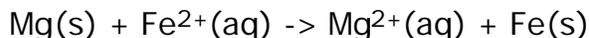
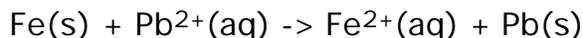
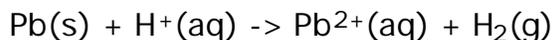
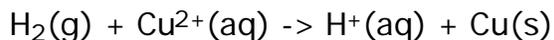
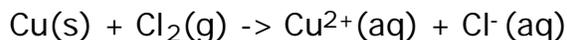


Chem12 Oxidation/Reduction : Notes/W.S. - 20

The Relative Strengths of Oxidizing Agents

Acids and bases have different strengths. Different species have differing attractions for protons. Oxidizing agents also have differing strengths. Some species will attract electrons more strongly than others. We can make a table of oxidizing agent strengths by finding which species will oxidize others.

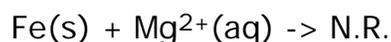
We find that the following (unbalanced) reactions will occur. There are many others.



In the above series, the oxidizing agents are ; Cl_2 , Cu^{2+} , H^+ , Pb^{2+} , and Fe^{2+} . Using the above information we can rank the oxidizing agents in order, from strongest oxidizing agent to weakest.



Some reactions will not occur. These are labeled N.R. for no reaction. A few of these (unbalanced) reactions are :



It is convenient to list the reduction half-reactions according to the strength of the oxidizing agent (on the left) in the following table.

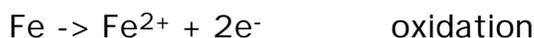


We can see from the previous information that the species which are higher on the left will react with species on the right which are lower. A species on the right will not react with a species on the left that is lower. That is, a species on the left will oxidize a lower species on the right. Conversely, a species on the right will reduce a higher species on the left.

Example : If we want to know whether Cu^{2+} will react with Fe, we first write down the reduction reactions.



We must change the second equation to an oxidation. It is lower in the table than the first

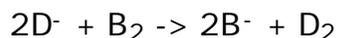
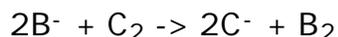


We now add the first and third reactions



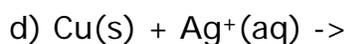
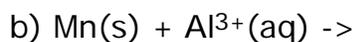
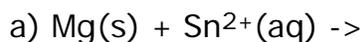
This reaction will occur since the oxidizing agent Cu^{2+} is stronger than Fe^{2+} . (It is higher on the left)

Problems : 1) The diatomic molecules A_2 , B_2 , C_2 and D_2 react as follows in the balanced redox reactions below :

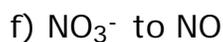
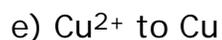
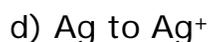
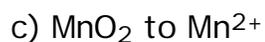
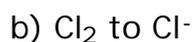
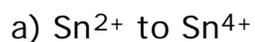


Arrange according to oxidizing strength. Write a reduction half-reaction table as shown above.

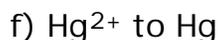
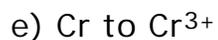
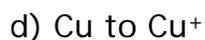
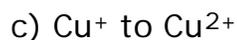
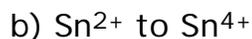
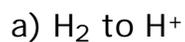
2) Using the Standard Reduction Potential table, complete the following equations. If there is no reaction write N.R.



3) Which of the following will oxidize Fe^{2+} to Fe^{3+} ?



4) Which of the following will reduce Cu^{2+} to Cu ?



5) Which of the following will oxidize Mn to Mn^{2+} but not oxidize Fe to Fe^{2+} ?



Answers : 1) $A_2 + 2e^- \rightarrow 2A^-$, $C_2 + 2e^- \rightarrow 2C^-$, $B_2 + 2e^- \rightarrow 2B^-$, $D_2 + 2e^- \rightarrow 2D^-$. 2) a) $Mg^{2+}(aq) + Sn(s)$, b) N.R., c) $Zn^{2+}(aq) + Fe(s)$, d) $Cu^{2+}(aq) + Ag(s)$, e) N.R., 3) a) No, b) Yes, c) Yes, d) No, e) No, f) Yes, 4) a) Yes, b) Yes, c) Yes, d) No, e) Yes, f) No, 5) a) No, b) Yes, c) Yes, d) No, e) No, f) No.