N42

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, when it is -1
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.
8. The sum of the oxidation numbers of all atoms in a neutral compound is 0.
9. The sum of the oxidation numbers of all atoms in a polyatomic ion equals charge of the ion.

$$1\,A = \frac{1\,Coulomb}{1\,second} = \frac{6.242\,x\,10^{18}e^-}{1\,second}$$

$$1\,Volt = \frac{1\,Joule}{1\,Coulomb} \qquad 1\,Faraday = \frac{96,500\,Coulombs}{1\,mol\,e^-}$$

Balancing Redox Equations

More complicated than balancing normal reactions.

You have to balance the electrons, not just the atoms!

Steps

1. Assign oxidation numbers to determine which things are oxidized and which are reduced.
2. Split the rxn into two halves – oxidation half and reduction half. Include electrons.
3. Balance the atoms.
4. Balance the charge by balancing the number of electrons.
5. 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.

Anode is Oxidation

Reduction at the Cathode

Mnemonics

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

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

Anode The electrode where oxidation occurs

Cathode The electrode where reduction occurs

N42

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, when it is -1
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.
8. The sum of the oxidation numbers of all atoms in a neutral compound is 0.
9. The sum of the oxidation numbers of all atoms in a polyatomic ion equals charge of the ion.

$$1\,A = \frac{1\,Coulomb}{1\,second} = \frac{6.242\,x\,10^{18}e^-}{1\,second}$$

$$1\,Volt = \frac{1\,Joule}{1\,Coulomb} \qquad 1\,Faraday = \frac{96,500\,Coulombs}{1\,mol\,e^-}$$

Balancing Redox Equations

More complicated than balancing normal reactions.

You have to balance the electrons, not just the atoms!

Steps

1. Assign oxidation numbers to determine which things are oxidized and which are reduced.
2. Split the rxn into two halves – oxidation half and reduction half. Include electrons.
3. Balance the atoms.
4. Balance the charge by balancing the number of electrons.
5. 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.

Anode is Oxidation

Reduction at the Cathode

Mnemonics

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

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

Anode The electrode where oxidation occurs

Cathode The electrode where reduction occurs

N42

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, when it is -1
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.
8. The sum of the oxidation numbers of all atoms in a neutral compound is 0.
9. The sum of the oxidation numbers of all atoms in a polyatomic ion equals charge of the ion.

$$1\,A = \frac{1\,Coulomb}{1\,second} = \frac{6.242\,x\,10^{18}e^-}{1\,second}$$

$$1\,Volt = \frac{1\,Joule}{1\,Coulomb} \qquad 1\,Faraday = \frac{96,500\,Coulombs}{1\,mol\,e^-}$$

Balancing Redox Equations

More complicated than balancing normal reactions.

You have to balance the electrons, not just the atoms!

Steps

1. Assign oxidation numbers to determine which things are oxidized and which are reduced.
2. Split the rxn into two halves – oxidation half and reduction half. Include electrons.
3. Balance the atoms.
4. Balance the charge by balancing the number of electrons.
5. 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.

Anode is Oxidation

Reduction at the Cathode

Mnemonics

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

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

Anode The electrode where oxidation occurs

Cathode The electrode where reduction occurs