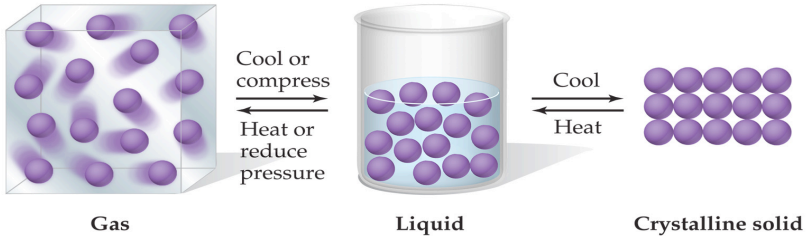
Intermolecular Forces

I. A note about gases, liquids and solids.



A. Gases:

B. Liquid:

C. Solid:

II. A substance's state at a certain temperature depends on

A. Gases: kinetic energy of the particles the of the particles.

B. Liquid: kinetic energy of the particles is but not

C. Solid: kinetic energy of the particles is

III. Intermolecular forces are

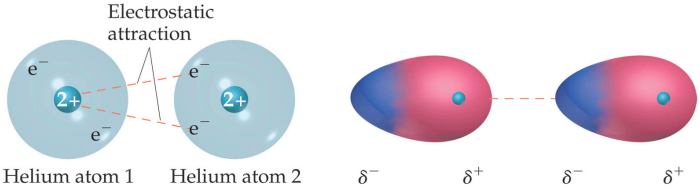
A. Less energy is needed to than to

B. These forces influence

C. Introducing:

D. these forces become more <u>important</u>. (Remember)

1.



a. Occurs in but is the only one present in

b. Molecules that have

i. The electrostatic forces b/w

ii. a.k.a.

c. What is actually happening:

i. as they come into close contact with each other,

ii. a molecule's

d. Strength of dispersion force is

Why?

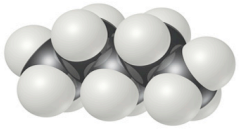
i. the bigger something is,

ii. the more

TABLE 11.3 Boiling Points of the Halogens and the Noble Gases

Halogen	Molecular Weight (amu)	Boiling Point (K)	Noble Gas	Molecular Weight (amu)	Boiling Point (K)
F_2	38.0	85.1	He	4.0	4.6
Cl_2	71.0	238.6	Ne	20.2	27.3
Br_2	159.8	332.0	Ar	39.9	87.5
I_2	253.8	457.6	Kr	83.8	120.9
			Xe	131.3	166.1

e.



n-Pentane
(bp = 309.4 K)

Neopentane
(bp = 282.7 K)

2.

a. Occurs in

b. Larger the dipole moment ( ),

c. These are

3.

a. Occurs in polar molecules that have an

b. Stronger than

c. They are so strong because of the attraction b/w the

E. Relative strength:

1.

2. If the is the same,

3. If is the same,

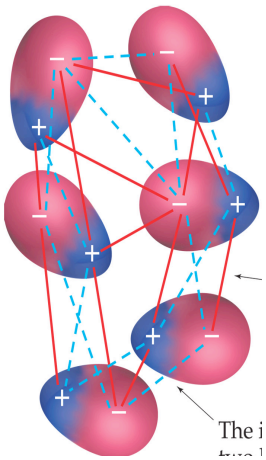


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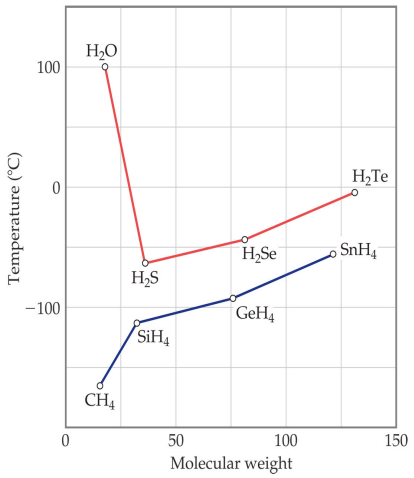
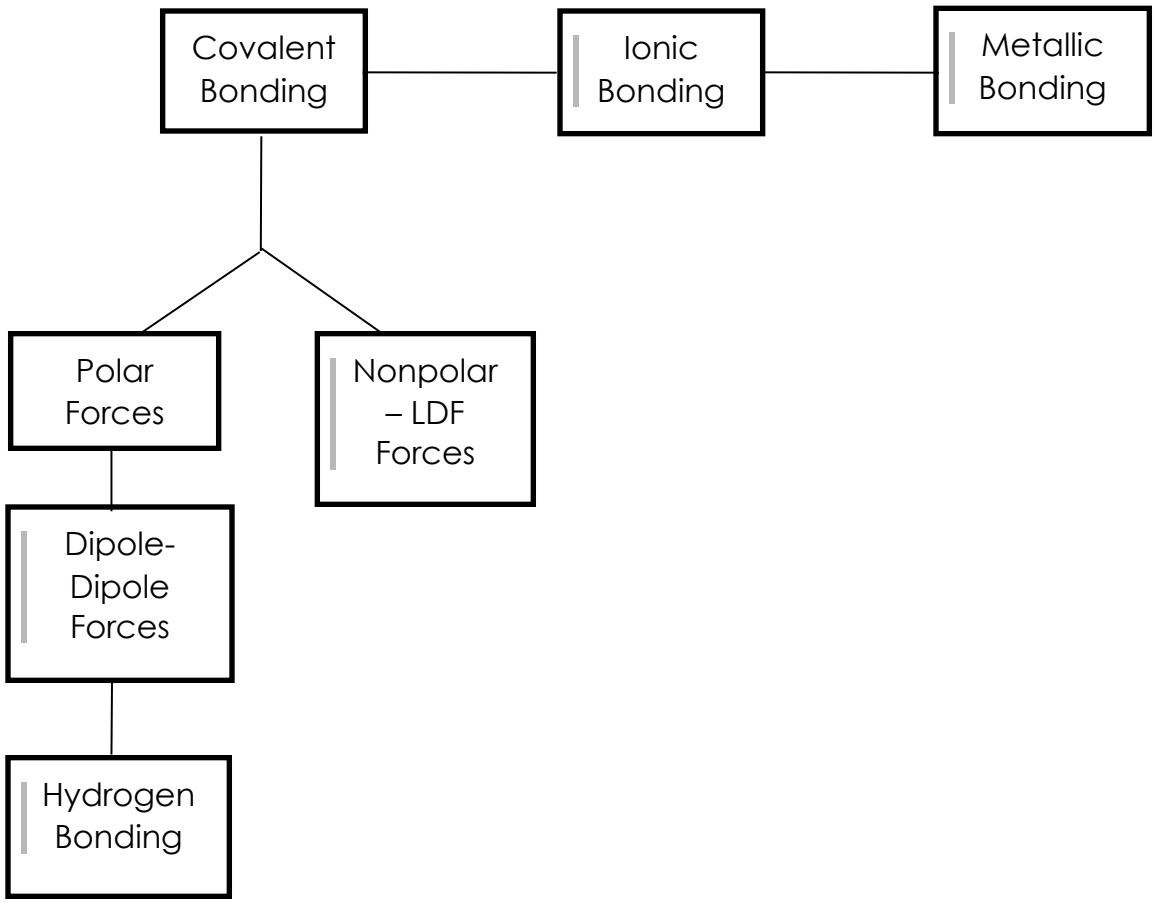
TABLE 11.2 Molecular Weights, Dipole Moments, and Boiling Points of Several Simple Organic Substances

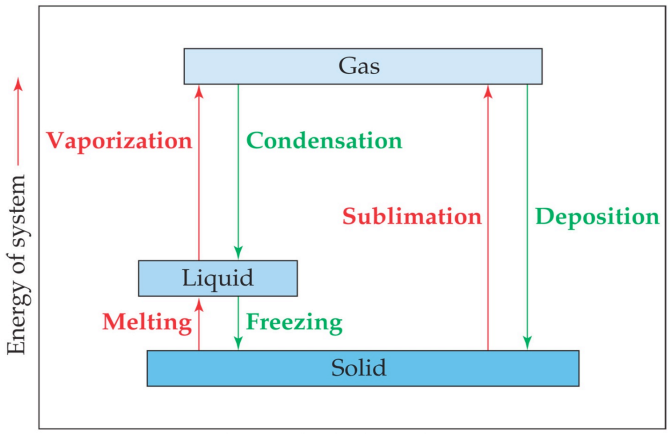
Substance	Molecular Weight (amu)	Dipole Moment μ (D)	Boiling Point (K)
Propane, $CH_3CH_2CH_3$	44	0.1	231
Dimethyl ether, CH_3OCH_3	46	1.3	248
Methyl chloride, CH_3Cl	50	1.9	249
Acetaldehyde, CH_3CHO	44	2.7	294
Acetonitrile, CH_3CN	41	3.9	355





Phase Changes

I. Phase change review:



II. during phase changes.

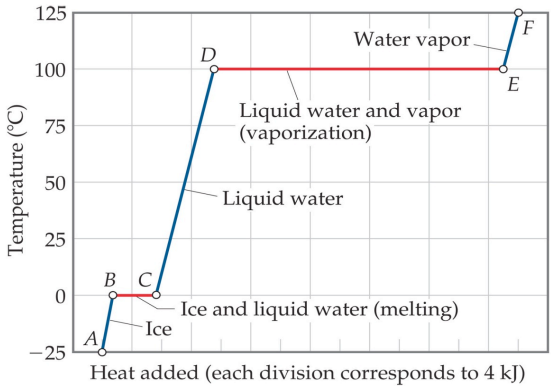
III. Energy changes:

A. Heat of vaporization ( ):

B. Heat of fusion ( ):

IV. Heating (Cooling) Curves (q or E v. T):

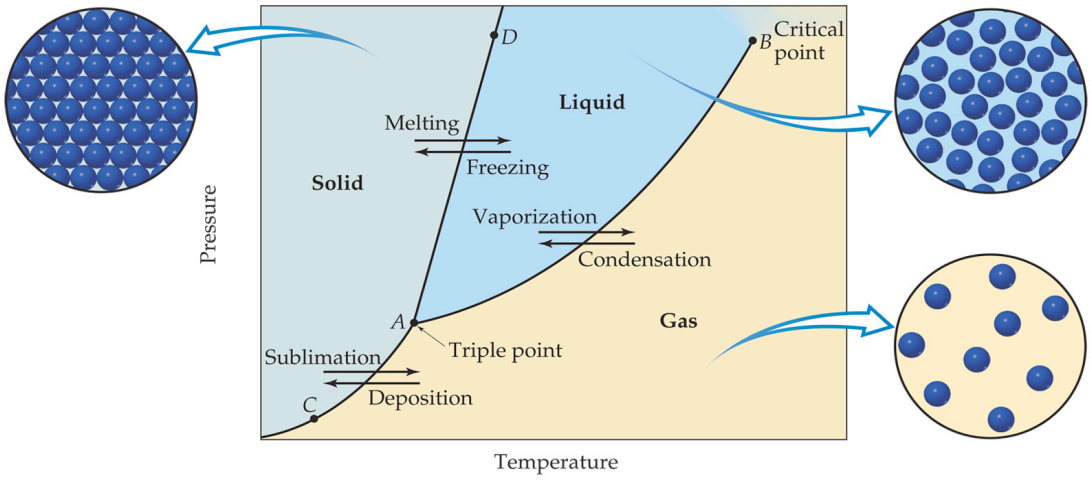
A.



Calculate the enthalpy change upon converting 1.00 mol of ice at –25°C to water vapor (steam) at 125°C under a constant pressure of 1 atm. The specific heats of ice, water, and steam are 2.09 J/g-K, 4.18 J/g-K and 1.84 J/g-K, respectively. For H_2O, ΔH_{fus} = 6.01 kJ/mol and ΔH_{vap} = 40.67 kJ/mol.

What is the enthalpy change during the process in which 100.0 g of water at 50.0°C is cooled to ice at –30.0°C? (Use the specific heats and enthalpies for phase changes given in Sample Exercise 11.4.)

V. Phase Diagrams (P v. T):



A. Some important points:

1. Lines (AD, AB, AC) represent points where

2. (A): P and T where

3. (B):

Above this point, .

4. : Line AD.

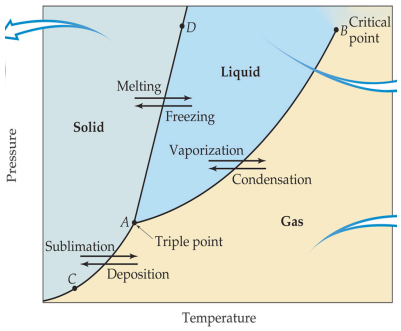
5. : Line AB.

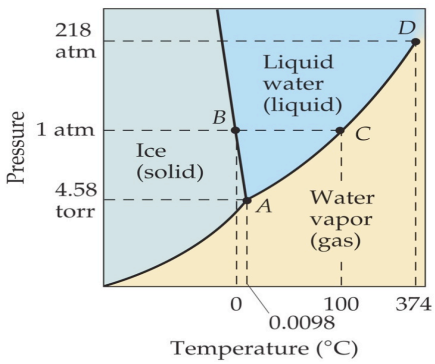
6. : Line AC.

B. A point about the melting point line. When the slope of this line is:

1.

2.





Vapor Pressure

I. At any temperature,

A. The pressure caused by these "escaped" molecules is known as

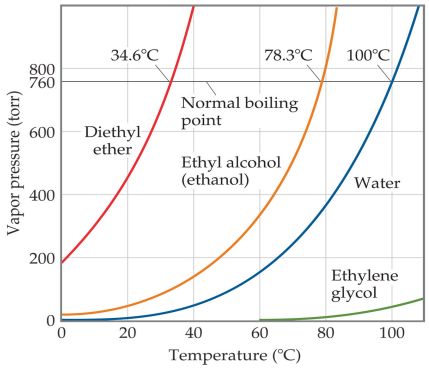
B. As temperature increases,

II. In a sealed container, the liquid and vapor are in

A. The substance

III. <u>Boiling Point</u>:

A. Normal boiling point: temperature at which



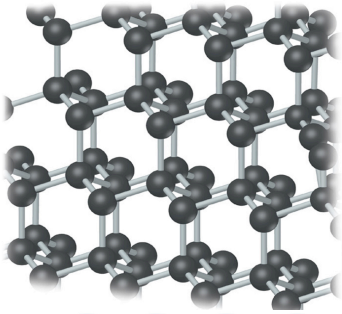
Ex: Estimate the boiling point of diethyl ether under an external pressure of 0.80 atm.

Ex: At what external pressure will ethanol have a boiling point of 60°C?

IV. Calculating vapor pressure

A. Derived from

B. The Clausius-Clapeyron Equation:



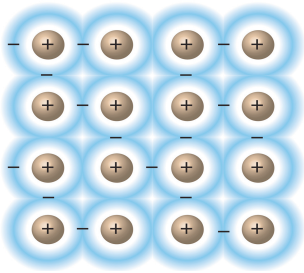
Solids!

I. Look at the chart...

II. Answering AP questions:

A. Relate your response to

B. Many times, it's all about the electrons ( )!

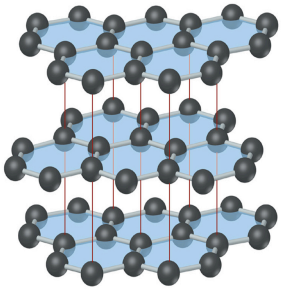


III. Alloys

A. Mixtures of

B. Two types

1. alloy: (One type of atom in the metallic matrix). Ex.:
2. alloy: (One type of atom in the metallic matrix). Ex.:
   a. special case:
   b. silicon is with other elements to



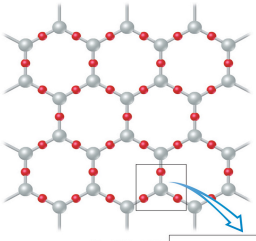
Polarity and Solubility

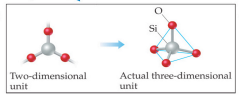
I.

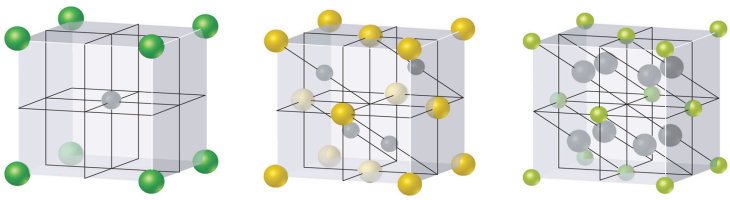
A. dissolves and dissolves

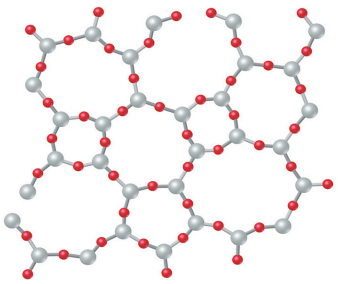
B. Therefore,

C. When answering these questions,









Amorphous SiO_2