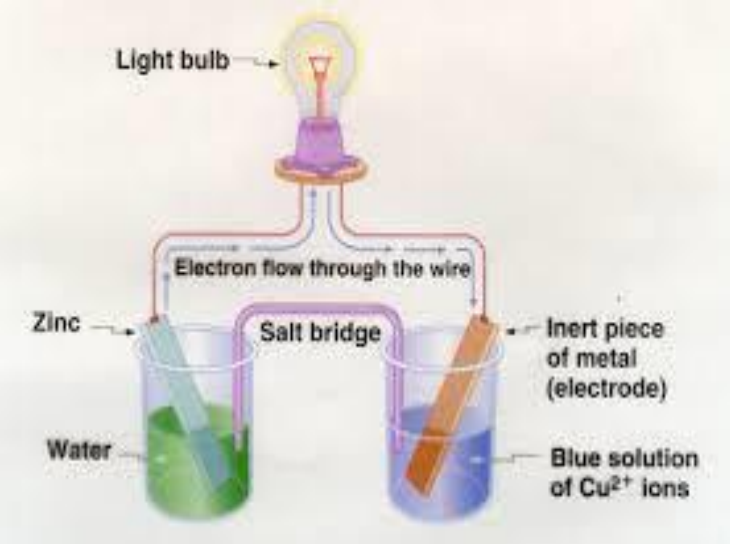
10 13 2017

OBJ SWBAT identify the oxidizing and reducing agents and balance 4 redox reactions

1. What is the charge of elemental magnesium?
2. What is the charge of the magnesium ion?

OXIDATION – REDUCTION REACTIONS

aka Redox Reactions

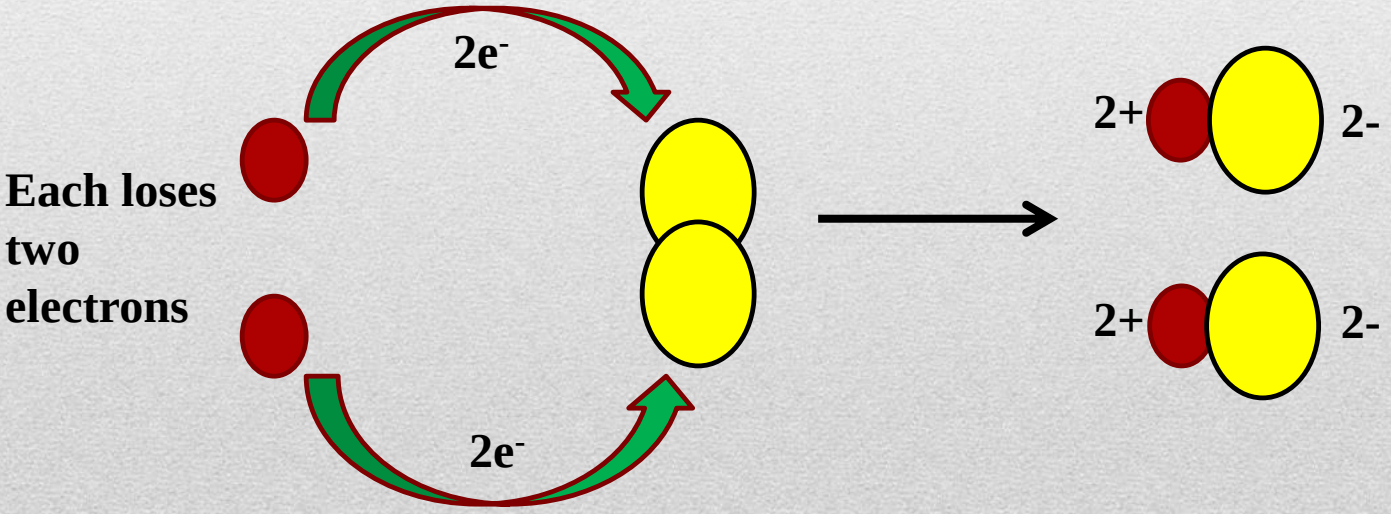


E.Q.:

How are substances in a redox reaction classified as oxidizing or reducing agents?

- **Oxidation-reduction reactions:** A reaction in which electrons are transferred from one substance to another.
- Also known as **redox reactions.**

$$2Mg + O_2 \longrightarrow 2MgO$$



Oxidation

- Complete or partial loss of electrons by a reactant in a chemical reaction
- $Na \longrightarrow Na^+ + e^-$
- Loss of electrons needs to be accepted by atoms or ions of another substance

Reduction

- Complete or partial gain of electrons by a reactant in a chemical reaction
- $Cl_2 + 2e^- \longrightarrow 2Cl^-$

Oxidation and reduction processes are complementary: One cannot happen without the other

Oxidizing agent

- The substance that is being reduced
- Substance that accepts the electrons

Reducing agent

- The substance that is being oxidized
- Substance that loses the electrons

Loses electrons (reducing agent) and is being oxidized

$$2K(s) + Cl_2(g) \quad 2KCl(s)$$

"Potassium is oxidized by chlorine"

Gains electrons (oxidizing agent) and is being reduced

1. The oxidation number of an uncombined atom and for the seven diatomic molecules is zero. Ex.: Li, K, Cr, N_2, Br_2
2. The oxidation number of a monoatomic ion is equal to the charge of the ion. Ex.: Na^{+1}, Ca^{+2}, P^{-3}, S^{-2}
3. The oxidation number of the more electronegative atom in a molecule or complex ion is the same as the charge it would have if it were an ion.
4. The oxidation number of H is usually +1, except in metal hydrides (then it is -1): H in NaH
5. Fluorine is ALWAYS -1; oxygen is ALWAYS -2 (unless it is peroxide or combined with fluorine).
6. The metals of groups 1A, 2A, and 3A are always +1, +2, and +3 respectively.
7. The sum of the oxidation numbers in a neutral compound is zero.
8. The sum of the oxidation numbers of the atoms in a polyatomic ion is equal to the charge on the ion.

Rules for determining oxidation numbers

Examples

- Ammonium ion: NH_4^+

  $NH_4^+ = (-3) + 4(+1) = +1$

- Calculate the oxidation number for sulfur in the sulfate ion: SO_3^{2-}

  Since O is always -2, the oxidation number for sulfur must be +4 in this polyatomic ion

  $x + 3(-2) = -2$ or $x = +4$

- Find the oxidation number for chlorine in the compound $KClO_3$ (K is always +1, O is always -2)

  $(+1) + x + 3(-2) = 0$

  $+1 + x + (-6) = 0$

  $x - 5 = 0$

  $x = +5$

1. Na**Cl**O_4
2. Al**P**O_4
3. H**N**O_2
4. **As**O_4^{3-}
5. Na**Cl**
6. $(NH_4)_2$**Cr**O_4
7. Ca**N**$_2$
8. Cu**S**O_4
9. H_2**S**O_4
10. K**C**N

Determine the oxidation number of the boldface, underlined element in the following compound/ion: