

Chemistry 236 -- Quiz 7
October 22, 2003 — Freezing Point Depression

Pledge and signature:

Note: If you want your paper returned folded (*i.e.*, score concealed), please print your name on the back.

1. (3) MgCl_2 and NaOH react in aqueous solutions to yield $\text{Mg}(\text{OH})_2(s)$. If 100 mL of 0.210 M MgCl_2 is mixed with 100 mL of 0.120 M NaOH , and volumes are assumed to be additive, which of the following ions is present after the reaction, and in what concentration?
 - a. $[\text{Mg}^{2+}] = 0.150 \text{ M}$.
 - b. $[\text{Mg}^{2+}] = 0.090 \text{ M}$
 - c. $[\text{Mg}^{2+}] = 0.075 \text{ M}$
 - d. $[\text{Mg}^{2+}] = 0.045 \text{ M}$
 - e. $[\text{OH}^-] = 0.015 \text{ M}$

2. (3) 70.0 mL of aqueous 0.30 M Na_2SO_4 is mixed with 30.0 mL of aqueous 0.10 M NaCl . Using the simplest theory of the role of ions in freezing point depression, and assuming that volumes are additive and that molality = molarity in these dilute solutions, the freezing point of the resulting solution should be ($k_f = 1.855 \text{ K kg/mol}$)
 - a. -1.28°C
 - b. -0.89°C
 - c. -0.74°C
 - d. -0.45°C
 - e. none of these

3. (3) A 0.038 m° solution of an electrolyte in water has a freezing point of -0.191°C . The electrolyte is most likely
 - a. $\text{Fe}(\text{NO}_3)_3$
 - b. CoCl_2
 - c. $\text{Mg}(\text{OH})_2$
 - d. HBr
 - e. More than one of these could be correct.

4. (3) Iodic acid (HIO_3) has $K_a^\circ = 0.16$ at 25°C . Neglecting activity coefficients, the freezing point of an aqueous iodic acid solution of concentration 0.25 m° should be about
 - a. -0.46°C
 - b. -0.71°C
 - c. -0.83°C
 - d. -0.93°C
 - e. -1.21°C