

Name Key SS# _____
Quiz 1 CHM 1046 May 9, 2002

Useful information:

Charge on electron: 1.60×10^{-19} Coulomb

$1.00 \text{ pm} = 1.00 \times 10^{-12} \text{ m}$

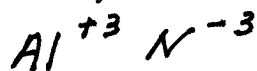
$1.00 \text{ Debye} = 3.336 \times 10^{-30}$ Coulomb meter

density of water = 1.00 g/mL

$N_A = 6.02 \times 10^{23}$

Masses (amu) C: 12, Cl: 35.5, O: 16, N: 14, H: 1, Al: 27

1. Consider the ionic compound aluminum nitride (AlN). If the "bond length" is 205 pm, calculate the dipole moment and record your answer in Debye to the appropriate number of significant figures. (Show all of your work in a logical fashion to receive full credit.)



$$\mu = q r$$

$$q = 3e^- \quad r = 205 \text{ pm}$$

$$\begin{aligned} \mu &= (3e^-)(1.60 \times 10^{-19} \text{ C})(205 \times 10^{-12} \text{ m}) \left(\frac{1 \text{ D}}{3.336 \times 10^{-30} \text{ C}\cdot\text{m}} \right) \\ &= 29.5 \text{ D} \end{aligned}$$

2. For each of the following substances, list the most important type of intermolecular force.

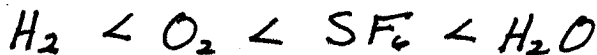
A. HCl dipole-dipole

B. CO₂ London dispersion

C. H₂O hydrogen bonding

D. HCN dipole-dipole

3. Arrange the following substances in order of increasing boiling point: H₂O, O₂, H₂, SF₆



4. At STP conditions, 1 mole of water (H₂O) in the gas phase occupies 22.4 L. If that amount of water is condensed, calculate the volume of the liquid water.

$$\begin{aligned} X \text{ mL} &= (1 \text{ mole H}_2\text{O}(g)) \left(\frac{18.0 \text{ g H}_2\text{O}(l)}{1 \text{ mole H}_2\text{O}(l)} \right) \left(\frac{1 \text{ mL H}_2\text{O}(l)}{1 \text{ g H}_2\text{O}(l)} \right) \\ &= 18 \text{ mL} \end{aligned}$$