## Spontaneous Reactions and Table J

Use Table J to help you with the following questions.
1. According to Table J, the element higher on the list will oxidize. Which element is oxidizing here and does that mean that this reaction is spontaneous?

$$Ca + Cu(NO_3)_2 \rightarrow Ca(NO_3)_2 + Cu$$

2. Which species is oxidized and which is reduced (use your oxidation states). Now look at table J....would this reaction be spontaneous?

$$Mg + Ca(NO_3)_2 \rightarrow Mg(NO_3)_2 + Ca$$
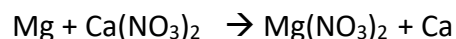
3. Based on Table J, which of the following metals is most reactive?
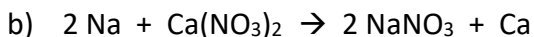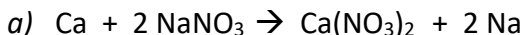   a) Ag   b) Au   c) Ca   d) Cu

4. Based on Table J, which of the following metals is most likely to lose electrons?
    a) Ca   b) Co   c) Cr   d) Cu

5. Based on Table J, which of the following metals is most likely to be oxidized?
    a) Li   b) Na   c) K   d) Cs

6. Based on Table J, circle the reaction below that is going to be "spontaneous." Explain why you chose it:

    a) $Ca + 2\ NaNO_3 \rightarrow Ca(NO_3)_2 + 2\ Na$

    b) $2\ Na + Ca(NO_3)_2 \rightarrow 2\ NaNO_3 + Ca$

7. On the non-metals side of Chart J, explain why it makes sense that F_2 is most reactive and I_2 is least. Explain using the definition of electronegativity, as well as the electronegativity values.

8. Treasure hunters that search for bounty from sunken Spanish ships often find hordes of gold and silver coins or bullion. Neither metal is very active. However, if the wreck is several hundred years old, the silver is often partially corroded, whereas the gold is not. Explain why based on Table J.

9. Which metal can spontaneously react with Cr^{+3}, according to Table J?

    1. nickel   2. lead   3. copper   4. Aluminum

Regents Review

1. Which reaction is an example of an oxidation-reduction reaction?
    (1) $AgNO_3 + KI \rightarrow AgI + KNO_3$
    (2) $Cu + 2AgNO_3 \rightarrow Cu(NO_3)_2 + 2Ag$
    (3) $2KOH + H_2SO_4 \rightarrow K_2SO_4 + 2H_2O$
    (4) $Ba(OH)_2 + 2HCl \rightarrow BaCl_2 + 2H_2O$

2. In an oxidation-reduction reaction, reduction is defined as the
  (1) loss of protons   (3) loss of electrons
  (2) gain of protons   (4) gain of electrons

3. When a lithium atom forms a Li^+ ion, the lithium atom
    (1) gains a proton   (3) loses a proton
    (2) gains an electron   (4) loses an electron

4. Which type of reaction occurs when nonmetal atoms become negative nonmetal ions?
    (1) oxidation   (3) substitution
    (2) reduction   (4) condensation

5. When a neutral atom undergoes oxidation, the atom's oxidation state
    (1) decreases as it gains electrons
    (2) decreases as it loses electrons
    (3) increases as it gains electrons
    (4) increases as it loses electrons
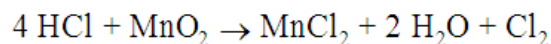
6. In a redox reaction, there is a conservation of
    (1) mass, only
    (2) both mass and charge
    (3) neither mass nor charge

7. In any redox reaction, the substance that undergoes reduction will
(1) lose e- & have a decrease in oxidation number
(2) lose e- & have an increase in oxidation number
(3) gain e- & have a decrease in oxidation number
(4) gain e- & have an increase in oxidation number

8. What occurs during the reaction below?
$$4\,HCl + MnO_2 \rightarrow MnCl_2 + 2\,H_2O + Cl_2$$
    (1) The manganese is reduced and its oxidation number changes from +4 to +2.
    (2) The manganese is oxidized and its oxidation number changes from +4 to +2.
    (3) The manganese is reduced and its oxidation number changes from +2 to +4.
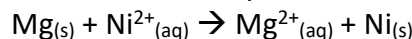   (4) The manganese is oxidized and its oxidation number changes from +2 to +4.
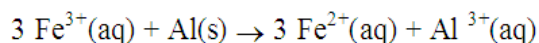
9. Given the balanced equation:
$$3\,Fe^{3+}(aq) + Al(s) \rightarrow 3\,Fe^{2+}(aq) + Al^{3+}(aq)$$
    What is the total number of moles of electrons lost by 2 moles of Al(s)?
    (1) 1 mole   (3) 3 moles
    (2) 6 moles   (4) 9 moles

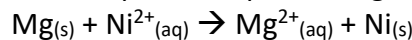10. Given the balanced equation:
    $Mg_{(s)} + Ni^{2+}_{(aq)} \rightarrow Mg^{2+}_{(aq)} + Ni_{(s)}$
What is the total number of moles of electrons lost by 2 moles of Mg(s)?
    (1) 1.0 mol   (3) 3.0 mol
    (2) 2.0 mol   (4) 4.0 mol

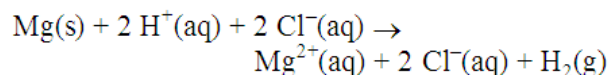11. Given the equation representing a reaction:
    $Mg_{(s)} + Ni^{2+}_{(aq)} \rightarrow Mg^{2+}_{(aq)} + Ni_{(s)}$
What is the total number of moles of e- lost by Mg when 2.0 moles of e- are gained by $Ni^{2+}_{(aq)}$?
    (1) 1.0 mol   (3) 3.0 mol
    (2) 2.0 mol   (4) 4.0 mol

12. Given the reaction:
$$Mg(s) + 2\,H^+(aq) + 2\,Cl^-(aq) \rightarrow$$
$$Mg^{2+}(aq) + 2\,Cl^-(aq) + H_2(g)$$
    Which species undergoes oxidation?
    (1) Mg(s)   (3) $Cl^-(aq)$
    (2) $H^+(aq)$ (4) $H_2(g)$