temperature (in˚C) when the vapor pressure is 760. torr. (R=8.314 J/mol K)

At 34.1˚C, the vapor pressure of water is 40.1 torr. What is the vapor pressure at 85.5˚C. The ΔH_{vap} of water is 40.7 kJ/mol.

Define-
boiling point:

melting point:

phase diagram:

critical point:

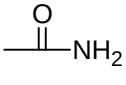
triple point:

Types of Inter and Intramolecular Forces

Force	Looks Like	Basis of Attraction	Energy (kJ/mol)	Example
Ionic				
Covalent				
Metallic				
Ion-Dipole				
H bond				
Dipole-Dipole				

Force	Looks Like	Basis of Attraction	Energy (kJ/mol)	Example
Ion-induced dipole				
Dipole-induced dipole				
Disperson (London)				

Hydrogen bonding-
Which of the following substances exhibits H bonding? For those that do, draw two molecules of the substance with the H bond(s) between them.

a. C_2H_6 b. CH_3OH c.  (CH_3CONH_2) d.  (CH_3COOH)

e. CH_3CH_2OH f.  (CH_3COCH_3)

Predicting the type of intermolecular forces-
For each pair of substances, identify the key intermolecular force(s) in each substance, and select the substance with the higher boiling point.

a. $MgCl_2$ and PCl_3

b. CH_3NH_2 and CH_3F

c. CH_3OH and CH_3CH_2OH

d. Hexane ($CH_3CH_2CH_2CH_2CH_2CH_3$) and 2,2-dimethylbutane

e. CH_3Br and CH_3F

f. $CH_3CH_2CH_2OH$ and $CH_3CH_2OCH_3$

g. C_2H_6 and C_3H_8

See www.jess-squared.com for further examples, solutions, and problems dealing with unit cells & properties of solids.