Learning from Exam 1

What the class did well on:

- Single step arguments about intermolecular forces (e.g., the stronger the IM forces, the ___ the boiling point, or in which gas are forces strongest)
- Calculations involving the gas laws
- Density of gases
- Reading phase diagrams and understanding meaning of vapor pressure

What the class didn't do well on:

- Graham's law of effusion
- Recognizing hydrogen bonding
- Moving between words and calculations involving gas laws
- Identifying conditions under which gases behave less ideally
- Determining whether a compound is molecular, ionic or metallic and connecting those with macroscopic properties

Graham's law of effusion

- Air, being about 16 times as dense as hydrogen, diffuses:
  - ~~A.~~ 16 times as fast
  - ~~B.~~ 4 times as fast
  - C. $^1/_{16}$ as fast
  - D. ¼ as fast
  - E. ½ as fast

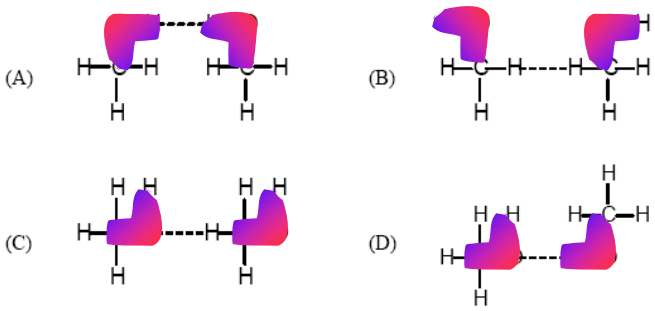
Air is more dense (heavier) than hydrogen, so it cannot diffuse/effuse faster than hydrogen.

Should air diffuse faster or slower than hydrogen? Why?

$$\frac{v_{air}}{v_{hydrogen}} = \sqrt{\frac{M_{hydrogen}}{M_{air}}} = \sqrt{\frac{1}{16}} = \frac{1}{4}$$

Recognizing H bonding

- Which represents hydrogen bonding?



Region of molecule that is polar is indicated. Blue end is δ+ and red end is δ-. Remember that δ+ end of one molecule is attracted to δ- end of a different molecule, because opposites attract. Orientation of molecules matters.

Words and math

- Air is sealed in a vessel at 273ºC and then cooled to 0ºC. If the vessel itself does not contract, the pressure inside the vessel will become
  A. zero
  B. one-fourth of its original value
  C. one-half its original value
  D. twice its original value
  E. none of these

Translating the words
T_1 = 273ºC + 273 = 546K, T_2 = 0ºC = 273K
"does not contract" = volume stays constant
"sealed" = moles (n) stay constant
P_1 = some value, P_2 = compare to P_1

Solving the problem
Direct relation, so if T ↓ then P also ↓ by same factor

Properties of materials and metallic, molecular or ionic compound

- Which substance meets the requirements: solid at room temperature but low melting point, poor electrical conductor?
  A. $C_{12}H_{22}O_{11}$ → molecular because made of C, H and O
  B. Ag → pure metal, located in metal region of Pd table
  C. Na_2SO_4 → ionic because contains Na^+ and SO_4^{2-} ions
  D. CH_4 → molecular because made of C and H

Metals: high melting points, conduct electricity

Molecular substances: relatively low melting points, insulators

Ionic substances: high melting points, brittle, in pure state do not conduct electricity unless melted (molten)

A website to help you review this, view 3-d moveable chemical structures, and practice identifying different substances:

http://www.creative-chemistry.org.uk/molecules/structures.htm