

Name _____

Honors Chemistry

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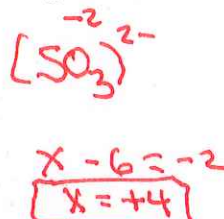
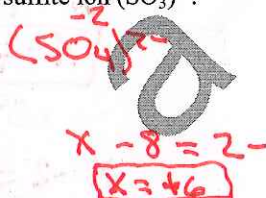
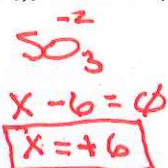
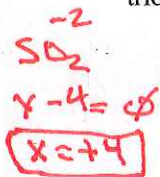
Oxidation States

Rules for Assigning Oxidation Numbers

Oxidation state of:	Charge	Examples
Neutral monoatomic or molecular elements	0	Na(s), Cl ₂ (g), S ₈ (s), O ₂ (g), Hg(l)
Fluorine	-1	HF, PF ₃
Oxygen	-2	H ₂ O (regular oxygen used)
Hydrogen	+1	H ₂ O, H ₃ P

- When determining the oxidation numbers of elements in an ion or compound, first determine the overall net charge of the ion or molecule. A molecule like ammonia (NH₃) is neutral. The ion ammonium (NH₄⁺) has an overall net charge of +1.
- In a neutral atom, the amount of positive charge must equal the amount of negative charge. In an ion, the amount of positive and negative charge will not be equal but their difference will represent the overall net charge on the ion.
- Fluorine always has a -1 charge, oxygen usually has a -2 charge (except when it is peroxide – we will see this rarely in Honors Chemistry) and hydrogen has a +1 charge. Use these values in determining the oxidation numbers of the other elements in the compound.
- Example:** Determine the oxidation number of nitrogen in nitrogen dioxide (NO₂).
 - Determine the amount of negative charge contributed by oxygen.: Since there are 2 oxygen atoms in the formula NO₂, and each oxygen atom has a -2 charge, the overall negative charge contributed by oxygen is -4.
 - Determine the charge of the other element. Since NO₂ is a neutral atom, nitrogen must contribute a +4 charge.

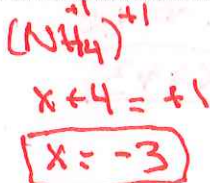
Practice Problem: Determine the oxidation number of sulfur in the following: sulfur dioxide(SO₂), sulfur trioxide(SO₃), sulfate ion(SO₄)²⁻ and sulfite ion (SO₃)²⁻.



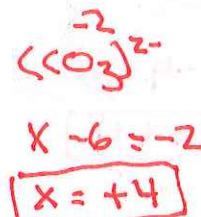
- Example:** Determine the oxidation number of nitrogen in the nitrate ion.
 - Write the formula: (NO₃)¹⁻
 - Determine the amount of negative charge contributed by oxygen: Since there are 3 oxygen atoms in the formula (NO₃)¹⁻, and each oxygen atom has a -2 charge, the overall negative charge contributed by oxygen is -6.
 - Determine the charge of the other element. Since (NO₃)¹⁻ has an overall -1 charge, nitrogen must contribute a +5 charge.
 - (N) + (O₃)¹⁻
 - (+5) + (-6) = -1

Calculate the charges of each element in each of the following polyatomic ions:

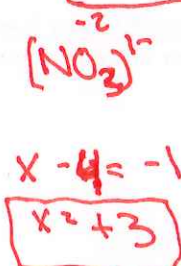
1. ammonium



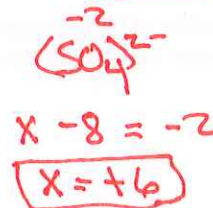
2. carbonate



3. nitrite



4. sulfate





$$X - 6 = -2$$

$$X = +4$$



$$X - 6 = -3$$

$$X = +3$$



$$2X + 3(-2) = -1$$

$$2X - 6 = -1$$

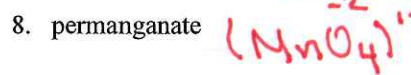
$$2X = +5$$

$$X = +2.5$$



$$X - 8 = -3$$

$$X = +5$$



$$X - 8 = -1$$

$$X = +7$$



$$+1 + X - 6 = -1$$

$$X = +4$$

Calculate the charges of each element in each of the following ionic compounds:



$$X - 4 = 0$$

$$X = +4$$



$$2X - 10 = 0$$

$$X = +5$$



$$X - 6 = 0$$

$$X = +6$$



$$X - 2 = 0$$

$$X = +2$$



$$X - 4 = 0$$

$$X = +4$$



$$2X - 6 = 0$$

$$X = +3$$



$$X - 4 = 0$$

$$X = +4$$



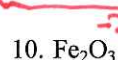
$$X - 2 = 0$$

$$X = +2$$



$$X - 2 = 0$$

$$X = +2$$



$$2X - 6 = 0$$

$$X = +3$$

At the completion of this assignment you will be prepared to take the following Chapter 3 on-line quizzes:

- oxidation number in a polyatomic ion quiz 1
- oxidation number in a polyatomic ion quiz 2