Pg. 173 #11

$$H_2SO_4\ (aq) + 2NaOH\ (aq) \longrightarrow Na_2SO_4\ (aq) + 2HOH\ (\ell)$$

$$Pb(NO_3)_2\ (aq) + 2KBr \longrightarrow PbBr_2 \downarrow + 2KNO_3\ (aq)$$

$$NH_4Cl\ (aq) + AgNO_3\ (aq) \longrightarrow AgCl \downarrow + NH_4NO_3\ (aq)$$

$$CaCO_3\ (s) + 2CH_3COOH\ (aq) \longrightarrow Ca(CH_3COO)_2\ (aq) + CO_2\ (g) + HOH\ (\ell)$$

Pg. 173 #12

$$CuSO_4\ (aq)\ +\ 2KOH\ (aq) \longrightarrow K_2SO_4\ (aq)\ +\ Cu(OH)_2\ (s)$$

$$H_3PO_4\ (aq)\ +\ 3NaOH(aq) \longrightarrow Na_3PO_4\ (aq)\ +\ 3HOH(\ell)$$

$$3NaHCO_3\ (s)\ +\ H_3PO_4\ (aq) \longrightarrow Na_3PO_4\ (aq)\ +3CO_2\ (g)\ +\ 3HOH\ (\ell)$$

$$2AlCl_3\ (aq)\ +\ 3Pb(NO_3)_2\ (aq) \longrightarrow 2Al(NO_3)_3\ (aq)\ +3PbCl_2\ (s)$$

Pg. 173 #13a

$$Ag\ (\mathrm{s}) + H_2SO_4\ (aq) \rightarrow$$

The reaction does not work because silver is **less reactive** than hydrogen. That is, it is lower on the activity series.

Pg. 173 #13b

$$Cl_2\ (g) + NaBr\ (aq) \rightarrow$$

This reaction **will work** because chlorine is more reactive then bromine. That is, it is higher on the activity series.

$$Cl_2\ (g) + NaBr\ (aq) \rightarrow Br_2\ (\ell) + NaCl\ (aq)$$

$$Cl_2\ (g) + 2NaBr\ (aq) \rightarrow Br_2\ (\ell) + 2NaCl\ (aq)$$

Pg. 173 #13c

$$Mg\ (s) + ZnCl_2\ (aq) \rightarrow$$

This reaction **will work** because magnesium is more reactive then zinc. That is, it is higher on the activity series.

$$Mg\ (s) + ZnCl_2\ (aq) \rightarrow Zn\ (s) + MgCl_2\ (aq)$$

This reaction is already balanced.

Pg. 173 #13d

$$Pb\ (s) + AgNO_3\ (aq) \rightarrow$$

This reaction **will work** because lead is more reactive then silver. That is, it is higher on the activity series.

$$Pb\ (s) + AgNO_3\ (aq) \rightarrow Ag\ (s) + Pb(NO_3)_2\ (aq)$$

$$Pb\ (s) + 2AgNO_3\ (aq) \rightarrow 2Ag\ (s) + Pb(NO_3)_2\ (aq)$$

Pg. 173 #15

$$H_2(g) + I_2(s) \longrightarrow 2\ HI\ (g)$$

$$CaCO_3\ (s) \xrightarrow{\Delta} CaO\ (s) + CO_2\ (g)$$

$$Mg\ (s)\ +\ H_2SO_4\ (aq)\ \longrightarrow H_2\ (g)\ +\ MgSO_4\ (aq)$$

$$FeCl_2\ (aq) +\ 2\ NaOH\ (aq)\ \longrightarrow 2\ NaCl\ (aq) +\ Fe(OH)_2\ \downarrow$$

Pg. 173 #17

$$2\ Ba\ (s) + O_2(s) \longrightarrow 2\ BaO\ (s)$$

$$2\ NaHCO_3\ (s) \xrightarrow{\Delta} Na_2CO_3\ (s) + CO_2\ (g) + H_2O\ (\ell)$$

$$Ni\ (s)\ +\ CuSO_4\ (aq)\ \longrightarrow Cu\ (s)\ +\ NiSO_4\ (aq)$$

$$MgO\ (s) +\ 2\ HCl\ (aq)\ \longrightarrow MgCl_2\ (aq) +\ HOH\ (\ell)$$

$$H_3PO_4\ (aq)\ +\ 3\ KOH\ (aq) \longrightarrow K_3PO_4\ (aq)\ +\ 3\ HOH\ (\ell)$$

Pg. 173 #21

$$CaO + H_2O \longrightarrow Ca(OH)_2 + 65.3\ kJ$$

$$1630\ kJ\ +\ Al_2O_3 \longrightarrow O_2 + Al$$

$$3260\ kJ\ +\ 2Al_2O_3 \longrightarrow 3O_2 + 4Al$$

Pg. 174 #23

$$2\,AgClO_3\ (s) \xrightarrow{\Delta} 2\ AgCl\ (s) + 3O_2(g)$$

decomposition

$$H_2SO_4\ (aq)\ +\ Fe\ (s) \longrightarrow H_2\ (g)\ +\ FeSO_4\ (aq)$$

single displacement

$$Cl_2\ (g) +\ Zn\ (s) \longrightarrow ZnCl_2\ (s)$$

synthesis

$$KOH\ (aq)\ +\ HBr\ (aq) \longrightarrow KBr\ (aq)\ +\ HOH\ (\ell)$$

double displacement/acid-base neutralization

Pg. 174 #24

$$Ni\ (s) + Pb(NO_3)_2(aq) \longrightarrow Pb\ (s) + Ni(NO_3)_2(aq)$$

double displacement

$$MgO\ (s)\ +\ H_2O\ (\ell) \longrightarrow Mg(OH)_2\ (s)$$

synthesis

$$2HgO\ (s) \xrightarrow{\Delta} 2Hg\ (\ell) + O_2\ (g)$$

decomposition

$$PbCl_2\ (aq)\ +\ (NH_4)_2CO_3\ (aq) \longrightarrow PbCO_3\ (s)\ +\ 2NH_4Cl\ (aq)$$

double displacement

Pg. 174 #30

This reaction will not take place because zinc is less reactive than magnesium. For a single displacement reaction to work, the free state element must be more reactive than the element it is trying to replace.

Pg. 174 #32

$$4K + O_2 \longrightarrow 2K_2O$$

$$2Al + 3Cl_2 \longrightarrow 2AlCl_3$$

$$CO_2 + H_2O \longrightarrow H_2CO_3$$

$$CaO + H_2O \longrightarrow Ca(OH)_2$$

Pg. 174 #34

$$Zn\ (s) + H_2SO_4\ (aq) \longrightarrow H_2\ (g) + ZnSO_4\ (aq)$$

$$2AlI_3\ (aq) + 3Cl_2\ (g) \longrightarrow 2AlCl_3\ (aq) + 3I_2\ (s)$$

$$Mg\ (s) + 2AgNO_3\ (aq) \longrightarrow 2Ag\ (s) + Mg(NO_3)_2\ (aq)$$

$$2Al\ (s) + 3CoSO_4\ (aq) \longrightarrow Al_2(SO_4)_3\ (aq) + 3Co\ (s)$$

Pg. 174 #35a

$$ZnCl_2\ (aq) + KOH\ (aq) \rightarrow$$

This reaction will work because zinc hydroxide will be a precipitate.

$$ZnCl_2\ (aq) + 2KOH\ (aq) \rightarrow Zn(OH)_2\ (s) + 2KCl\ (aq)$$

Pg. 174 #35b

$$CuSO_4\ (aq) + H_2S\ (aq) \rightarrow$$

This reaction will work because copper(II) sulfide will be a precipitate.

$$CuSO_4\ (aq) + H_2S\ (aq) \rightarrow CuS\ (s) + H_2SO_4\ (aq)$$

This reaction is already balanced.

Pg. 174 #35c

$$Ca(OH)_2\ (aq) + H_3PO_4\ (aq) \rightarrow$$

This reaction will work because calcium phosphate will be a precipitate and water is produced.

$$3Ca(OH)_2\ (aq) + 2H_3PO_4\ (aq) \rightarrow 6H_2O\ (\ell) + Ca_3(PO_4)_2\ (s)$$

Pg. 174 #35d

$$(NH_4)_3PO_4\ (aq) + Ni(NO_3)_2\ (aq) \rightarrow$$

This reaction will work because nickel(II) phosphate will be a precipitate.

$$2(NH_4)_3PO_4\ (aq) + 3Ni(NO_3)_2\ (aq) \rightarrow 6NH_4NO_3\ (aq) + Ni_3(PO_4)_2\ (s)$$

Pg. 174 #35e

$$Ba(OH)_2\ (aq) + HNO_3\ (aq) \rightarrow$$

This reaction will work because water is produced.

$$Ba(OH)_2\ (aq) + 2HNO_3\ (aq) \rightarrow Ba(NO_3)_2\ (aq) + 2H_2O\ (\ell)$$

Pg. 174 #35f

$$(NH_4)_2S\ (aq) + HCl\ (aq) \rightarrow$$

This reaction works because hydrogen sulfide is a gas.

$$(NH_4)_2S\ (aq) + 2HCl\ (aq) \rightarrow 2NH_4Cl\ (aq) + H_2S\ (g)$$

Pg. 174 #36a

$$AgNO_3\ (aq) + KCl\ (aq) \rightarrow$$

This reaction will work because silver chloride will be a precipitate.

$$AgNO_3\ (aq) + KCl\ (aq) \rightarrow KNO_3\ (aq) + AgCl\ (s)$$

This reaction is already balanced.

Pg. 174 #36b

$$Ba(NO_3)_2\ (aq) + MgSO_4\ (aq) \rightarrow$$

This reaction will work because barium sulfate will be a precipitate.

$$Ba(NO_3)_2\ (aq) + MgSO_4\ (aq) \rightarrow BaSO_4\ \downarrow + Mg(NO_3)_2\ (aq)$$

This reaction is already balanced.

Pg. 174 #36c

$$H_2SO_4\ (aq) + Mg(OH)_2\ (aq) \rightarrow$$

This reaction will work because the reaction produces water, which is not aqueous.

$$H_2SO_4\ (aq) + Mg(OH)_2\ (aq) \rightarrow MgSO_4\ (aq) + 2H_2O\ (\ell)$$

Pg. 174 #36d

$$MgO\ (s) + H_2SO_4\ (aq) \rightarrow$$

This reaction will work because the reaction produces water, which is not aqueous.

$$MgO\ (s) + H_2SO_4\ (aq) \rightarrow MgSO_4\ (aq) + H_2O\ (\ell)$$

This reaction is already balanced.

Pg. 174 #36e

$$Na_2CO_3\ (aq) + NH_4Cl\ (aq) \rightarrow$$

This reaction will not work because the predicted products will contain either sodium or ammonium, both of which make aqueous compounds.

Pg. 174 #37

$$CH_4 + 2O_2 \xrightarrow{\Delta} CO_2 + 2H_2O$$

$$2H_2 + O_2 \xrightarrow{\Delta} 2H_2O$$

Pg. 175 #38

$$2C_2H_6 + 7O_2 \xrightarrow{\Delta} 4CO_2 + 6H_2O$$

$$2C_6H_6 + 9O_2 \xrightarrow{\Delta} 6CO_2 + 6H_2O$$

$$C_7H_{16} + 11O_2 \xrightarrow{\Delta} 7CO_2 + 8H_2O$$