

**Chemistry 300 – Inorganic Chemistry**

Exam #1 – September 22, 2004

Name: \_\_\_\_\_

1. Rank the following ions from *most* acidic to *least* acidic:  $\text{Mo}^{6+}$ ,  $\text{V}^{5+}$ ,  $\text{Sn}^{4+}$ ,  $\text{As}^{5+}$ ,  $\text{Te}^{6+}$
  
2. Give the complete electronic configuration of Ga and the complete set of quantum numbers that describe **a 4s-electron** in Ga. What is the effective nuclear charge,  $Z^*$ , felt by **the 4p and 3d electrons**?
  
3. Give the formula and the name of the highest expected oxide (oxo compound) of Si. What is the oxidation number of Si in this oxide?
  
4. What is the  $\text{pK}_b$  of the second highest oxide of Si? (That's one less oxo than in question 3.)
  
5. Name the conjugate acid of the oxo anion in question 4 and calculate its  $\text{pK}_a$ .

Based upon the following predominance diagrams:

$M_a^{+y}$		$M_a$ oxide
$M_b^{+y}$	$M_b$ oxide	$[M_b \text{ hydroxide}]^{h-}$
$M_c^{+y}$	$M_c$ oxide	$[M_c \text{ (OH)}]$
$M_d^{+y}$	$M_d$ oxide	$[M_d(\text{OH})]^{h-}$
$HA_e$	$A_e^-$	
$HA_f$		$A_f^-$
$HA_g$	$A_g^-$	
$HA_h$		$A_h^-$

- Rank the acids (cations) from strongest to weakest.
- Rank the bases (anions) from strongest to weakest.
- Which pairs will react? Rank **ALL** cation/anion pairs that will react from most reactive to least reactive?

9. Draw Lewis structures and VSEPR shapes for the following:

