Summary: redox reactions and electrode potentials

Zinc provides the electrons which reduce Cu^{2+} to Cu, so we say that zinc is a **reducing agent**. Similarly, Cu^{2+} is an **oxidising agent**.
If copper is added to zinc sulphate solution no change is observed. Reaction does not occur in the reverse direction. Zinc reacts with copper ions, but copper ions do not react with zinc. However, if copper is added to silver nitrate(V) solution the copper does react. A grey precipitate forms, and the solution turns from colourless to blue. The overall reaction is

$Cu(s) + 2Ag^{+}(aq) \rightarrow Cu^{2+}(aq) + 2Ag(s)$

And the half-reactions are

$Cu(s) \rightarrow Cu^{2+}(aq) + 2e^{-}$ oxidation
$2Ag^{+}(aq) + 2e^{-} \rightarrow 2Ag(s)$ reduction

No reaction is observed when silver is added to Copper(II) sulphate solution.
Individual half-reactions are reversible. They can go either way.

$Cu^{2+}(aq) + 2e^{-} \rightarrow Cu(s)$

But copper atoms supply electrons to silver ions, so in this case the copper half-reaction is

$Cu(s) \rightarrow Cu^{2+}(aq) + 2e^{-}$

Combining half-equations

Once we know the direction in which each half-reaction will go, we can add together the half-equations to get an equation for the overall reaction. For example, if you add zinc to silver ions, the zinc atoms supply electrons to the silver ions. The half-equations are

$Zn(s) \rightarrow Zn^{2+}(aq) + 2e^{-}$
$Ag^{+}(aq) + e^{-} \rightarrow Ag(s)$

To combine the two half-equations together, we need to make sure the number of electrons is the same in each half-equation – because every electron released by a zinc atom must be accepted by a silver ion.
This means we have to multiply the silver half-equation by two so there are $2e^{-}$ in each half-equation:

$Zn(s) \rightarrow Zn^{2+}(aq) + 2e^{-}$
$2Ag^{+}(aq) + 2e^{-} \rightarrow 2Ag(s)$

Now we van add the two half-equations together to give the overall equation:

$Zn(s) + 2Ag^{+}(aq) \rightarrow 2Ag(s) + Zn^{2+}(aq)$

The $2e^{-}$ disappear because they are on both sides of the equation.