Chemical Equations and Balancing Review KEY – Types of Reactions

a) decomposition
b) neutralization (or double replacement)
c) combination
d) decomposition
e) decomposition
f) single replacement
g) single replacement
h) single replacement
i) single replacement
j) double replacement

1) neutralization (or double replacement)
2) double replacement
3) double replacement (the H_2CO_3 that is formed decomposes into CO_2 and H_2O)
4) double replacement
5) combustion
6) double replacement (the H_2CO_3 that is formed decomposes into CO_2 and H_2O)
7) combustion
8) double replacement
9) double replacement
10) double replacement
11) combustion
12) neutralization (or double replacement)
13) double replacement
14) double replacement
15) combustion
16) double replacement

decane → combustion
nonene → combustion

Chemical Equations and Balancing Review KEY – Reactants Translation to Formulas

a) $Li_2CO_{3(s)}$ →
b) $H_2CO_{3(aq)} + NH_4OH_{(aq)}$ →
c) $P_{(s)} + O_{2(g)}$ →
d) $AgHCO_{3(s)}$ →
e) $Ca(NO_3)_{2(s)}$ →
f) $H_2SO_{4(aq)} + Al_{(s)}$ →
g) $Zn_{(s)} + Pb(NO_3)_{2(aq)}$ →
h) $Fe_2(SO_4)_{2(aq)} + Cd_{(s)}$ →
i) $MnO_{2(s)} + Al_{(s)}$ →
j) $TiCl_{4(aq)} + H_2O_{(l)}$ →

1) $H_2SO_{4(aq)} + Al(OH)_{3(s)}$ →
2) $Pb(NO_3)_{2(aq)} + FeBr_{3(aq)}$ →
3) $HC_2H_3O_{2(aq)} + CaCO_{3(s)}$ →
4) $CuS_{(s)} + Sn(BrO_3)_{4(aq)}$ →
5) $C_3H_7OH_{(l)} + O_{2(g)}$ →
6) $NaHCO_{3(s)} + H_3PO_{4(aq)}$ →
7) $C_6H_{6(l)} + O_{2(g)}$ →
8) $ZnCl_{2(aq)} + KOH_{(aq)}$ →
9) $Co_2(SO_4)_{3(aq)} + H_2SeO_{4(aq)}$ →
10) $(NH_4)_3PO_{4(aq)} + Ni(NO_3)_{2(aq)}$ →
11) $C_5H_{10(l)} + O_{2(g)}$ →
12) $HNO_{3(aq)} + Mg(OH)_{2(s)}$ →
13) $Bi_2S_{3(s)} + HCl_{(aq)}$ →
14) $SbI_{3(aq)} + (NH_4)_2S_{(aq)}$ →
15) $C_7H_{16(l)} + O_{2(g)}$ →
16) → $Bi(CrO_4)_{2(s)} + NaNO_{3(aq)}$

decane → $C_{10}H_{22} + O_{2(g)}$ →
nonene → $C_9H_{18} + O_{2(g)}$ →

Chemical Equations and Balancing Review KEY – Completed Reactions (Unbalanced)

a) $Li_2CO_{3(s)} \rightarrow Li_2O_{(s)} + CO_{2(g)}$
b) $H_2CO_{3(aq)} + NH_4OH_{(aq)} \rightarrow (NH_4)_2CO_{3(aq)} + H_2O_{(l)}$
c) $P_{(s)} + O_{2(g)} \rightarrow P_2O_{5(l)}$
d) $AgHCO_{3(s)} \rightarrow Ag_2CO_{3(aq)} + CO_{2(g)} + H_2O_{(l)}$
e) $Ca(NO_3)_{2(s)} \rightarrow Ca(NO_2)_{2(s)} + O_{2(g)}$
f) $H_2SO_{4(aq)} + Al_{(s)} \rightarrow Al_2(SO_4)_{3(aq)} + H_{2(g)}$
g) $Zn_{(s)} + Pb(NO_3)_{2(aq)} \rightarrow Pb_{(s)} + Zn(NO_3)_{2(aq)}$
h) $Fe_2(SO_4)_{2(aq)} + Cd_{(s)} \rightarrow$ **N.R.**
i) $MnO_{2(s)} + Al_{(s)} \rightarrow Al_2O_{3(s)} + Mn_{(s)}$
j) $TiCl_{4(aq)} + H_2O_{(l)} \rightarrow TiO_{2(s)} + HCl_{(g)}$

1) $H_2SO_{4(aq)} + Al(OH)_{3(s)} \rightarrow Al_2(SO_4)_{3(aq)} + H_2O_{(l)}$
2) $Pb(NO_3)_{2(aq)} + FeBr_{3(aq)} \rightarrow Fe(NO_3)_{3(aq)} + PbBr_{2(s)}$
3) $HC_2H_3O_{2(aq)} + CaCO_{3(s)} \rightarrow Ca(C_2H_3O_2)_{2(aq)} + H_2O_{(l)} + CO_{2(g)}$
4) $CuS_{(s)} + Sn(BrO_3)_{4(aq)} \rightarrow Cu(BrO_3)_{2(aq)} + SnS_{2(s)}$
5) $C_3H_7OH_{(l)} + O_{2(g)} \rightarrow CO_{2(g)} + H_2O_{(l)}$
6) $NaHCO_{3(s)} + H_3PO_{4(aq)} \rightarrow Na_3PO_{4(aq)} + CO_{2(g)} + H_2O_{(l)}$
7) $C_6H_{6(l)} + O_{2(g)} \rightarrow CO_{2(g)} + H_2O_{(l)}$
8) $ZnCl_{2(aq)} + KOH_{(aq)} \rightarrow Zn(OH)_{2(s)} + KCl_{(aq)}$
9) $Co_2(SO_4)_{3(aq)} + H_2SeO_{4(aq)} \rightarrow Co_2(SeO_4)_{3(aq)} + H_2SO_{4(aq)}$
10) $(NH_4)_3PO_{4(aq)} + Ni(NO_3)_{2(aq)} \rightarrow Ni_3(PO_4)_{2(s)} + NH_4NO_{3(aq)}$
11) $C_5H_{10(l)} + O_{2(g)} \rightarrow CO_{2(g)} + H_2O_{(l)}$
12) $HNO_{3(aq)} + Mg(OH)_{2(s)} \rightarrow Mg(NO_3)_{2(aq)} + H_2O_{(l)}$
13) $Bi_2S_{3(s)} + HCl_{(aq)} \rightarrow BiCl_3 + H_2S_{(aq)}$
14) $SbI_{3(aq)} + (NH_4)_2S_{(aq)} \rightarrow NH_4I_{(aq)} + Sb_2S_{3(s)}$
15) $C_7H_{16(l)} + O_{2(g)} \rightarrow CO_{2(g)} + H_2O_{(l)}$
16) $Na_2CrO_{4(aq)} + Bi(NO_3)_{4(aq)} \rightarrow Bi(CrO_4)_{2(s)} + NaNO_{3(aq)}$

decane → $C_{10}H_{22} + O_{2(g)} \rightarrow CO_{2(g)} + H_2O_{(g)}$
nonene → $C_9H_{18} + O_{2(g)} \rightarrow CO_{2(g)} + H_2O_{(g)}$

Chemical Equations and Balancing Review KEY – Balanced Reactions

a) $Li_2CO_{3(s)} \rightarrow Li_2O_{(s)} + CO_{2(g)}$
b) $H_2CO_{3(aq)} + 2\ NH_4OH_{(aq)} \rightarrow (NH_4)_2CO_{3(aq)} + 2\ H_2O_{(l)}$
c) $4\ P_{(s)} + 5\ O_{2(g)} \rightarrow 2\ P_2O_{5(l)}$
d) $2\ AgHCO_{3(s)} \rightarrow Ag_2CO_{3(aq)} + CO_{2(g)} + H_2O_{(l)}$
e) $Ca(NO_3)_{2(s)} \rightarrow Ca(NO_2)_{2(s)} + O_{2(g)}$
f) $3\ H_2SO_{4(aq)} + 2\ Al_{(s)} \rightarrow Al_2(SO_4)_{3(aq)} + 3\ H_{2(g)}$ (Al is more reactive than H, so a reaction takes place)
g) $Zn_{(s)} + Pb(NO_3)_{2(aq)} \rightarrow Pb_{(s)} + Zn(NO_3)_{2(aq)}$ (Zn is more reactive than Pb, so a reaction takes place)
h) $Fe_2(SO_4)_{2(aq)} + Cd_{(s)} \rightarrow$ **N.R.** (Cd is less reactive than Fe, so no reaction takes place)
i) $3\ MnO_{2(s)} + 4\ Al_{(s)} \rightarrow 2\ Al_2O_{3(s)} + 3\ Mn_{(s)}$
j) $TiCl_{4(aq)} + 2\ H_2O_{(l)} \rightarrow TiO_{2(s)} + 4\ HCl_{(g)}$

1) $3\ H_2SO_{4(aq)} + 2\ Al(OH)_{3(s)} \rightarrow Al_2(SO_4)_{3(aq)} + 6\ H_2O_{(l)}$
2) $3\ Pb(NO_3)_{2(aq)} + 2\ FeBr_{3(aq)} \rightarrow 2\ Fe(NO_3)_{3(aq)} + 3\ PbBr_{2(s)}$
3) $2\ HC_2H_3O_{2(aq)} + CaCO_{3(s)} \rightarrow Ca(C_2H_3O_2)_{2(aq)} + H_2O_{(l)} + CO_{2(g)}$
4) $2\ CuS_{(s)} + Sn(BrO_3)_{4(aq)} \rightarrow 2\ Cu(BrO_3)_{2(aq)} + SnS_{2(s)}$
5) $2\ C_3H_7OH_{(l)} + 9\ O_{2(g)} \rightarrow 6\ CO_{2(g)} + 8\ H_2O_{(l)}$
6) $3\ NaHCO_{3(s)} + H_3PO_{4(aq)} \rightarrow Na_3PO_{4(aq)} + 3\ CO_{2(g)} + 3\ H_2O_{(l)}$
7) $2\ C_6H_{6(l)} + 15\ O_{2(g)} \rightarrow 12\ CO_{2(g)} + 6\ H_2O_{(l)}$
8) $ZnCl_{2(aq)} + 2\ KOH_{(aq)} \rightarrow Zn(OH)_{2(s)} + 2\ KCl_{(aq)}$
9) $Co_2(SO_4)_{3(aq)} + 3\ H_2SeO_{4(aq)} \rightarrow Co_2(SeO_4)_{3(aq)} + 3\ H_2SO_{4(aq)}$
10) $2\ (NH_4)_3PO_{4(aq)} + 3\ Ni(NO_3)_{2(aq)} \rightarrow Ni_3(PO_4)_{2(s)} + 6\ NH_4NO_{3(aq)}$
11) $2\ C_5H_{10(l)} + 15\ O_{2(g)} \rightarrow 10\ CO_{2(g)} + 10\ H_2O_{(l)}$
12) $2\ HNO_{3(aq)} + Mg(OH)_{2(s)} \rightarrow Mg(NO_3)_{2(aq)} + 2\ H_2O_{(l)}$
13) $Bi_2S_{3(s)} + 6\ HCl_{(aq)} \rightarrow 2\ BiCl_3 + 3\ H_2S_{(aq)}$
14) $2\ SbI_{3(aq)} + 3\ (NH_4)_2S_{(aq)} \rightarrow 6\ NH_4I_{(aq)} + Sb_2S_{3(s)}$
15) $C_7H_{16(l)} + 11\ O_{2(g)} \rightarrow 7\ CO_{2(g)} + 8\ H_2O_{(l)}$
16) $2\ Na_2CrO_{4(aq)} + Bi(NO_3)_{4(aq)} \rightarrow Bi(CrO_4)_{2(s)} + 4\ NaNO_{3(aq)}$

decane → $2\ C_{10}H_{22} + 31\ O_{2(g)} \rightarrow 20\ CO_{2(g)} + 22\ H_2O_{(g)}$
nonene → $2\ C_9H_{18} + 27\ O_{2(g)} \rightarrow 18\ CO_{2(g)} + 18\ H_2O_{(g)}$