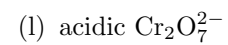
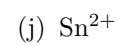
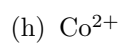
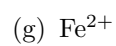
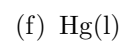
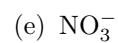
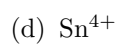
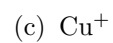
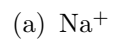
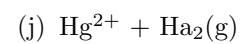
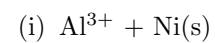
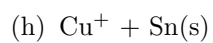
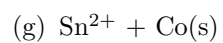
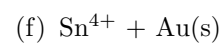
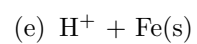
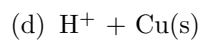
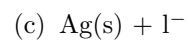
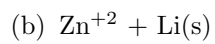
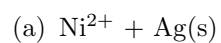


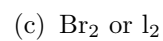
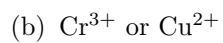
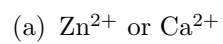
7. Using the Standard Reduction Potential table, state whether the following species  
can only undergo reduction, or  
can only undergo oxidation, or  
cannot react at all, or  
can undergo either reduction or oxidation (because it is found on both sides of the Table).



8. Classify as spontaneous or no reaction. If spontaneous, write out the complete reaction.



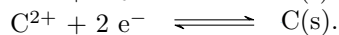
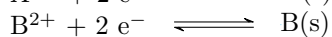
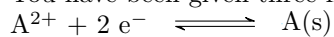
9. Which member of each of the following pairs is the stronger oxidizing agent?



10. Which member of each of the following pairs is the stronger reducing agent?
- (a) Mn or Pb
  - (b)  $\text{Cu}^+$  or  $\text{Sn}^{2+}$
  - (c)  $\text{Cr}^{2+}$  or  $\text{Fe}^{2+}$
11. Predict whether a spontaneous reaction is expected when the following are mixed, and state the products of any spontaneous reactions.
- (a)  $\text{Zn(s)}$  and  $\text{H}_2\text{(g)}$
  - (b)  $\text{Sn(s)}$  and  $\text{Sn}^{4+}$
  - (c)  $\text{H}^+$  is added to  $\text{Mn(s)}$
  - (d)  $\text{Fe}^{2+}$  is added to  $\text{Cr}_2\text{O}_7^{2-}$
  - (e)  $\text{Fe}^{2+}$  is added to acidic  $\text{Cr}_2\text{O}_7^{2-}$
  - (f)  $\text{Cu(s)}$  and  $\text{H}^+$
  - (g) A mixture of  $\text{MnO}_2\text{(s)}$  and  $\text{H}^+$  is added to  $\text{I}^-$
  - (h)  $\text{SO}_4^{2-}$  is added to  $\text{Sn(s)}$

12. (a) Which of Cr,  $I_2$ , Al and  $Fe^{3+}$  will oxidize Co?
- (b) Which of  $H_2$ ,  $Cl_2$ ,  $Hg^{2+}$  and  $H_2O_2$  will reduce  $Ag^+$  ?
- (c) Which of  $I^-$ , Pb,  $Br_2$  and  $Sn^{2+}$  will act as reducing agents for  $Sn^{4+}$ ?
- (d) Which of  $Cu^{2+}$ , Zn, acidic  $NO_3^-$  and  $Cl^-$  will act as oxidizing agents for aqueous  $SO_2$  (i.e.  $H_2SO_3$ ) ?
- (e) Which substance(s) can be oxidized by  $I_2$  but not by acidic  $SO_4^{2-}$ ?
- (f) Which substance(s) can be reduced by  $I_2$  but not by  $Fe^{2+}$ ?
- (g) Which substance(s) can act as an oxidizing agent for Pb but not for  $Sn^{2+}$  ?
- (h) Which substance(s) will oxidize Co and reduce  $H^+$  ?
13. An electrochemical cell was made by joining a half-cell containing 1 M  $Pb(NO_3)_2$  and a lead electrode to a half-cell consisting of 1 M  $Zn(NO_3)_2$  and a zinc electrode. As the cell continues to operate, what happens to the  $[Pb^{2+}]$  ? What happens to the  $[Zn^{2+}]$ ?

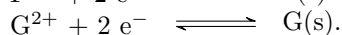
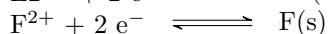
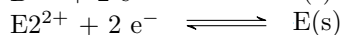
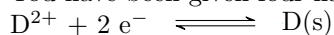
14. You have been given three half-reactions:



The reactions are not in any order of tendency to reduce. The following experiment data is found:

$\text{A}^{2+}$  reacts with  $\text{C(s)}$  but not with  $\text{B(s)}$ . Arrange the half reactions in decreasing order of tendency to reduce (greatest tendency first).

15. You have been given four half-reactions:



Experimentally, it was found that:

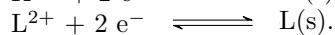
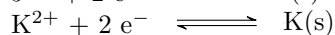
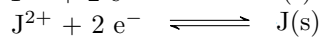
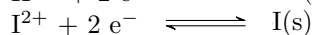
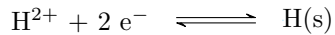
$\text{F}^{2+}$  reacts with  $\text{D(s)}$ ,  $\text{E(s)}$  and  $\text{G(s)}$

no reaction occurs between  $\text{D}^{2+}$  and any of the metals

$\text{G}^{2+}$  only reacts with  $\text{D(s)}$ .

Arrange the half-reactions decreasing strength as oxidizing agents (greatest strength first).

16. You have been given five half-reactions:



Experimentally, it was found that:

$\text{K}^{2+}$  only reacted with  $\text{I(s)}$  and  $\text{H(s)}$

$\text{L}^{2+}$  did not react with  $\text{J(s)}$

$\text{I}^{2+}$  reacted with  $\text{H(s)}$ .

Arrange the half-reactions in decreasing tendency to reduce (greatest tendency first).

17. Use your Table of Reduction Potentials to complete the following table. Omit the spaces on the diagonal and use "RX" to indicate that a reaction occurs between the metal and ion or use "-" to indicate that no reaction occurs.

	$\text{Fe}^{2+}$	$\text{Au}^{3+}$	$\text{Ni}^{2+}$	$\text{Pb}^{2+}$
Fe				
Au				
Ni				
Pb				

18. Given the following data

	$V^{2+}$	$Cd^{2+}$	$Ti^{2+}$	$Ga^{3+}$
V		Rx	-	Rc
Cd	-		-	-
Ti	Rx	Rx		Rx
Ga	-	Rx	-	

where: "RX" means a reaction occurred and "-" means no reaction occurred  
Arrange the metal ions in decreasing strength as oxidizing agents.