Non Sibi High School

Andover's Chem 250: Introductory/Basic Chemistry

Chapter 12, Review Quiz 1 Answers

1

Rank the compounds $CaBr_2$, KI, MgS, and $SiCl_4$ from lowest to highest melting point.

$SiCl_4$ = molecular = lowest melting point because other three are ionic with the following sum of charge magnitudes:

$CaBr_2 = Ca^{2+}$ and Br^-, 2 + 1 = 3

$KI = K^+$ and I^-, 1 + 1 = 2

$MgS = Mg^{2+}$ and S^{2-}, 2 + 2 = 4

highest sum = highest melting point, so $SiCl_4 < KI < CaBr_2 < MgS$

2

State whether each of the following is a good or poor conductor of electricity in the solid state:

a. Na_2SO_4
b. Xe
c. SiC
d. Zn

a. Na^+ and $SO_4{}^{2-}$ = ionic = poor conductor in solid state (but good conductor in liquid or aqueous state)
b. nonmetal = molecular = poor conductor in solid state (and also poor conductor in liquid state)
c. network covalent with localized electrons = poor conductor in solid state
d. metallic = good conductor in solid state (and also good conductor in liquid state)

3

Rank the following from highest to lowest boiling point:

CH_3NH_2, CO, H_2, N_2, SiO_2

SiO_2 = network covalent = highest boiling point because all others are molecular

CH_3NH_2 has hydrogen bonding = second highest boiling point

CO = about 28 g/mol, H_2 = about 2 g/mol, N_2 = about 28 g/mol

H_2 has lowest molar mass = weakest London forces = lowest boiling point

CO and N_2 have same molar mass = equal London forces, but CO is polar with dipole-dipole forces whereas N_2 is nonpolar with no dipole-dipole forces = CO has third highest boiling point, so:

$H_2 < N_2 < CO < CH_3NH_2 < SiO_2$

4

Predict whether each solute below will dissolve to a greater extent in carbon tetrachloride or water:

a. H_2O_2
b. Br_2
c. HI
d. NH_4NO_3

CCl_4 is nonpolar, whereas water is polar.

a. H_2O_2 is capable of hydrogen bonding, so will dissolve to a greater extent in water, which can hydrogen bond as well.

b. The nonpolar Br_2 will dissolve to a greater extent in the nonpolar carbon tetrachloride.

c. The polar HI will dissolve to a greater extent in the polar water.

d. NH_4NO_3 = NH_4^+ and NO_3^- = ionic, so will dissolve to a greater extent in the polar water.

Contact: kcardozo@andover.edu