Precipitation Reactions

Activity 1: Soluble or Insoluble

Question Group 1

Question 1

The names of three ionic compounds are given below. Identify those that are soluble in water (i.e., dissolve in water). Select all that apply. If necessary, view the list of Solubility Rules.

aluminum chloride
ammonium nitrate
zinc sulfide

Question 2

The names of three ionic compounds are given below. Identify those that are soluble in water (i.e., dissolve in water). Select all that apply. If necessary, view the list of Solubility Rules.

aluminum nitrate
ammonium chloride
copper(II) sulfide

Question 3

The names of three ionic compounds are given below. Identify those that are soluble in water (i.e., dissolve in water). Select all that apply. If necessary, view the list of Solubility Rules.

iron nitrate
iron(II) sulfide
potassium chloride

Question Group 2

Question 4

The names of three ionic compounds are given below. Identify those that are insoluble in water (i.e., do NOT dissolve in water). Select all that apply. If necessary, view the list of Solubility Rules.

calcium phosphate
copper(II) hydroxide
iron(II) nitrate

Question 5
The names of three ionic compounds are given below. Identify those that are insoluble in water (i.e., do NOT dissolve in water). Select all that apply. If necessary, view the list of Solubility Rules.

copper(II) nitrate
iron(II) phosphate
zinc hydroxide

Question 6
The names of three ionic compounds are given below. Identify those that are insoluble in water (i.e., do NOT dissolve in water). Select all that apply. If necessary, view the list of Solubility Rules.

calcium nitrate
copper(II) phosphate
iron(II) hydroxide

Question Group 3
Question 7
The names of three ionic compounds are given below. Identify those that are insoluble in water (i.e., do NOT dissolve in water). Select all that apply. If necessary, view the list of Solubility Rules.

barium sulfite
copper(II) acetate
tin(IV) carbonate

Question 8
The names of three ionic compounds are given below. Identify those that are insoluble in water (i.e., do NOT dissolve in water). Select all that apply. If necessary, view the list of Solubility Rules.

calcium sulfite
copper(II) carbonate
tin(IV) acetate

Question 9

The names of three ionic compounds are given below. Identify those that are insoluble in water (i.e., do NOT dissolve in water). Select all that apply. If necessary, view the list of Solubility Rules.

barium carbonate
iron(III) acetate
zinc sulfite

Question Group 4
Question 10
The names of three ionic compounds are given below. Identify those that are soluble in water (i.e., dissolve in water). Select all that apply. If necessary, view the list of Solubility Rules.

ammonium sulfate
barium hydroxide
silver(I) chloride

Question 11
The names of three ionic compounds are given below. Identify those that are soluble in water (i.e., dissolve in water). Select all that apply. If necessary, view the list of Solubility Rules.

ammonium bromide
barium sulfate
lead(II) chloride

Question 12
The names of three ionic compounds are given below. Identify those that are soluble in water (i.e., dissolve in water). Select all that apply. If necessary, view the list of Solubility Rules.

ammonium carbonate
silver(I) chloride
strontium hydroxide

Question Group 5
Question 13
The formulae of three ionic compounds are given below. Identify those that are soluble in water (i.e., dissolve in water). Select all that apply. If necessary, view the list of Solubility Rules.

$AgCl$
$Ca(NO_3)_2$
CuS

Question 14
The formulae of three ionic compounds are given below. Identify those that are soluble in water (i.e., dissolve in water). Select all that apply. If necessary, view the list of Solubility Rules.

$AgNO_3$
$BaCl_2$
$Mg(OH)_2$

Question 15
The formulae of three ionic compounds are given below. Identify those that are soluble in water (i.e., dissolve in water). Select all that apply. If necessary, view the list of Solubility Rules.

$NaC_2H_3O_2$
$FeCO_3$
$Pb(NO_3)_2$

Question Group 6
Question 16
The formulae of three ionic compounds are given below. Identify those that are insoluble in water (i.e., do NOT dissolve in water). Select all that apply. If necessary, view the list of Solubility Rules.

$BaSO_4$
FeS
$NH_4C_2H_3O_2$

Question 17
The formulae of three ionic compounds are given below. Identify those that are insoluble in water (i.e., do NOT dissolve in water). Select all that apply. If necessary, view the list of Solubility Rules.

KOH
$ZnCl_2$
ZnS

Question 18

The formulae of three ionic compounds are given below. Identify those that are insoluble in water (i.e., do NOT dissolve in water). Select all that apply. If necessary, view the list of Solubility Rules.

$Cu(C_2H_3O_2)_2$
CuS
$Fe(OH)_2$

Activity 2: What's Going Down?
Question Group 7
Question 19
Aqueous solutions of NaOH and $Cu(NO_3)_2$ are mixed and a precipitate is formed. What is the chemical formula of the precipitate? Use the list of Solubility Rules and the Polyatomic Ion list to help answer this question.

$CuOH$
Cu_2OH
$Cu(OH)_2$
$NaNO_3$
$Na(NO_3)_2$
Na_2NO_3

Question 20
Aqueous solutions of KOH and $Mg(NO_3)_2$ are mixed and a precipitate is formed. What is the chemical formula of the precipitate? Use the list of Solubility Rules and the Polyatomic Ion list to help answer this question.

KNO_3
$K(NO_3)_2$
K_2NO_3
$Mg(OH)_2$
$MgOH$
Mg_2OH

Question 21
Aqueous solutions of LiOH and $Ca(NO_3)_2$ are mixed and a precipitate is formed. What is the chemical formula of the precipitate? Use the list of Solubility Rules and the Polyatomic Ion list to help answer this question.

$CaOH$
Ca_2OH
$Ca(OH)_2$
$LiNO_3$
$Li(NO_3)_2$
Li_2NO_3

Question Group 8
Question 22

Aqueous solutions of Na_2SO_4 and $BaCl_2$ are mixed and a precipitate is formed. What is the chemical formula of the precipitate? Use the list of Solubility Rules and the Polyatomic Ion list to help answer this question.

Ba_2SO_4
$BaSO_4$
Ba_4SO
$NaCl$
Na_2Cl_2
Na_2Cl_2

Question 23
Aqueous solutions of K_2SO_4 and $Pb(NO_3)_2$ are mixed and a precipitate is formed. What is the chemical formula of the precipitate? Use the list of Solubility Rules and the Polyatomic Ion list to help answer this question.

KCl
K_2Cl_2
K_2Cl_2
$PbSO_4$
Pb_2SO_4
Pb_4SO

Question 24
Aqueous solutions of $AgNO_3$ and $CaCl_2$ are mixed and a precipitate is formed. What is the chemical formula of the precipitate? Use the list of Solubility Rules and the Polyatomic Ion list to help answer this question.

$AgCl$
$AgCl_2$
Ag_2Cl
$Ca(NO_3)_2$
Ca_2NO_3
$CaNO_3$

Question Group 9

Question 25

Aqueous solutions of NH_4Cl and $Pb(C_2H_3O_2)_2$ are mixed and a precipitate is formed. What is the chemical formula of the precipitate? Use the list of Solubility Rules and the Polyatomic Ion list to help answer this question.

$NH_4(C_2H_3O_2)_2$
$NH_4C_2H_3O_2$
$NH(C_2H_3O_2)_2$
$PbCl$
$PbCl_2$
Pb_4Cl

Question 26

Aqueous solutions of NH_4Br and $Pb(NO_3)_2$ are mixed and a precipitate is formed. What is the chemical formula of the precipitate? Use the list of Solubility Rules and the Polyatomic Ion list to help answer this question.

$NH_4(NO_3)_2$
NH_4NO_3
$NH(NO_3)_2$
$PbBr$
$PbBr_2$
Pb_4Br

Question 27

Aqueous solutions of MgI_2 and Ag_2SO_4 are mixed and a precipitate is formed. What is the chemical formula of the precipitate? Use the list of Solubility Rules and the Polyatomic Ion list to help answer this question.

AgI
AgI_2
AgI_4
$MgSO_4$
Mg_2SO_4
$Mg(SO_4)_2$

Question Group 10
Question 28
Aqueous solutions of Na_3PO_4 and $FeCl_2$ are mixed and a precipitate is formed. What is the chemical formula of the precipitate? Use the list of Solubility Rules and the Polyatomic Ion list to help answer this question.

$Fe_2(PO_4)_3$
Fe_3PO_4
$Fe_3(PO_4)_2$
$NaCl$
$NaCl_2$
Na_3Cl_2

Question 29
Aqueous solutions of K_3PO_4 and $CuCl_2$ are mixed and a precipitate is formed. What is the chemical formula of the precipitate? Use the list of Solubility Rules and the Polyatomic Ion list to help answer this question.

Cu_3PO_4
$Cu_3(PO_4)_2$
$Cu_2(PO_4)_3$
KCl
KCl_2
K_3Cl_2

Question 30
Aqueous solutions of Li_3PO_4 and $MgCl_2$ are mixed and a precipitate is formed. What is the chemical formula of the precipitate? Use the list of Solubility Rules and the Polyatomic Ion list to help answer this question.

$LiCl$
$LiCl_2$
Li_3Cl_2
$Mg_3(PO_4)_2$
$Mg_2(PO_4)_3$
Mg_3PO_4

Question Group 11

Question 31

Aqueous solutions of sodium carbonate and magnesium chloride are mixed and a precipitate is formed. What is the chemical formula of the precipitate? Use the list of Solubility Rules and the Polyatomic Ion list to help answer this question.

$MgCl_2$
$MgCO_3$
$Mg(CO_3)_2$
NaCl
Na_2CO_3
Mg_2CO_3

Question 32

Aqueous solutions of ammonium carbonate and calcium iodide are mixed and a precipitate is formed. What is the chemical formula of the precipitate? Use the list of Solubility Rules and the Polyatomic Ion list to help answer this question.

$CaCO_3$
Ca_3CO
$Ca(CO_3)_2$
NH_4I
NHI_4
$(NH_4)_2I$

Question 33

Aqueous solutions of potassium carbonate and copper(II) chloride are mixed and a precipitate is formed. What is the chemical formula of the precipitate? Use the list of Solubility Rules and the Polyatomic Ion list to help answer this question.

$CuCO_3$
Cu_2CO_3
$Cu(CO_3)_2$
KCl
K_2CO_3
KCO_3

Question Group 12

Question 34

Aqueous solutions of sodium sulfide and aluminum chloride are mixed and a precipitate is formed. What is the chemical formula of the precipitate? Use the list of Solubility Rules and the Polyatomic Ion list to help answer this question.

Al_2S
AlS_3
Al_2S_3
$NaCl$
NaS_2
Na_2S

Question 35

Aqueous solutions of ammonium sulfide and iron(III) chloride are mixed and a precipitate is formed. What is the chemical formula of the precipitate? Use the list of Solubility Rules and the Polyatomic Ion list to help answer this question.

Fe_2S
FeS_3
Fe_2S_3
NH_4Cl
NH_4S_2
$(NH_4)_2S$

Question 36

Aqueous solutions of magnesium sulfide and chromium(III) chloride are mixed and a precipitate is formed. What is the chemical formula of the precipitate? Use the list of Solubility Rules and the Polyatomic Ion list to help answer this question.

CrS_3
Cr_2S
Cr_2S_3
$CrCl_3$
MgS
Mg_2S

Activity 3: Net Ionic Equations
Question Group 13
Question 37
Aqueous solutions of sodium hydroxide and barium nitrate are mixed and a precipitate is formed. Determine the ions that precipitate and then identify the net ionic equation that describes its formation.

$$Ba^{+}_{(aq)} + OH^{-}_{(aq)} \rightarrow BaOH_{(s)}$$

$$Ba^{2+}_{(aq)} + OH^{-}_{(aq)} \rightarrow BaOH_{(s)}$$

$$Ba^{2+}_{(aq)} + 2\ OH^{-}_{(aq)} \rightarrow Ba(OH)_{2\,(s)}$$

$$4\ Ba^{2+}_{(aq)} + 2\ OH^{-}_{(aq)} \rightarrow Ba_4(OH)_{2\,(s)}$$

$$2\ Ba^{2+}_{(aq)} + OH^{-}_{(aq)} \rightarrow Ba_2OH_{(s)}$$

Question 38
Aqueous solutions of potassium hydroxide and aluminum chloride are mixed and a precipitate is formed. Determine the ions that precipitate and then identify the net ionic equation that describes its formation.

$$Al^{3+}_{(aq)} + OH^{-}_{(aq)} \rightarrow AlOH_{(s)}$$

$$Al^{+}_{(aq)} + OH^{-}_{(aq)} \rightarrow AlOH_{(s)}$$

$$Al^{3+}_{(aq)} + 3\ OH^{-}_{(aq)} \rightarrow Al(OH)_{3\,(s)}$$

$$3\ Al^{3+}_{(aq)} + OH^{-}_{(aq)} \rightarrow 3\ Al_3OH_{(s)}$$

$$3\ Al^{3+}_{(aq)} + 2\ OH^{2-}_{(aq)} \rightarrow Al_3(OH)_{2\,(s)}$$

Question 39
Aqueous solutions of ammonium hydroxide and calcium chloride are mixed and a precipitate is formed. Determine the ions that precipitate and then identify the net ionic equation that describes its formation.

$$Ca^{+}_{(aq)} + OH^{-}_{(aq)} \rightarrow CaOH_{(s)}$$

$$Ca^{2+}_{(aq)} + OH^{-}_{(aq)} \rightarrow CaOH_{(s)}$$

$$Ca^{2+}_{(aq)} + 2\ OH^{-}_{(aq)} \rightarrow Ca(OH)_{2\ (s)}$$

$$2\ Ca^{2+}_{(aq)} + OH^{-}_{(aq)} \rightarrow Ca_2OH_{\ (s)}$$

$$4\ Ca^{2+}_{(aq)} + 2\ OH^{-}_{(aq)} \rightarrow Ca_4(OH)_{2\ (s)}$$

Question Group 14
Question 40
Aqueous solutions of sodium sulfide and aluminum chloride are mixed and a precipitate is formed. Determine the ions that precipitate and then identify the net ionic equation that describes its formation.

$$Al^{+}_{(aq)} + S^{-}_{(aq)} \rightarrow AlS_{\ (s)}$$

$$Al^{3+}_{(aq)} + S^{2-}_{(aq)} \rightarrow AlS_{\ (s)}$$

$$2\ Al^{3+}_{(aq)} + 3\ S^{2-}_{(aq)} \rightarrow Al_2S_{3\ (s)}$$

$$2\ Al^{+}_{(aq)} + S^{2-}_{(aq)} \rightarrow Al_2S_{\ (s)}$$

$$3\ Al^{3+}_{(aq)} + 2\ S^{2-}_{(aq)} \rightarrow Al_3S_{2\ (s)}$$

Question 41
Aqueous solutions of potassium sulfide and chromium(III) chloride are mixed and a precipitate is formed. Determine the ions that precipitate and then identify the net ionic equation that describes its formation.

$$Cr^{3+}_{(aq)} + 3\ S^{-}_{(aq)} \rightarrow CrS_{3\ (s)}$$

$$Cr^{3+}_{(aq)} + S^{2-}_{(aq)} \rightarrow Cr_2S_{3\ (s)}$$

$$2\ Cr^{3+}_{(aq)} + 3\ S^{2-}_{(aq)} \rightarrow Cr_2S_{3\ (s)}$$

$$2\ Cr^{+}_{(aq)} + S^{2-}_{(aq)} \rightarrow Cr_2S_{\ (s)}$$

$$3\ Cr^{3+}_{(aq)} + 2\ S^{2-}_{(aq)} \rightarrow Cr_3S_{2\ (s)}$$

Question 42
Aqueous solutions of ammonium sulfide and iron(III) chloride are mixed and a precipitate is formed. Determine the ions that precipitate and then identify the net ionic equation that describes its formation.

$$Fe^{3+}_{(aq)} + S^{2-}_{(aq)} \rightarrow Fe_2S_{3\,(s)}$$

$$Fe^{3+}_{(aq)} + 3\,S^{-}_{(aq)} \rightarrow FeS_{3\,(s)}$$

$$2\,Fe^{3+}_{(aq)} + 3\,S^{2-}_{(aq)} \rightarrow Fe_2S_{3\,(s)}$$

$$2\,Fe^{+}_{(aq)} + S^{2-}_{(aq)} \rightarrow Fe_2S_{(s)}$$

$$3\,Fe^{3+}_{(aq)} + 2\,S^{2-}_{(aq)} \rightarrow Fe_3S_{2\,(s)}$$

Question Group 15
Question 43
Aqueous solutions of Na_2CO_3 and $Fe(NO_3)_3$ are mixed and a precipitate is formed. Determine the ions that precipitate and then identify the net ionic equation that describes its formation.

$$Fe^{3+}_{(aq)} + 3\,CO_3^{-}{}_{(aq)} \rightarrow Fe(CO_3)_{3\,(s)}$$

$$3\,Fe^{+}_{(aq)} + CO_3^{-}{}_{(aq)} \rightarrow Fe_3CO_{3\,(s)}$$

$$2\,Fe^{+}_{(aq)} + CO_3^{2-}{}_{(aq)} \rightarrow Fe_2CO_{3\,(s)}$$

$$2\,Fe^{3+}_{(aq)} + 3\,CO_3^{2-}{}_{(aq)} \rightarrow Fe_2(CO_3)_{3\,(s)}$$

$$3\,Fe^{3+}_{(aq)} + 2\,CO_3^{2-}{}_{(aq)} \rightarrow Fe_3(CO_3)_{2\,(s)}$$

Question 44
Aqueous solutions of $(NH_4)_2CO_3$ and $AlCl_3$ are mixed and a precipitate is formed. Determine the ions that precipitate and then identify the net ionic equation that describes its formation.

$$Al^{3+}_{(aq)} + 3\,CO_3^{-}{}_{(aq)} \rightarrow Al(CO_3)_{3\,(s)}$$

$$3\,Al^{+}_{(aq)} + CO_3^{-}{}_{(aq)} \rightarrow Al_3CO_{3\,(s)}$$

$$2\,Al^{+}_{(aq)} + CO_3^{2-}{}_{(aq)} \rightarrow Al_2CO_{3\,(s)}$$

$$2\,Al^{3+}_{(aq)} + 3\,CO_3^{2-}{}_{(aq)} \rightarrow Al_2(CO_3)_{3\,(s)}$$

$$3\,Al^{3+}_{(aq)} + 2\,CO_3^{2-}{}_{(aq)} \rightarrow Al_3(CO_3)_{2\,(s)}$$

Question 45

Aqueous solutions of K_2CO_3 and $FeCl_3$ are mixed and a precipitate is formed. Determine the ions that precipitate and then identify the net ionic equation that describes its formation.

$$Fe^{3+}_{(aq)} + 3\ CO_3^{-}{}_{(aq)} \rightarrow Fe(CO_3)_{3\ (s)}$$

$$2\ Fe^{+}_{(aq)} + CO_3^{2-}{}_{(aq)} \rightarrow Fe_2CO_{3\ (s)}$$

$$2\ Fe^{3+}_{(aq)} + 3\ CO_3^{2-}{}_{(aq)} \rightarrow Fe_2(CO_3)_{3\ (s)}$$

$$3\ Fe^{+}_{(aq)} + CO_3^{-}{}_{(aq)} \rightarrow Fe_3CO_{3\ (s)}$$

$$3\ Fe^{3+}_{(aq)} + 2\ CO_3^{2-}{}_{(aq)} \rightarrow Fe_3(CO_3)_{2\ (s)}$$

Question Group 16

Question 46

Aqueous solutions of Na_3PO_4 and $CaCl_2$ are mixed and a precipitate is formed. Determine the ions that precipitate and then identify the net ionic equation that describes its formation.

$$Ca^{2+}_{(aq)} + PO_4^{3-}{}_{(aq)} \rightarrow CaPO_{4\ (s)}$$

$$Ca^{2+}_{(aq)} + PO_4^{3-}{}_{(aq)} \rightarrow Ca_3(PO_4)_{2\ (s)}$$

$$2\ Ca^{2+}_{(aq)} + 3\ PO_4^{3-}{}_{(aq)} \rightarrow Ca_2(PO_4)_{3\ (s)}$$

$$3\ Ca^{+}_{(aq)} + PO_4^{3-}{}_{(aq)} \rightarrow Ca_3PO_{4\ (s)}$$

$$3\ Ca^{2+}_{(aq)} + 2\ PO_4^{3-}{}_{(aq)} \rightarrow Ca_3(PO_4)_{2\ (s)}$$

Question 47

Aqueous solutions of K_3PO_4 and $CuCl_2$ are mixed and a precipitate is formed. Determine the ions that precipitate and then identify the net ionic equation that describes its formation.

$$Cu^{+}_{(aq)} + PO_4^{3-}{}_{(aq)} \rightarrow Cu_3PO_{4\ (s)}$$

$$Cu^{2+}_{(aq)} + PO_4^{3-}{}_{(aq)} \rightarrow Cu_3(PO_4)_{2\ (s)}$$

$$2\ Cu^{2+}_{(aq)} + 3\ PO_4^{3-}{}_{(aq)} \rightarrow Cu_2(PO_4)_{3\ (s)}$$

$$3\ Cu^{+}_{(aq)} + PO_4^{3-}{}_{(aq)} \rightarrow Cu_3PO_{4\ (s)}$$

$$3\ Cu^{2+}_{(aq)} + 2\ PO_4^{3-}{}_{(aq)} \rightarrow Cu_3(PO_4)_{2\ (s)}$$

Question 48

Aqueous solutions of $(NH_4)_3PO_4$ and $ZnCl_2$ are mixed and a precipitate is formed. Determine the ions that precipitate and then identify the net ionic equation that describes its formation.

$$Zn^{2+}_{(aq)} + PO_4^{3-}{}_{(aq)} \rightarrow ZnPO_{4\ (s)}$$

$$Zn^{2+}_{(aq)} + PO_4^{3-}{}_{(aq)} \rightarrow Zn_3(PO_4)_{2\ (s)}$$

$$2\ Zn^{2+}_{(aq)} + 3\ PO_4^{3-}{}_{(aq)} \rightarrow Zn_2(PO_4)_{3\ (s)}$$

$$3\ Zn^{+}_{(aq)} + PO_4^{3-}{}_{(aq)} \rightarrow Zn_3PO_{4\ (s)}$$

$$3\ Zn^{2+}_{(aq)} + 2\ PO_4^{3-}{}_{(aq)} \rightarrow Zn_3(PO_4)_{2\ (s)}$$