

2. ATOMS, MOLECULES, AND IONS

2.5 The Periodic Table

2.7 Ions and Ionic Compounds



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The Periodic Table

1A 1	2A 2																		3A 13	4A 14	5A 15	6A 16	7A 17	8A 18
1 H																								2 He
2 Li	3 Be																							10 Ne
3 Na	4 Mg	3B 3	4B 4	5B 5	6B 6	7B 7	8B 8 9 10			1B 11	2B 12	13B 13	14B 14	15B 15	16B 16	17B 17	18B 18							18 Ar
4 K	5 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr							36 Kr
5 Rb	6 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe							54 Xe
6 Cs	7 Ba	71 Lu	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn							86 Rn
7 Fr	8 Ra	103 Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112	113	114	115	116									118 Og

Metals
Metalloids
Nonmetals

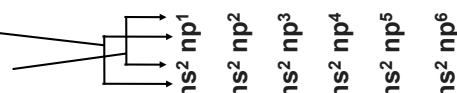


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$ns^1 ns^2$

Valence shell
Valence electrons



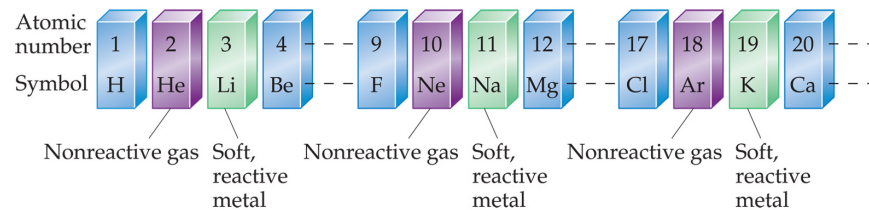
1A 1	2A 2																							8A 18
1 H $1s^1$																								2 He $1s^2$
2 Li $2s^1$	3 Be $2s^2$																							10 Ne $2s^2 2p^6$
3 Na $3s^1$	4 Mg $3s^2$	3B 3	4B 4	5B 5	6B 6	7B 7	8B 8 9 10			1B 11	2B 12	13B 13	14B 14	15B 15	16B 16	17B 17	18B 18							18 Ar $3s^2 3p^6$
4 K $4s^1$	5 Ca $4s^2$	21 Sc $4s^2 3d^1$	22 Ti $4s^2 3d^2$	23 V $4s^2 3d^3$	24 Cr $4s^1 3d^5$	25 Mn $4s^2 3d^5$	26 Fe $4s^2 3d^6$	27 Co $4s^2 3d^7$	28 Ni $4s^2 3d^8$	29 Cu $4s^1 3d^9$	30 Zn $4s^2 3d^10$	31 Ga $4s^2 3d^10 4p^1$	32 Ge $4s^2 3d^10 4p^2$	33 As $4s^2 3d^10 4p^3$	34 Se $4s^2 3d^10 4p^4$	35 Br $4s^2 3d^10 4p^5$	36 Kr $4s^2 3d^10 4p^6$							36 Kr $4s^2 3d^10 4p^6$
5 Rb $5s^1$	6 Sr $5s^2$	39 Y $5s^2 4d^1$	40 Zr $5s^2 4d^2$	41 Nb $5s^2 4d^4$	42 Mo $5s^1 4d^5$	43 Tc $5s^2 4d^5$	44 Ru $5s^2 4d^6$	45 Rh $5s^1 4d^7$	46 Pd $5s^0 4d^9$	47 Ag $5s^1 4d^9$	48 Cd $5s^2 4d^10$	49 In $5s^2 4d^10 5p^1$	50 Sn $5s^2 4d^10 5p^2$	51 Sb $5s^2 4d^10 5p^3$	52 Te $5s^2 4d^10 5p^4$	53 I $5s^2 4d^10 5p^5$	54 Xe $5s^2 4d^10 5p^6$							54 Xe $5s^2 4d^10 5p^6$
6 Cs $6s^1$	7 Ba $6s^2$	57 La $6s^2 5d^1$	72 Hf $6s^2 5d^2$	73 Ta $6s^2 5d^4$	74 W $6s^2 5d^4$	75 Re $6s^2 5d^5$	76 Os $6s^2 5d^6$	77 Ir $6s^2 5d^7$	78 Pt $6s^1 5d^9$	79 Au $6s^1 5d^9$	80 Hg $6s^2 5d^10$	81 Tl $6s^2 5d^10 6p^1$	82 Pb $6s^2 5d^10 6p^2$	83 Bi $6s^2 5d^10 6p^3$	84 Po $6s^2 5d^10 6p^4$	85 At $6s^2 5d^10 6p^5$	86 Rn $6s^2 5d^10 6p^6$							86 Rn $6s^2 5d^10 6p^6$
7 Fr $7s^1$	8 Ra $7s^2$	89 Ac $7s^2 6d^1$	104 Rf $7s^2 6d^2$	105 Db $7s^2 6d^3$	106 Sg $7s^2 6d^4$	107 Bh $7s^2 6d^5$	108 Hs $7s^2 6d^6$	109 Mt $7s^2 6d^7$	110 Ds $7s^2 6d^8$	111 Rg $7s^2 6d^9$	112	(113)	114	(115)	116	(117)	(118)							118 Og $7s^2 6d^10 7p^6$



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The Periodic Table



there is a repeating pattern of reactivity



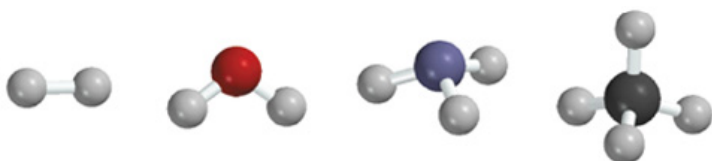
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Ions and Ionic Compounds

Molecule:

made from two or more atoms in a definite arrangement held together by chemical forces



H₂

H₂O

NH₃

CH₄



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Ions and Ionic Compounds

Diatomic Molecule:

contains only two atoms

H₂ N₂ HCl CO

Polyatomic Molecule:

contains more than two atoms

O₃ H₂O NH₃ CH₄



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Ions and Ionic Compounds

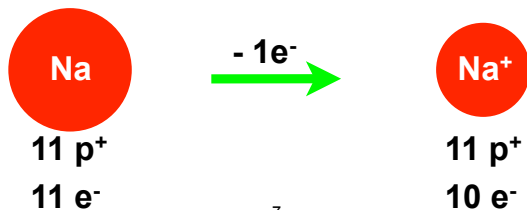
Ion:

an atom, or group of atoms, that has a net positive or negative charge.

Cation:

an ion with a positive charge.

results from removing an electron or more from a neutral atom.



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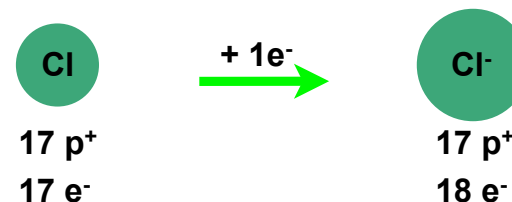
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Ions and Ionic Compounds

Anion:

an ion with a negative charge.

results from adding an electron or more to a neutral atom.



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Ions and Ionic Compounds

monatomic ion:

contains only one atom.



polyatomic ion:

contains more than one atom.



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Ions and Ionic Compounds

Predicting Ionic Charges

1A H^+	2A															7A H^-	8A	
Li^+																N^{3-}	O^{2-}	F^-
Na^+	Mg^{2+}	Transition metals										Al^{3+}			S^{2-}	Cl^-		
K^+	Ca^{2+}															Se^{2-}	Br^-	
Rb^+	Sr^{2+}															Te^{2-}	I^-	
Cs^+	Ba^{2+}																	



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Ions and Ionic Compounds

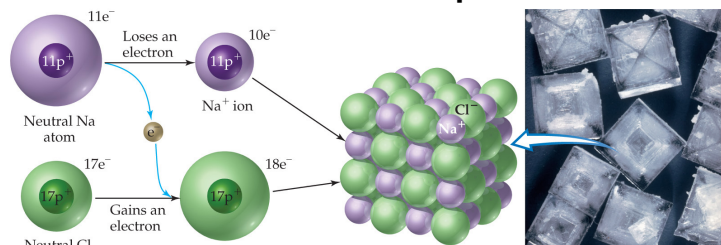
Molecular Compounds:

nonmetal + nonmetal = molecular compound



Ionic Compounds:

metal + nonmetal = ionic compound



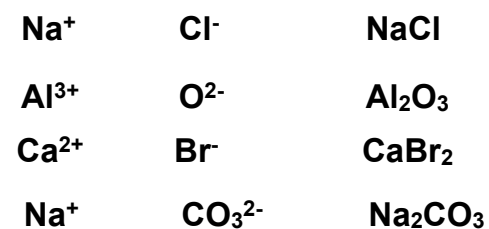
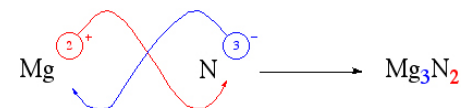
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Ions and Ionic Compounds

Ionic Compounds:

sum of charges on the cation(s) and anion(s) in each formula unit must equal zero.



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