

Competition for Electrons

- *lim*
- write equations for oxidation and reduction half reactions

Notes

Atoms compete for each other's electrons

- ★ When chemical bonds form, electrons are either lost, gained or shared

★ Oxidation-Reduction reactions (Redox reactions)

☆ Metals

- ★ lose electrons (OXIDATION) [NOTE: as when metals combine with oxygen]

- ★ are oxidized
- ★ are reducing agents

☆ Nonmetals

- ★ gain electrons reducing their oxidation states (REDUCTION)
- ★ are reduced
- ★ are oxidizing agents

★ Example 1 - $2\text{Mg}(s) + \text{O}_2(g) \rightarrow 2\text{MgO}(s)$

Mg	O₂
★ loses electrons	★ gains electrons
★ gets oxidized to Mg ²⁺	★ gets reduced to O ²⁻
★ is the reducing agent for O ₂	★ is the oxidizing agent for Mg

☆ Half reactions — reaction showing either a gain or loss of electrons



☆ Net equation (REDOX REACTION) — combination of the half reactions such that the number of electrons lost equals the number of electrons gained



★ Example 2 - More active metals replace less active metals in compounds by transferring electrons to them

☆ Sample Reaction:



☆ Half reactions — reaction showing either a gain or loss of electrons



☆ Net equation — combination of the half reactions such that the number of electrons lost equals the number of electrons gained



☆ Spectator ions — ions that are present during a reaction but do not participate in the reaction:



**Oxidation
Is
Loss**

**Reduction
Is
Gain**

Oxidation number (Oxidation state) - number assigned to keep track of electrons based on the arbitrary assumption that shared electrons belong to the more electronegative element

★ Rules for assigning oxidation numbers

- ☆ Oxidation numbers for atoms that are free elements are always zero
- ☆ The oxidation numbers of ions are the same as the charge on the ion
- ☆ Some elements have only one oxidation state
 - ★ group 1 metals always form 1+ ions and always have a +1 oxidation state
 - ★ group 2 metals always form 2+ ions and always have a +2 oxidation state
- ☆ Some elements usually have a particular oxidation state
 - ★ oxygen has a -2 oxidation state except in peroxides where it is -1 and in compounds with fluorine (OF₂) where it is +2
 - ★ hydrogen has a +1 oxidation state except in hydrides with group 1 and group 2 metals
- ☆ the sum of the oxidation numbers
 - ★ in a compound it is always zero
 - ★ in a polyatomic ion it is equal to the charge on the ion

★ Finding oxidation numbers

- ☆ apply the rules
- ☆ construct a table if necessary

Sample Problem

Find the oxidation state of the elements in K₂Cr₂O₇.

Element	K	Cr	O	T O T A L
Subscript	2	2	7	
Oxidation state	+1	?	-2	
Sum of oxidation states	+2	??	-14	0

- [a] potassium is a group one metal, its oxidation state is always +1
 [b] oxygen usually has an oxidation state of -2
 [c] the sum of oxidation states of each element is the product of the subscript and the oxidation state
 [d] find the -sum of the oxidation states of chromium (??) by setting the sum of all the oxidation states to zero:
 $(+2) + ?? + (-14) = 0$
 $?? = +12$
 [e] find the oxidation state of chromium (?) by dividing the sum (+12) by the subscript (2):
 $+12 \div 2 = +6$

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Identify whether a chemical equation is a redox reaction or not. o (Hint: what kind of reaction is always redox?) ... g Evan P. Silberstein, 2003 /{} ~- ; -Regents Chemistry: Half-Reactions Name: · Date:· ____ . Half-reactions must conserve atoms and charge. That means the total number of atoms of . each element p:i.ust be the same on qqtb. sid~s of the half-reaction and the total ...

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REDOX AND ELECTROCHEMISTRY Date ____ Period ____ Analyzing Oxidation-Reduction Reactions When chemical bonds form, electrons are either lost, gained or shared. Metals lose electrons. This is what happens when iron rusts. When the iron, a metal, combines with oxygen, a non metal, to form rust, it loses electrons. This process is called oxidation even when the nonmetal is not oxygen. Nonmetals ...

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Representations that depict redox reactions often contain implicit features that may be ... Evan J Livesey ; Micah B Goldwater ... with the level of significance set at 0.05 (P=0.05). Results: A ...

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During a redox reaction electrons are both lost and gained. The metal loses and the non rrietal gains. An equation showing either the gain or the loss of electrons but not both is called half reaction. Consider the reaction below: 2Mg(s) + O2(g) -> 2MgO(s) Magnesium loses electrons while oxygen gains. The reaction can be split into two half reactions showing each. The oxidation halfreaction ...

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Sample Problem 1 What is the concentration of a 30. mL sample of HCl if it can be neutralized by 50. mL of 1.2 M NaOH? Step 1: Note the ratio of H+ to OH- is 1 to 1 Step 2: Substitute values into the equation MA x VA = MB x VB MA(30. mL) = (1.2 M)(50. mL) Step 3: Solve for the unknown M 12M 50mL

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