Name Key

Chem 370 - Spring, 2019
Fifteen Minute Quiz No. 10

1. (2 points) To what does the term "inert pair effect" refer? What is the underlying cause of this behavior? Explain briefly.
   The inert pair effect refers to the increasing stability of an oxidation state that is two less than the group-characteristic state for the heavier members of groups 13, 14, and 15 (e.g., Tl^+ in group 13). The so-called inert pair is $6s^2$ (or $5s^2$ in cases such as Sn^{2+}). The lower state is favored by the rapid falloff of bond stability down the group accompanied by less rapid (or even slightly rising) ionization potential. At the bottom of these groups the endothermic cost of ionization to the higher state is not compensated by exothermic bond formation, so the lower state is favored.
2. (8 points) In the spaces below the given information, write *balanced* chemical equations for **four (4)** of the following. Indicate any conditions that are key to the reaction. **Be sure to cross out the three (3) you are not answering.**

a. $Ca(OH)_2(aq) + CO_2(g) \rightarrow$

$Ca(OH)_2(aq) + CO_2(g) \rightarrow CaCO_3(s) + H_2O(l)$

b. Potassium is burned in air

$K(s) + O_2(g) \rightarrow KO_2(s)$ (potassium superoxide)

c. The Hall-Héroult process

$2\ Al_2O_3 \xrightarrow[K_3AlF_6/elect.]{1000^oC} 4\ Al + 3\ O_2$

d. $NaNO_3(s) \xrightarrow{\Delta}$

$2\ NaNO_3(s) \xrightarrow{\Delta} 2\ NaNO_2(s) + O_2(g)$

e. $Cl_2(g) + OH^-(aq) \rightarrow$

$Cl_2(g) + 2\ OH^-(aq) \rightarrow OCl^-(aq) + Cl^-(aq) + H_2O(l)$

f. The Goldschmidt (thermite) reaction

$2\ Al(s) + Fe_2O_3(s) \rightarrow Al_2O_3(s) + 2\ Fe(s)$ (ignited with Mg ribbon fuse)

g. $CaC_2(s) + H_2O(l) \rightarrow$

$CaC_2(s) + 2\ H_2O(l) \rightarrow Ca(OH)_2(aq) + C_2H_2(g)$