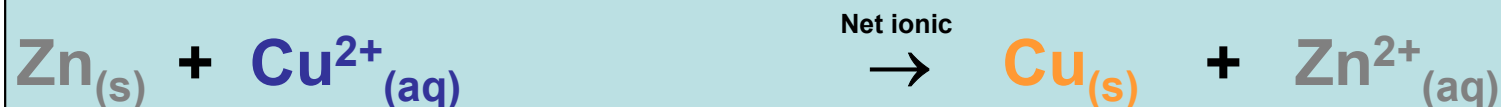
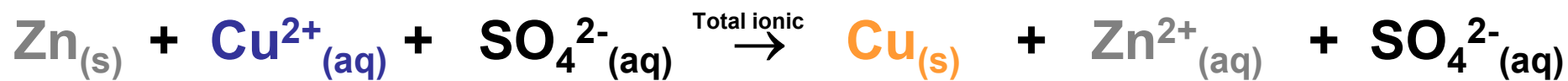
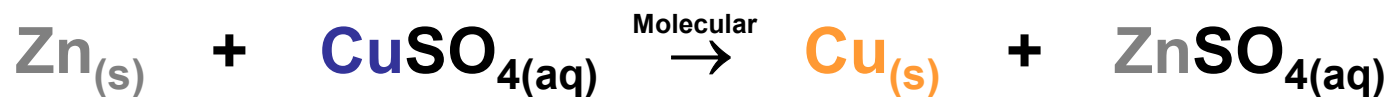
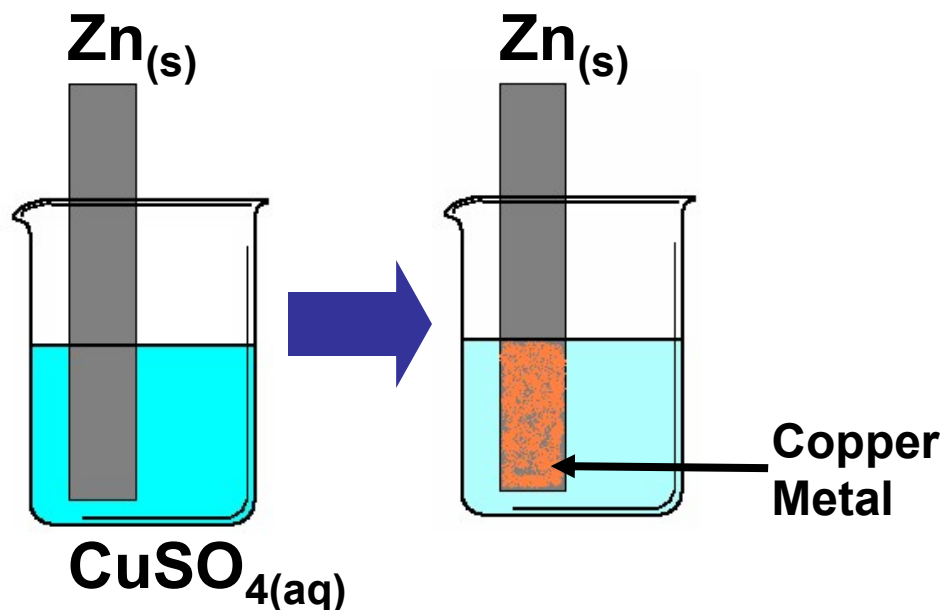


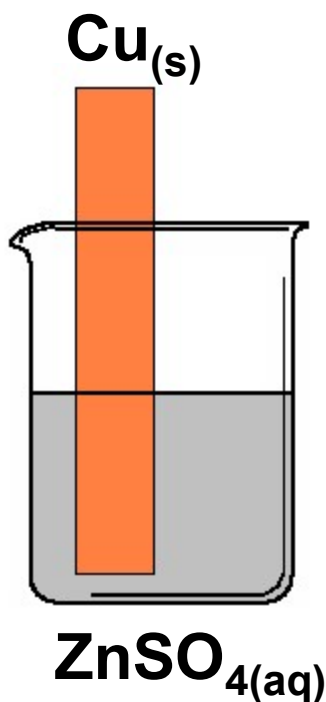
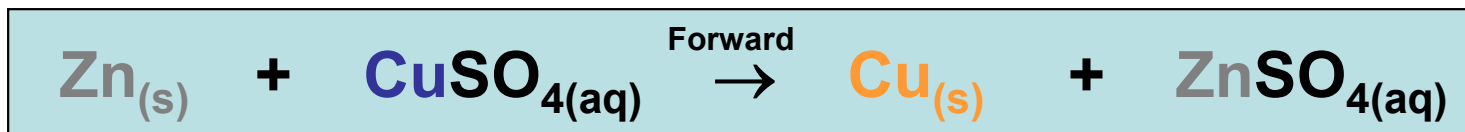
# Oxidation-Reduction



# Oxidation/Reduction Reactions



# Oxidation/Reduction Reactions



➡ No Reaction!

An oxidation reduction reaction will only occur *spontaneously in one direction.*



# Oxidation/Reduction: Terminology

*Reducing Agent*

*Oxidizing Agent*

Oxidized

Reduced



$\text{Cu}^{2+}$  cation gains 2 e<sup>-</sup> ...and changes into... neutral Cu atom

**Reduction**

Gain of electrons  
Decreasing charge

*“Cu<sup>2+</sup><sub>(aq)</sub> is reduced.”*

Neutral Zn atom loses 2e<sup>-</sup>...and changes into... Zn<sup>2+</sup> cation

**Oxidation**

Loss of electrons  
Increasing charge

*“Zn<sub>(s)</sub> is oxidized.”*



# Redox: Monitoring charge Changes

**Oxidation Number (O.N.):** The charge the atom would have if its electrons were held by the most attractive atom.

**Elemental Species: O.N. = 0**

- $O_{2(g)}$ ,  $Al_{(s)}$ ,  $Xe_{(g)}$ ,  $Hg_{(L)}$  all have O.N. = 0

**Monatomic ions: O.N. = Charge**

- $Fe^{2+}_{(aq)}$ ,  $Co^{2+}_{(aq)}$ ,  $Cu^{2+}_{(aq)}$  O.N. = +2
- $Cu^{+}_{(aq)}$ ,  $Na^{+}_{(aq)}$ ,  $Hg_2^{2+}_{(aq)}$  O.N. = +1

Use Periodic table to get O.N. of representative elements  
(covered in nomenclature notes)

- LiCl: Lithium is group 1A: O.N. = +1  
Chlorine is group VIIA: O.N. = -1

\*Hydrogen in a compound: O.N. = +1      \*Oxygen in a compound O.N. = -2

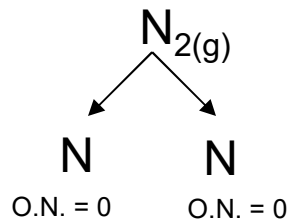
*\* This is often but not always true.*

$\Sigma$  O.N.'s = charge on molecule. ( $\Sigma$  means to sum or add together)

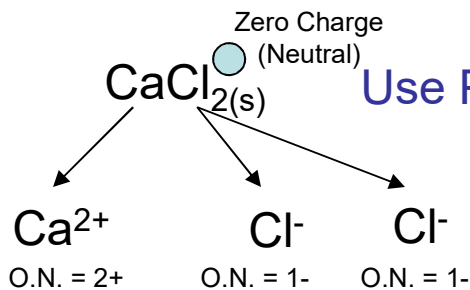


# Redox: Monitoring charge Changes

Determine the oxidation numbers of all species in the following species:



Elemental Species: Each nitrogen has O.N. = 0



Use Periodic table to get O.N. of representative elements

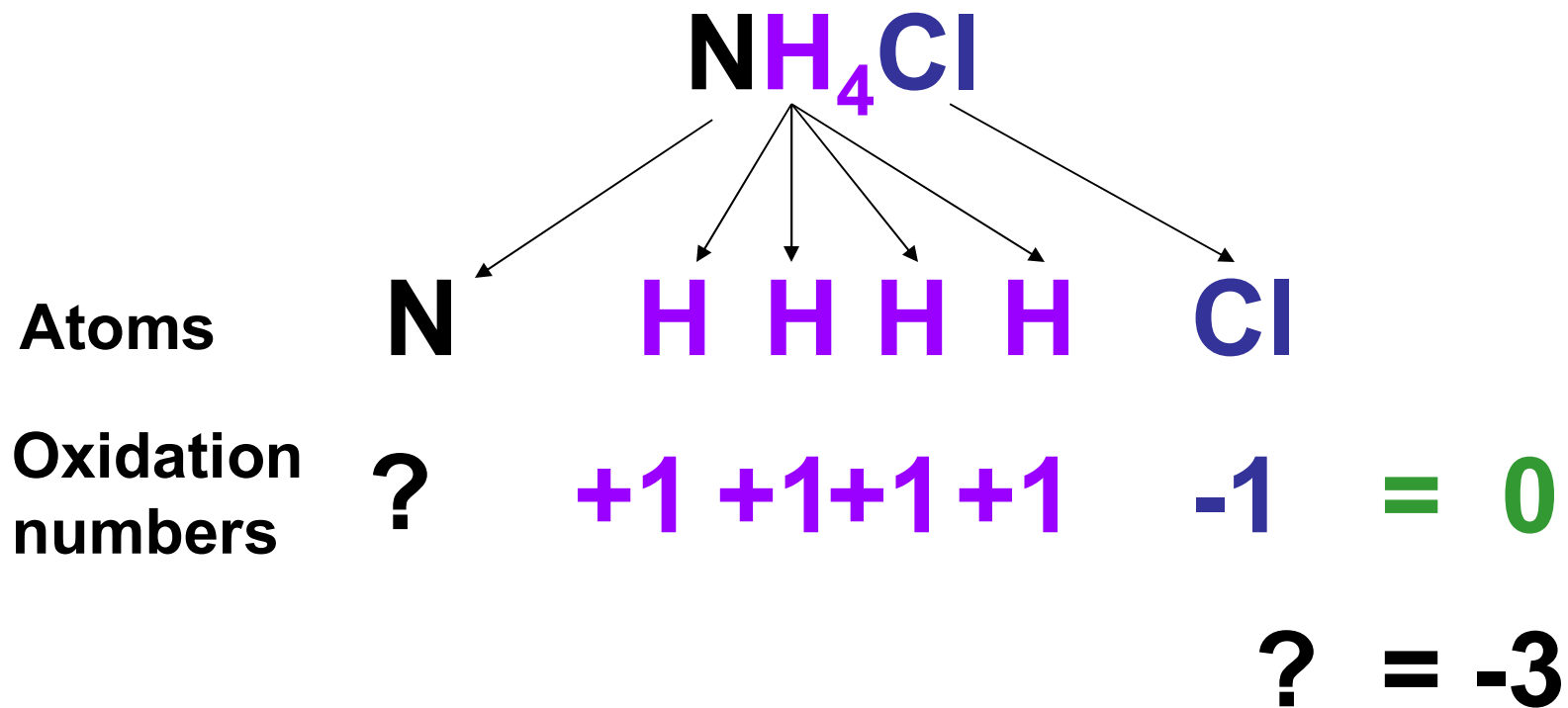
2+	1-	1-	=	0
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*Add together all O.N.'s ...result will be charge on formula unit.*



# Redox: Monitoring charge Changes

What is the oxidation number of nitrogen in  $\text{NH}_4\text{Cl}_{(s)}$



**Nitrogen's oxidation number is equal to -3.**

