

# Net Ionic Equations and ReDox

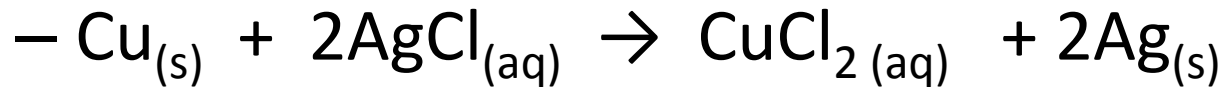
# Net ionic equations

- For equations where there are ions involved, the reactions can be simplified.
- Some ions react and are changed in charge or phase, and some ions remain the same throughout the reaction.
- The ions that remain unchanged are called “spectator” ions since they only “watch” the reaction occur around them.
- The spectator ions are removed from the equation so the equation only shows what changed.

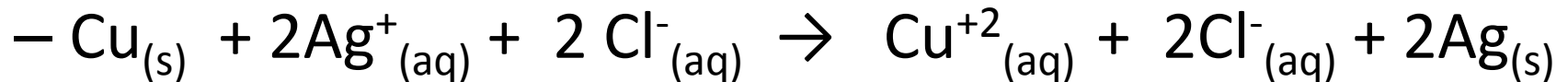
# Examples of net ionic equations

- Only two reactions will have net ionic equations, single replacement (later called redox) and double replacement.

- Single replacement:



Written as ions it becomes:



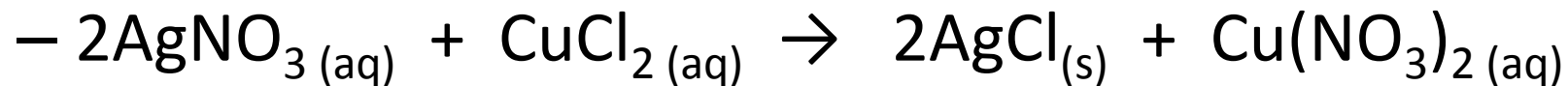
The chloride ions never changed from reactants to products so they are the spectator and can be removed leaving:



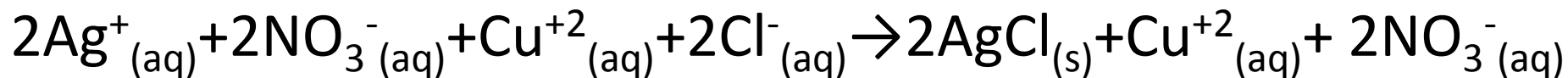
– This is the net ionic equation.

# Other example

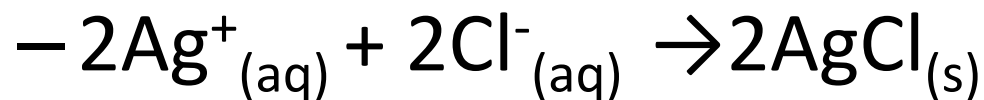
- Double Replacement:



As ions it looks like this:



The nitrate and copper ions are unchanged on both sides of the equation so they are spectators and can be removed leaving:



- This is the net ionic equation for the reaction.

- This is why if both products are soluble no reaction would occur because all ions would be spectators.

# Redox reactions

- Redox stands for oxidation-reduction reactions.
- One substance is being reduced, which means it is gaining electrons, and therefore its charge is being reduced.
- The other substance is being oxidized, which means it is losing electrons and therefore its charge is being increased.
- Both of these have to happen at the same time, and the number of electrons lost or gained must be equal.
- This happens in single replacement reactions in this class.

# Half reactions

- Using the earlier example of:
- $\text{Cu}_{(s)} + 2\text{AgCl}_{(aq)} \rightarrow \text{CuCl}_{2(aq)} + 2\text{Ag}_{(s)}$
- And the net ionic equation that was:
- $\text{Cu}_{(s)} + 2\text{Ag}^+_{(aq)} \rightarrow \text{Cu}^{2+}_{(aq)} + 2\text{Ag}_{(s)}$
- We can write our oxidation and reduction half-reactions as follows:
  - Oxidation:  $\text{Cu}^0 \rightarrow \text{Cu}^{+2} + 2\text{e}^-$
  - Reduction:  $2\text{Ag}^+ + 2\text{e}^- \rightarrow 2\text{Ag}^0$
  - Notice that the number of electrons released by the copper and the number of electrons gained by the 2 silver atoms are equal.

# Electrochemical cells

- Each half-reaction has a certain electric potential value.
- By separating the two components of the reaction, and providing a path for the electrons to travel, you can create a current.
- This is how a battery works.
- The portion where reduction takes place is called the anode.
- The portion where oxidation takes place is called the cathode.