NI · Net ionic equations

Student notes - complete the underlined spaces | Notes 1/2

Write a dissolved ionic compound as its ions. Write a net ionic equation, name the spectator ions, and check atoms and charge.

Name: _____ Date: _____

1. Which substances are written as ions

A dissolved ionic compound is separate ions

An ionic compound that is dissolved in water breaks into its ions. This is called _____.

$Na_2SO_4(aq)$ is really $2Na^+(aq)$ and $SO_4^{2-}(aq)$. The subscript 2 on Na becomes the _____ 2.

An ion with several atoms, like SO_4^{2-} or NO_3^-, stays _____. Every ion keeps its charge and the state (aq).

Check the charges: $2(+1) + (-2) = 0$. The ions of a compound always add to _____.

Read the state before you split

Split only an ionic compound or a strong acid marked _____.

A solid, a liquid or a gas stays _____: Cu(s), $H_2O(l)$, $Cl_2(g)$.

A solid ionic compound stays whole too. AgCl(s) is _____ split.

A strong acid in water is written as ions. HCl(aq) is _____ and $Cl^-(aq)$.

On the diploma: read the state of every substance first. A common wrong choice splits a solid product into ions.

NI · Net ionic equations

Student notes - complete the underlined spaces | Notes 2/2

2. From a full equation to a net ionic equation

Split, cancel, write what is left

Start with the balanced equation, with states: $Mg(s) + 2AgNO_3(aq) \rightarrow Mg(NO_3)_2(aq) + 2Ag(s)$.

Split every dissolved ionic compound: $Mg(s) + 2Ag^+(aq) + 2NO_3^-(aq) \rightarrow Mg^{2+}(aq) + 2NO_3^-(aq) + 2Ag(s)$. This is the _____.

$2NO_3^-(aq)$ is the same on both sides, so it did not change. An ion that does not change is a _____.

Cancel the spectator ions. What is left is the _____: $Mg(s) + 2Ag^+(aq) \rightarrow Mg^{2+}(aq) + 2Ag(s)$.

To count an ion, multiply the coefficient by the subscript. $3CuCl_2(aq)$ gives $3Cu^{2+}(aq)$ and _____$Cl^-(aq)$.

On the diploma: a question may ask for the net ionic equation or for the spectator ion. Read which one it wants.

Check it, then ask if it is redox

Check atoms: 1 Mg and 2 Ag on each side. Check _____: 2(+1) = +2 on the left and +2 on the right.

Now the electron transfer is easy to see. Mg goes 0 → +2, so it is _____. Ag^+ goes +1 → 0, so it is _____.

Not every net ionic equation is redox. In $Pb^{2+}(aq) + 2I^-(aq) \rightarrow PbI_2(s)$, lead stays +2 and iodine stays −1.

No _____ changes there, so no electrons move. The ions only join to make a solid.

On the diploma: do not call a reaction redox only because it has ions. Check the oxidation numbers.

NI · Practice

Net ionic equations | Questions 1-3 of 12

State symbols: (s) solid, (aq) dissolved in water, (l) liquid, (g) gas. Use the supplied reaction and conditions. B4 values name the Alberta Chemistry 30 Data Booklet table where used.

NI-P01 · Easy · Given: $MgCl_2(aq)$. Write the ions it forms in water, with the number of each ion.

Optional start: The subscript tells you how many of that ion there are.

NI-P02 · Easy · Given: $(NH_4)_2SO_4(aq)$. Write the ions it forms in water, with the number of each ion.

Optional start: The 2 outside the brackets counts whole NH_4^+ ions.

NI-P03 · Easy · Which of these is written as ions in a total ionic equation: Fe(s), NaOH(aq), $Br_2(l)$, $BaSO_4(s)$? Explain.

Optional start: Read the state after each formula.

NI · Practice

Net ionic equations | Questions 4-6 of 12

NI-P04 · Easy · Given the total ionic equation $Zn(s) + Fe^{2+}(aq) + SO_4^{2-}(aq) \rightarrow Zn^{2+}(aq) + SO_4^{2-}(aq) + Fe(s)$. Name the spectator ion and write the net ionic equation.

Optional start: Look for an ion that is written the same on both sides.

NI-P05 · Medium · Given: $Mg(s) + ZnCl_2(aq) \rightarrow MgCl_2(aq) + Zn(s)$. Write the total ionic equation and the net ionic equation. Name the spectator ion.

Optional start: Split only the two compounds marked (aq).

NI-P06 · Medium · Given: $Pb(s) + 2AgNO_3(aq) \rightarrow Pb(NO_3)_2(aq) + 2Ag(s)$. Write the net ionic equation and check its charge.

Optional start: Two $AgNO_3$ give two Ag^+ and two NO_3^-.

NI · Practice

Net ionic equations | Questions 7-9 of 12

NI-P07 · Medium · Given: $Mg(s) + 2HBr(aq) \rightarrow MgBr_2(aq) + H_2(g)$. HBr(aq) is a strong acid. Write the net ionic equation and name the spectator ion.

Optional start: A strong acid marked (aq) is written as $H^+(aq)$ and its negative ion.

NI-P08 · Medium · Given: $Br_2(l) + 2NaI(aq) \rightarrow 2NaBr(aq) + I_2(s)$. Write the net ionic equation. Then say what is oxidized and what is reduced.

Optional start: $Br_2(l)$ and $I_2(s)$ are not dissolved ionic compounds. Keep them whole.

NI-P09 · Challenging · Given: $2Al(s) + 6HCl(aq) \rightarrow 2AlCl_3(aq) + 3H_2(g)$. HCl(aq) is a strong acid. Write the total ionic equation and the net ionic equation. Check the charge.

Optional start: Multiply the coefficient by the subscript to count each ion.

NI · Practice

Net ionic equations | Questions 10-12 of 12

NI-P10 · Challenging · Given: $3CaCl_2(aq) + 2Na_3PO_4(aq) \rightarrow Ca_3(PO_4)_2(s) + 6NaCl(aq)$. Write the net ionic equation. Is it a redox reaction? Explain.

Optional start: A solid product stays whole. Then compare the oxidation numbers before and after.

NI-P11 · Challenging · For $Zn(s) + 2AgNO_3(aq) \rightarrow Zn(NO_3)_2(aq) + 2Ag(s)$, a student writes the net ionic equation $Zn(s) + Ag^+(aq) \rightarrow Zn^{2+}(aq) + Ag(s)$. Which check finds the mistake? Write the correct net ionic equation.

Optional start: Add the charge on each side.

NI-P12 · Challenging · Given: $Cu(s) + 2Fe(NO_3)_3(aq) \rightarrow Cu(NO_3)_2(aq) + 2Fe(NO_3)_2(aq)$. Write the total ionic equation and the net ionic equation. How many nitrate ions cancel from each side?

Optional start: Count the nitrate ions from each compound separately, then add them.