Chem 360 Problems
Answers

1. Zn has a higher nuclear charge but no additional shells to shield the valence electrons (5 points)

2. (a) S < P – P is 1/2 filled p shell, S is p^4 (b) K < Cu higher nuclear charge both come out of s (c) Al < Mg – Mg is from filled s, Al from s^1 (3 point each)

3. (a) H_3NO – tetrahedral H-N-H < 109.5° (b) SF_4 trigonal bipyramid with 1 lone pairs cis/s, trans angle = 173.1°, cis F-S-F angle = 1-1.6° (10 points)

4. (a) F-F-F (b) F-F-S-F (10 points)

5. H-O-C≡N O=C≡N^- (10 points)

6. (a) CH_4, (b) NO_2^- (115 °) or O_3 (116°)

7. (a) CaCl_2 (b) ZnO (c) MgCl_2 (15 points).

8. (a) H_2O > NH_3 – stronger H-bonds (b) CH_3OH (-97 °C) > CF_3CH_2OH (73.6 °C) > (CF_3)_2CHOH > (CF_3)_3COH (45°). – oops signs wrong! (10 points)

9. (10 points)

10. e.g., TiCl_4 + D_2O → DCl + TiO_2 (10 points).

11. (a) SiH_4 - reduction, (b) HCl – direct combination, (c) PH_3 - hydrolysis of Ca_3P_2 (10 points)

12. 5256.74 kJ.mol^{-1}. (10 points)
13. Cannizzaro reaction

R\text{CHO} + \cdot\text{OH} \rightarrow R\text{O}^- + \cdot\text{H} \rightarrow R\text{O}^- + \cdot\text{H} \rightarrow R\text{CO}_2\text{H} + R\text{HO}^-

14. (10 points)