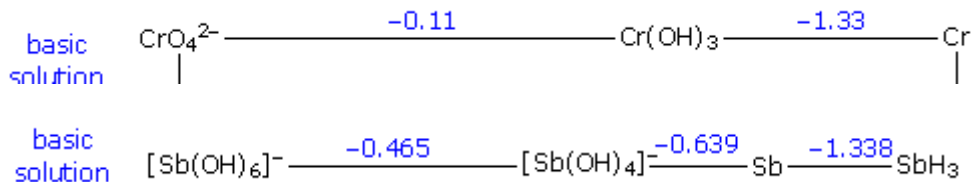
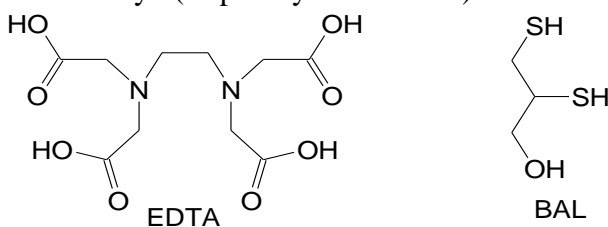


- You have observed the following hydration numbers:  $\text{Zn}^{2+} = 44$ ;  $\text{Ba}^{2+} = 28$ ;  $\text{Sr}^{2+} = 29$ ;  $\text{Mg}^{2+} = 36$ ;  $\text{Na}^+ = 13$ . How many water molecules are in the inner/primary coordination sphere of each of these metal ions? Explain the size of these hydration numbers and describe their effect upon the solubility of the nitrate salts of each of these metal ions.
- Construct redox predominance diagrams for the following species:

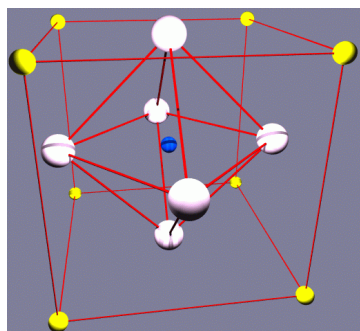


If  $\text{SbH}_3$  and  $\text{CrO}_4^{2-}$  are combined, what products would you expect to form? Write a balanced equation for the expected redox reaction.

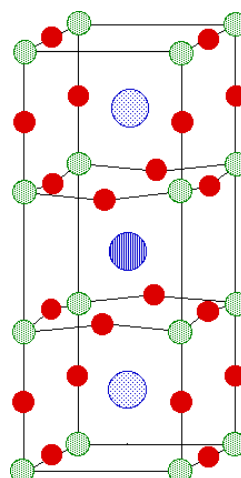
- You have an aqueous mixture of  $\text{Au}^+$ ,  $\text{V}^{3+}$ ,  $\text{Na}^+$ , and  $\text{Sn}^{4+}$  that you would like to separate. If you combine this mixture with a solution containing  $\text{F}^-$ ,  $\text{S}^{2-}$ , ethylenediamine, and 15-C-5, what complexes would you expect to form? Explain your choices.
- Ethylenediaminetetraacetic acid (EDTA) and British Anti-Lewisite (BAL) are both used to remove excess metal ions from humans. Explain why each of these pharmaceuticals is especially good at binding tightly to metal ions. Give 2 examples of metal ions that each ligand would remove effectively. (Explain your choices.)



- Determine the stoichiometry of the compounds represented by the following unit cells. Describe how you arrive at your stoichiometry and assign reasonable oxidation numbers to each element in these unit cells.

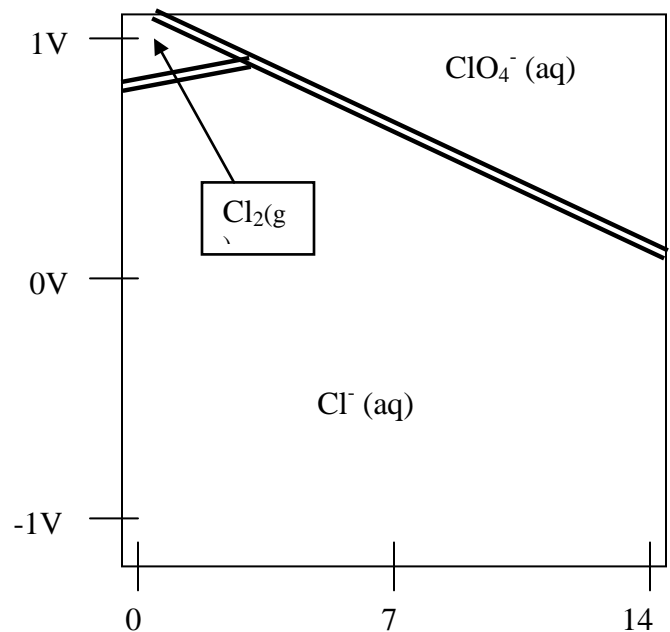
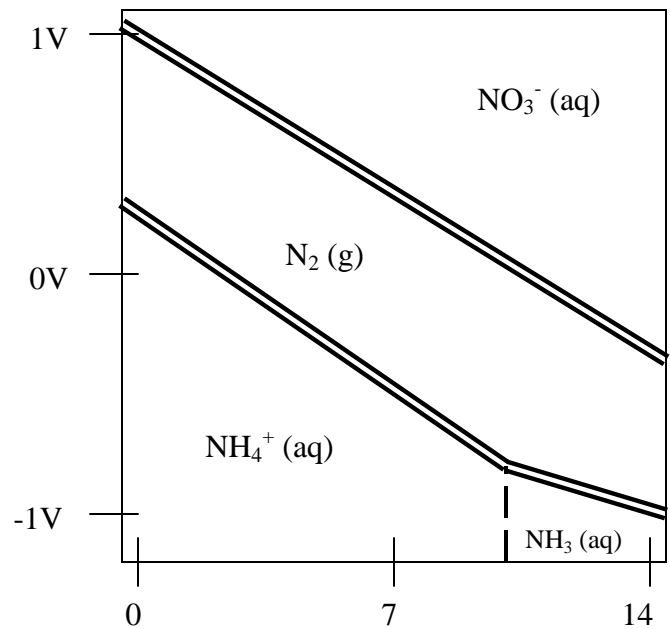
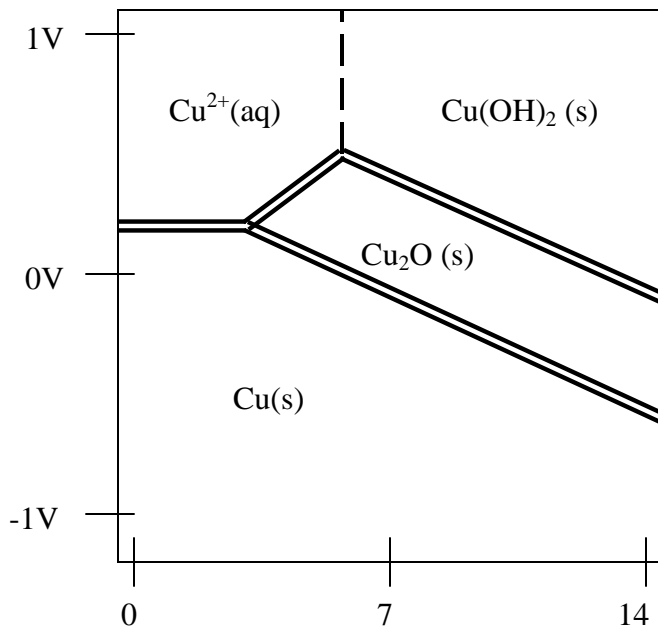


strontium (small dark ball)  
 potassium (medium balls)  
 oxygen (largest balls)



● Barium  
● Yttrium  
● Copper  
● Oxygen

6. Copper(I) is a biologically important but not exceptionally stable oxidation state. When looking at simple redox predominance diagrams, Cu(I) has no predominance region (it is metastable), but in a Pourbaix diagram there is a region of predominance. Explain this. What conditions would stabilize Cu(I) ions? Given the Pourbaix diagrams below, explain why CuCl is commercially available but CuNO<sub>3</sub> is not.



7. What radius ratio would you expect for a calcium fluoride lattice? (0.2-0.4, 0.4-0.7, 0.7-1.0) Explain your choice.