**Quiz 9**

# Directions: Answer each of the following questions. Be sure to use complete sentences where appropriate. For full credit be sure to show all of your work. Where appropriate answers should be boxed for clarity, written to the correct number of significant figures, and, include the proper units.

1. Given the following data (10 points):

Mg (s) → Mg (g) ∆H° = 148 kJ

F2 (g) → 2 F (g) ∆H° = 159 kJ

Mg (g) → Mg+ (g) + e- ∆H° = 738 kJ

Mg+ (g) → Mg2+ (g) + e- ∆H° = 1450 kJ

F (g) + e- → F- (g) ∆H° = -328 kJ

Mg (s) + F2 (g) → MgF2 (s) ∆H° = -1123 kJ

* 1. Use the following to calculate the ∆H°lattice of MgF2:

∆H°lattice = -1123 kJ – 148 kJ – 159 kJ – 738 kJ – 1450 kJ – 2(-328 kJ) = -2962 kJ

* 1. Compared with the lattice energy of LiF (1050 kJ/mol) or the lattice energy of NaCl (788 kJ), does the relative magnitude of the value for MgF2 surprise you? Explain.

No, both of these compounds have +1 and -1 charges, whereas MgF2 has a +2 and -1 charge, because E α q1q2 and the magnitude of the charges is higher the lattice energy should also be higher.

1. What is the concentration of O2 in a freshwater stream in equilibrium with air at 25 °C and at a pressure of 1.0 bar? kH = 1.3 × 10-3 mol O2/kg bar and the air is about 21% oxygen gas. Express the answer in grams of O2 per kg of water (6 points).

$$S\_{O\_{2}}=k\_{H}P\_{O\_{2}}$$

$S\_{O\_{2}}=\left(1.3×10^{-3}\frac{mol}{kg bar}\right)\left(0.21 bar\right)=2.73×10^{-4}\frac{mol}{kg}×\frac{31.998 g }{1 mol }=8.7×10^{-3}\frac{g O\_{2}}{kg water}$

1. Polar molecules exhibit dipole-dipole forces. Do they also exhibit dispersion forces? Explain (4 points).

All particles (atoms and molecules) exhibit dispersion forces, but the total force is weak for small molecules. Dipole-dipole forces between small polar molecules dominate the dispersion forces.