

Unit 7: Redox &



Electrochemistry

What is Redox?

- REDOX stands for REDuction/OXidation
- Oxidation is often thought of as a combination of a substance with oxygen (rusting, burning)
- Just like with acid/base definitions the definition of oxidation is expanded
- Oxidation refers to a loss of electrons
- Reduction refers to a gain of electrons
- As a mnemonic remember LEO says GER
- **L**oss **E**lectrons = **O**xidation
- **G**ain **E**lectrons = **R**eduction
- Read 12.1 (pg. 443 - 445)



Testing concepts

Q- Define oxidizing agent, reducing agent.

Q- PE 1

These are called "half reactions"

Rules (and rationale - 12.2)

1. Any element, when not combined with atoms of a different element, has an oxidation # of zero. (O in O₂ is zero)
2. Any simple monatomic ion (one-atom ion) has an oxidation number equal to its charge (Na⁺ is +1, O²⁻ is -2)
3. The sum of the oxidation numbers of all of the atoms in a formula must equal the charge written for the formula. (if the oxidation number of O is -2, then in CO₃²⁻ the oxidation number of C is +4)



What's the point ?

REDOX reactions are important in ...

- Purifying metals (e.g. Al, Na, Li)
- Producing gases (e.g. Cl₂, O₂, H₂)
- Electroplating metals
- Electrical production (batteries, fuel cells)
- Protecting metals from corrosion
- Balancing complex chemical equations
- Sensors and machines (e.g. pH meter)



Testing concepts

Q- What is oxidation? What is reduction? Represent each as a chemical equation.

Q- Why are 2Na + Cl₂ → 2NaCl & 2H₂ + O₂ → 2H₂O considered redox reactions?

Q- Is it possible to oxidize a material without reducing something else?

Oxidation numbers

- We will see that there is a simple way to keep track of oxidation and reduction
- This is done via "oxidation numbers"
- An oxidation number is the charge an atom would have if electrons in its bonds belonged completely to the more electronegative atom
- E.g. in HCl, Cl has a higher EN (pg. 255). Thus, oxidation numbers are Cl = -1, H = +1
- Notice that oxidation numbers are written as +1 vs. 1+ to distinguish them from charges.
- Instead of referring to EN chart, a few rules are followed to assign oxidation numbers
- Refer also to study note

Rules (and rationale - 12.2)

4. In compounds, the oxidation # of IA metals is +1, IIA is +2, and aluminum (in IIIA) is +3
5. In ionic compounds, the oxidation # of a nonmetal or polyatomic ion is equal to the charge of its associated ion. (CuCl₂, Cl is -1)
6. F is always -1, O is always -2 (unless combined with F), H is usually +1

rule					
total					
Ox.#					
	HNO ₃	K ₂ Cr ₂ O ₇	C ₂ H ₆ O	AgI	H ₂ PO ₄ ⁻

PE 2 (450), 12.9, 12.12 (484), 12.10, 12.11, 12.13 (484)