Electrochemistry Review

P586 #1-6

1. Oxidation refers to the gaining of electrons. There does not need to be oxygen in an oxidation reaction. Electrons can move from one metal to another

2. Originally, reduction referred to the process of converting the iron ions to metallic iron. However, today, chemists apply this term to all cases in which atoms or ions gain electrons in a reaction.

3. Originally, oxidation reactions required oxygen to be a reactant. However, today the term oxidation encompasses all reactions

4. An electron cannot exist in a free state. If an element loses an electron, there HAS to be an element that accepts the electron.

5. $2Al - 6e^- \rightarrow 2Al$ oxidation
   $3Fe + 6e^- \rightarrow 3Fe$ reduction

6. Usually double displacement reactions are not redox reactions because no elements have changed oxidation state

$$\overset{2+\ -1}{BaCl_2} + \overset{+1\ -2}{K_2CO_3} \rightarrow \overset{2+\ 2-}{BaCO_3} + \overset{+1\ -1}{2KCl}$$

NO CHANGES

P588 #7-12

7. a) spontaneous b) unspontaneous c) spontaneous

d) unspontaneous e) unspontaneous f) unspontaneous

8. Lithium, Potassium, Calcium

9. a) because silver is a stronger oxidizing agent

P589 # 1, 3, 5-8, 12

1. When an electron is lost, it can never exist in a free state. Their needs to be a molecule that can accept the electron

3. The oxidizing agent gains electrons, and oxidation is the process of losing electrons. Reduction, means gaining electrons. ∴ oxidizing agent gains electrons from species that is being oxidized, which means it undergoes reduction

5. a) $Mg + 2e^- \rightarrow MgCl_2$ | $2HCl \rightarrow 2e^- + H_2$ | b) $2Na + e^- \rightarrow 2NaOH$ | $2H_2O \rightarrow H_2 + e^-$ | c) $Cr + 2e^- \rightarrow CrSO_4$ | $FeO_4 \rightarrow Fe + 2e^-$

6. a) $Zn + Fe^{2+} \rightarrow Zn^{2+} + Fe$
b) $Al + Cr^{3+} \rightarrow Al^{3+} + Cr$
c) $Tl + Au^{+} \rightarrow Tl^{+} + Au$
d) $Cu + Pt^{2} \rightarrow Cu^{2+} + Pt$

7. a) $Al_{(s)} + Fe^{3+}_{(aq)} \rightarrow Al^{3+}_{(aq)} + Fe_{(s)}$
b) Al oxidized ; Fe reducing

8. a) $\overset{0}{Ca}_{(s)} + \overset{+2}{Cu}\overset{-2}{SO_4}_{(aq)} \rightarrow \overset{+2}{Ca}\overset{-2}{SO_4}_{(aq)} + \overset{0}{Cu}_{(s)}$

b) $\overset{0}{Ni} + \overset{+1}{Hg}\overset{-1}{NO_3} \rightarrow \overset{+1}{Ni}\overset{-1}{NO_3} + \overset{0}{Hg}$

$Ni + Hg^{+} \rightarrow Ni^{+} + Hg$

c) $\overset{0}{Tl} + \overset{+1}{Ag}\overset{-1}{Cl} \rightarrow \overset{+1}{Tl}\overset{-1}{Cl} + \overset{0}{Ag}$

$Tl + Ag^{+} \rightarrow Tl^{+} + Ag$

PG 606 #11-24

11. +3 12. 0 13. +6 14. +5 15. 0 16. -1

17. $\overset{+1}{H_2}\overset{+4}{S}\overset{-2}{O_3}$ 18. $\overset{-2}{O}\overset{+1}{H}^{-}$ 19. $\overset{+1}{H}\overset{5}{P}\overset{-2}{O_4}^{2-}$

20. 0 21. -2 22. $\overset{3}{Al}(\overset{1}{H}\overset{4}{C}\overset{-2}{O_3})_3$ 23. $(\overset{-3}{N}\overset{+1}{H_4})_3\overset{5}{P}\overset{-2}{O_4}$

24. $\overset{+1}{K_2}\overset{+1}{H_3}\overset{+7}{I}\overset{-2}{O_6}$

P611 # 25-34