**In-Class Activity**

Reactions of cations with water

1. The following salts dissolve in water to form cations and anions: BaCl2, ZrCl4,NaBr, and BiCl3. Rank the cations in order of increasing charge (Z).
2. Using periodic trends, rank the cations from question 1 in order of decreasing ionic radius (r).

1. Many properties of ions in aqueous solution are roughly proportional to Z2/r. Which of the above rankings (from questions 1 and 2) do you think most accurately lists the cations in order of increasing hydration number? Why?
2. Which cation(s) will cause the water to heat up the most? (Remember that hydration involves the formation of intermolecular interactions with water, similar to bond formation.)
3. Which cation(s) do you think will be highly acidic? Which cations(s) are most likely to not be acidic at all?
4. Calculate Z2/r for each of the cations. Rank the cations in order of increasing hydration number. Does this match your answer from 3? Why or why not? (Note: Make sure to use ionic radii (not atomic radii)--these can be found in the back cover of the Wulfsburg textbook as well as on the internet. It will also help you in question 6 if your radii are in picometers.)
5. Using the Z2/r values from question 5 and Table 2.3 (p. 29) from the Wulfsburg textbook, label each cation as (1) non-acidic; (2) feebly or weakly acidic; (3) moderately acidic; or (4) strongly or very strongly acidic. (Note: The Z2/r values in Wulfsberg Table 2.3 assume radii in picometers. Electronegativity values can be found in the front cover of the Wulfsberg textbook as well as on the internet.)
6. How well do your classifications in question 6 match your predictions from question 4?