

CONCEPT: CALCULATE OXIDATION NUMBERS

- The **Oxidation Number**: an element's ability to _____, _____ or _____ electrons when alone or in a compound.

The Natural State

- For an atom in its **Natural State** (standard state), its oxidation number (oxidation state) is equal to _____.

	1A (1)	2A (2)																	3A (3)	4A (4)	5A (5)	6A (6)	7A (7)	8A (8)
1	Hydrogen																		Boron	Carbon	Nitrogen	Oxygen	Fluorine	Helium
2	Li	Be																						Neon
3	Na	Mg																	Aluminum	Silicon	Phosphorus	Sulfur	Chlorine	Argon
4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br							Krypton
5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I							Xenon
6	Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At							Rn
7	Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts							Og

EXAMPLE: Which of the following compounds would have an oxidation number or oxidation state equal to zero?

- a) Na_3 b) Cl c) He d) Mn_4

Ions

- Recall, an ion is an element or compound with a _____ or _____ charge.
 - For a *monoatomic ion*, the oxidation number is _____ to its charge.

EXAMPLE: Which of the following elements would have the most positive oxidation number based on its ionic form?

- a) Silver, Ag b) Scandium, Sc c) Sodium, Na d) Sulfur, S

PRACTICE: Which of the following elements would have the lowest oxidation number?

- a) Indium, In b) Strontium, Sr c) Argon, Ar d) Manganese, Mn

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Oxidation Number Rules

- *Oxidation Numbers* don't always correspond to real charges and therefore a list of rules will be necessary.
 - When different elements are in a compound these specific rules will be used to calculate oxidation numbers.

Specific Oxidation Number Rules	
Element(s)	Oxidation Number
Group 1A	_____ when connected to any other element
Group 2A	_____ when connected to any other element
Fluorine	_____ when connected to any other element
Hydrogen	_____ when connected to nonmetals Ex: _____, _____, _____ _____ when connected metals or boron Ex: _____, _____, _____
Oxygen	_____ when it is not a peroxide or superperoxide _____ when it exists as a peroxide Ex: _____, _____, _____ □ Peroxide = ____ Group 1A elements + ____ oxygens. _____ when it exists as a superoxide Ex: _____, _____, _____ □ Superoxide = ____ Group 1A elements + ____ oxygens. _____ except when they are connected to oxygen
Group 7A (Cl, Br, I)	

EXAMPLE: Which compound has oxygen with the lowest oxidation state?

a) NaO₂

b) CO₂

c) Cs₂O₂

d) O₂

Oxidation Number of Non-listed Elements

- When asked to determine the oxidation number of a non-listed element within a compound:

STEP 1: Treat the non-listed element as _____.

STEP 2: Use the list to WRITE the known oxidation number of the other elements.

STEP 3: If an element has a **subscript** then remember to distribute it.

STEP 4: ADD up the oxidation numbers, create an equation and make it equal to the _____ of the compound.

EXAMPLE: Give the oxidation number of the carbon atom in the acetate ion: C₂H₃O₂⁻