N42 – Electrochem Concepts

Rules for Assigning Oxidation Numbers

- 1. Any uncombined element is 0.
- 2. Monatomic ion equals the charge on the ion.
- 3. The more-electronegative element in a binary compound is assigned the number equal to the charge it would have if it were an ion.
- 4. Fluorine in a compound is always -1
- 5. Oxygen is -2 unless it is combined with F, when it is +2, or it is in a peroxide, such as H_2O_2 ,
- 6. Hydrogen in most of its compounds is +1 unless it is combined with a metal, in which case it is -1
- 7. In compounds, the elements of groups 1 and 2 as well as aluminum have oxidation numbers +1, +2 and +3 respectively.
- The sum of the oxidation numbers of all atoms in a neutral compound is 0.
- The sum of the oxidation numbers of all atoms in a polyatomic ion equals charge of the ion.



Balancing Redox Equations

More complicated than balancing normal reactions. You have to balance the electrons, not just the atoms!

Steps

- Assign oxidation numbers to determine which things are oxidized and which are reduced.
- Split the rxn into two halves oxidation half and reduction half. Include electrons.
- Balance the atoms
- Balance the charge by balancing the number of electrons.
- Add half reactions back together, simplify, and CHECK.

Oxidation and Reduction Recap

Oxidation is the process that occurs when

- the oxidation number of an element increases,
- an element loses electrons.
- a compound adds oxygen,
- a compound loses hydrogen, or
- a half-reaction has electrons as products.

Reduction is the process that occurs when

- the oxidation number of an element decreases,
- an element gains electrons,
- a compound loses oxygen,
- a compound gains hydrogen, or
- a half-reaction has electrons as reactants.

Oxidation Reduction Sathode Anode Loss of Electrons is Oxidation Gain of Electrons is Reduction Oxidation is Loss of Electrons Reduction is Gain of Electrons The electrode where The electrode where LEO goes GER oxidation occurs eduction occurs

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Oxidation Reduction at the Cathode Loss of Electrons is Oxidation Gain of Electrons is Reduction Oxidation is Loss of Electrons Reduction is Gain of Electrons The electrode where The electrode where reduction occurs LEO goes GER oxidation occurs Mnemonics

OIL RIG

Mnemonics

of Electrons is Oxidation of Electrons is Reduction goes GER Gain of LEO (Loss

Oxidation is Loss of Electrons Reduction is Gain of Electrons OIL RIG

Anode

The electrode where

oxidation occurs

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1 second

 $1 \, Volt = \frac{-5}{1 \, Coulomb}$

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1 Joule

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1 Faraday =

polyatomic ion equals charge of the ion.

 $\frac{1 \ Coulomb}{2} = \frac{6.242 \ x}{10^{18}} e^{-\frac{1}{2}}$

Balancing Redox Equations

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- a compound loses hydrogen, or

Split the rxn into two halves - oxidation half

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96, 500 Coulombs

1 mol e







The electrode where reduction occurs