Binary Ionic Compounds

Review

 At your table, discuss how you determine the charge of atoms based on the group it is in.

• Group 1A?

Group 5A?

• Group 2A?

Group 6A?

• Group 3A?

Group 7A?

• Group B?

Review: Predicting Ionic Charges

Group 1A: Lose 1 electron to form 1+ ions

H1+ Li1+ Na1+ K1+ Rb1+

| 1 H 1.00794 | | | | | | | | | | | | | | | | | He 4.002602 |
|-------------------|---------------|---------------|--------------|----------------|-------------|------------|--------------|-----------------|--------------|----------------|---------------|-----------------|---------------|----------------|--------------|-----------------|----------------|
| Li | Be | | | | | | | | | | | B | ć | N | Ö | F | Ne |
| 6.941 | 9.012182 | | | | | | | | | | | 10.811 | 12.0107 | 14.00674 | 15.9994 | 18.9984032 | 20.1797 |
| 11 | 12 | 1 | | | | | | | | | | 13 | 14 | 15 | 16 | 17 | 18 |
| Na 22.989770 | Mg 24.3050 | l | | | | | | | | | | Al 26.981538 | Si 28.0855 | P 30.973761 | S 32.066 | Cl 35.4527 | Ar 39.948 |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35.4527 | 36 |
| K | Ca | Sc | Τi | Ÿ | Čr | Mn | Fe | Ĉo | Ñi | Ĉu | Zn | Ga | Ĝe | Ās | Se | Br | Kr |
| 39.0983 | 40.078 | 44.955910 | 47.867 | 50.9415 | 51.9961 | 54.938049 | 55.845 | 58.933200 | 58.6934 | 63.546 | 65.39 | 69.723 | 72.61 | 74.92160 | 78.96 | 79.904 | 83.80 |
| 37 TO 1- | 38 | 39 V | 40 | 41 N.T. | 42 | 43 TD- | 44 | 45 D.1- | 46 D.1 | 47 | 48 | 49 T | 50 | 51 CTI- | 52 TE | 53 T | 54 |
| Rb 85,4678 | Sr 87.62 | Y 88.90585 | Zr 91.224 | Nb | Mo 95.94 | Tc | Ru | Rh | Pd | Ag | Cd | In | Sn 118.710 | Sb 121.760 | Te 127.60 | 1 | Xe 131.29 |
| 55 | 56 | 57 | 72 | 92.90638 73 | 74 | (98) 75 | 101.07 76 | 102.90550 77 | 106.42 78 | 107.8682 79 | 112.411 80 | 114.818 81 | 82 | 83 | 84 | 126.90447 85 | 86 |
| Čs | Ba | La | Hf | Ta | W | Re | Os | Ír | Pt | Au | Hg | Τl | Pb | Bi | Po | Āt | Rn |
| 132.9054 | | 138.9055 | 178.49 | 180.9479 | 183.84 | 186.207 | 190.23 | 192.217 | 195.078 | 196.96655 | 200.59 | 204.3833 | 207.2 | 208.98038 | (209) | (210) | (222) |
| 87 | 88 | 89 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | | 114 | | 116 | | |
| Fr | Ra | Ac | Rf | Db | Sg | Bh | Hs | Mt | | | (227) | | (289) | | | | |
| (223) | (226) | (227) | (261) | (262) | (263) | (262) | (265) | (266) | (269) | (272) | (277) | I | (287) | | (289) |] | |

Group 2A: Loses 2 electrons to form 2+ ions

Be²⁺ Mg²⁺ Ca²⁺ Sr²⁺ Ba²⁺

| 1 H 1.00794 | ↓ | | | | | | | | | | | | | | | | He 4.002602 |
|-----------------------|---------------------|-----------------------|--------------------|----------------------|---------------------|-----------------------|--------------------|-----------------------|---------------------|-----------------------|---|-----------------------|---------------------|-----------------------|-------------------|----------------------|---------------------|
| Li 6.941 | 4 Be 9.012182 | | | | | | | | | | | B 10.811 | C 12.0107 | 7 N 14.00674 | 8 O 15.9994 | 9 F 18.9984032 | 10 Ne 20.1797 |
| 11 Na 22.989770 | 12 Mg 24.3050 | | | | | | | | | | | 13 Al 26.981538 | 14 Si 28.0855 | 15 P 30.973761 | 16 S 32.066 | 17 Cl 35.4527 | 18 Ar 39.948 |
| 19 K 39.0983 | 20 Ca 40.078 | 21 Sc 44.955910 | Ti 47.867 | V 50.9415 | 24 Cr 51.9961 | 25 Mn 54.938049 | Fe 55.845 | Co 58.933200 | Ni 58.6934 | Cu 63.546 | $\overset{\scriptscriptstyle{30}}{\operatorname{Zn}}_{\scriptscriptstyle{65.39}}$ | 31 Ga 69.723 | Ge 72.61 | AS 74.92160 | 34 Se 78.96 | Br 79.904 | Kr 83.80 |
| 37 Rb 85.4678 | 38 Sr 87.62 | 39 Y 88.90585 | 40 Zr 91.224 | 41 Nb 92.90638 | 42 Mo 95.94 | Tc (98) | 44 Ru 101.07 | 45 Rh 102.90550 | 46 Pd 106.42 | 47 Ag 107.8682 | 48 Cd 112.411 | 49 In 114.818 | 50 Sn 118.710 | 51 Sb 121.760 | Te 127.60 | 53 I 126.90447 | Xe 131.29 |
| 55 Cs 132.90545 | 56 Ba 137.327 | 57 La 138.9055 | 72 Hf 178.49 | 73 Ta 180.9479 | 74 W 183.84 | 75 Re 186.207 | 76 Os 190.23 | 77 Ir 192.217 | 78 Pt 195.078 | 79 Au 196.96655 | Hg 200.59 | 81 T1 204.3833 | Pb 207.2 | 83 Bi 208.98038 | PO (209) | At (210) | Rn (222) |
| Fr (223) | 88 Ra (226) | Ac (227) | 104 Rf (261) | 105 Db (262) | 106 Sg (263) | 107 Bh (262) | 108 Hs (265) | 109 Mt (266) | (269) | (272) | (277) | | (289) (287) | | 116 (289) | | |

B3+ AI3+ Ga3+

Group 3A: Loses 3 electrons to form 3+ ions

| 1 H 1.00794 | | | | | | | | | | | | ↓ | | | | | He 4.002602 |
|-----------------------|---------------------|-----------------------|--------------------|----------------------|---------------------|-----------------------|--------------------|-----------------------|---------------------|-----------------------|---|-----------------------|-----------------------|----------------------|-------------------|----------------------|---------------------|
| Li 6.941 | 4 Be 9.012182 | | | | | | | | | | | B 10.811 | C 12.0107 | 7 N 14.00674 | 8 O 15.9994 | 9 F 18.9984032 | 10 Ne 20.1797 |
| 11 Na 22.989770 | 12 Mg 24.3050 | | | | | | | | | | | 13 Al 26.981538 | 14 Si 28.0855 | 15 P 30.973761 | 16 S 32.066 | 17 Cl 35.4527 | 18 Ar 39.948 |
| 19 K 39.0983 | 20 Ca 40.078 | 21 Sc 44.955910 | Ti 47.867 | V 50.9415 | 24 Cr 51.9961 | 25 Mn 54.938049 | Fe 55.845 | CO 58.933200 | Ni 58.6934 | Cu 63.546 | $\overset{\scriptscriptstyle{30}}{\operatorname{Zn}}_{\scriptscriptstyle{65.39}}$ | 31 Ga 69.723 | Ge 72.61 | AS 74.92.160 | 34 Se 78.96 | Br 79.904 | Kr 83.80 |
| Rb 85.4678 | 38 Sr 87.62 | Y 88.90585 | 40 Zr 91.224 | 41 Nb 92.90638 | 42 Mo 95.94 | Tc (98) | 44 Ru 101.07 | 45 Rh 102.90550 | 46 Pd 106.42 | 47 Ag 197.8682 | 48 Cd 112.411 | 49 In 114.818 | 50 Sn 118.710 | 51 Sb 121.760 | Te 127.60 | 53 I 126.90447 | Xe 131.29 |
| 55 Cs 132.90545 | 56 Ba 137.327 | 57 La 138.9055 | 72 Hf 178.49 | 73 Ta 180.9479 | 74 W 183.84 | 75 Re 186.207 | 76 Os 190.23 | 77 Ir 192.217 | 78 Pt 195.078 | 79 Au 196.96655 | 80 Hg 200.59 | 81 T1 204.3833 | Pb 207.2 | Bi 208.98038 | PO (209) | At (210) | Rn (222) |
| Fr (223) | 88 Ra (226) | Ac (227) | 104 Rf (261) | 105 Db (262) | 106 Sg (263) | 107 Bh (262) | 108 Hs (265) | 109 Mt (266) | (269) | (272) | (277) | | 114 (289) (287) | | 116 (289) | | |

Neither! Group 4A elements rarely form ions (they tend to share)

Group 4A: Do they lose 4 electrons or gain 4 electrons?

| 1 H 1.00794 | | | | | | | | | | | | | 1 | | | | He 4.002602 |
|-----------------------|---------------------|-----------------------|--------------------|----------------------|---------------------|-----------------------|--|-----------------------|---------------------|-----------------------|---|-----------------------|-----------------------|-----------------------|-------------------|----------------------|---------------------|
| 3 Li 6.941 | 4 Be 9.012182 | | | | | | | | | | | B 10.811 | C 12.0107 | 7 N 14.00674 | 8 O 15.9994 | 9 F 18.9984032 | 10 Ne 20.1797 |
| 11 Na 22.989770 | 12 Mg 24.3050 | | | | | | | | | | | 13 Al 26.981538 | 14 Si 28.0855 | 15 P 30.973761 | 16 S 32.066 | 17 Cl 35.4527 | 18 Ar 39.948 |
| 19 K 39.0983 | 20 Ca 40.078 | 21 Sc 44.955910 | Ti 47.867 | V 50.9415 | 24 Cr 51.9961 | 25 Mn 54.938049 | ²⁶ Fe ^{55,845} | CO 58.933200 | Ni 58.6934 | Cu 63.546 | $\overset{\scriptscriptstyle{30}}{\operatorname{Zn}}_{\scriptscriptstyle{65.39}}$ | 31 Ga 69.723 | Ge 72.61 | 33 As 74.92160 | 34 Se 78.96 | Br 79.904 | Kr 83.80 |
| 37 Rb 85.4678 | 38 Sr 87.62 | Y 88.90585 | 40 Zr 91.224 | 41 Nb 92.90638 | 42 Mo 95.94 | Tc (98) | 44 Ru 101.07 | 45 Rh 102.90550 | 46 Pd 106.42 | 47 Ag 107.8682 | 48 Cd 112.411 | 49 In 114.818 | 50 Sn 118.710 | 51 Sb 121.760 | Te 127.60 | 53 I 126.90447 | Xe 131.29 |
| 55 Cs 132.90545 | 56 Ba 137.327 | 57 La 138.9055 | 72 Hf 178.49 | 73 Ta 180.9479 | 74 W 183.84 | 75 Re 186.207 | 76 Os 190.23 | 77 Ir 192.217 | 78 Pt 195.078 | 79 Au 196.96655 | 80 Hg 200.59 | 81 T1 204.3833 | Pb 207.2 | 83 Bi 208.98038 | PO (209) | At (210) | Rn (222) |
| Fr (223) | 88 Ra (226) | Ac (227) | 104 Rf (261) | 105 Db (262) | 106 Sg (263) | 107 Bh (262) | 108 Hs (265) | 109 Mt (266) | (269) | (272) | (277) | | 114 (289) (287) | | 116 (289) | | |

N³- Nitride

P³- Phosphide

As³- Arsenide

Group 5A: Gains 3 electrons to form 3-ions

| 1 H 1.00794 | | | | | | | | | | | | | | | | | He 4.002602 |
|-----------------------|---------------------|-----------------------|--------------------|----------------------|---------------------|-----------------------|--------------------|-----------------------|---------------------|-----------------------|---|-----------------------|-----------------------|-----------------------|-------------------|----------------------|---------------------|
| 3 Li 6.941 | 4 Be 9.012182 | | | | | | | | | | | B 10.811 | C 12.0107 | 7 N 14.00674 | 8 O 15.9994 | 9 F 18.9984032 | 10 Ne 20.1797 |
| 11 Na 22.989770 | Mg 24.3050 | | | | | | | | | | | 13 Al 26.981538 | 14 Si 28.0855 | 15 P 30.973761 | 16 S 32.066 | 17 Cl 35.4527 | 18 Ar 39.948 |
| 19 K 39.0983 | Ca 40.078 | 21 Sc 44.955910 | Ti 47.867 | V 50.9415 | 24 Cr 51.9961 | 25 Mn 54.938049 | Fe 55.845 | Co 58.933200 | Ni 58.6934 | Cu 63.546 | $\overset{\scriptscriptstyle{30}}{\operatorname{Zn}}_{\scriptscriptstyle{65.39}}$ | 31 Ga 69.723 | Ge 72.61 | 33 As 74.92160 | 34 Se 78.96 | Br 79.904 | Kr 83.80 |
| Rb 85.4678 | 38 Sr 87.62 | Y 88.90585 | 2r Zr 91.224 | 41 Nb 92.90638 | 42 Mo 95.94 | 43 Tc (98) | 44 Ru 101.07 | 45 Rh 102.90550 | 46 Pd 106.42 | 47 Ag 107.8682 | 48 Cd 112.411 | 49 In 114.818 | 50 Sn 118.710 | 51 Sb 121.760 | Te 127.60 | 53 I 126.90447 | 54 Xe 131.29 |
| 55 Cs 132.90545 | 56 Ba 137.327 | 57 La 138.9055 | 72 Hf 178.49 | 73 Ta 180.9479 | 74 W 183.84 | 75 Re 186.207 | 76 Os 190.23 | 77 Ir 192.217 | 78 Pt 195.078 | 79 Au 196.96655 | 80 Hg 200.59 | 81 T1 204.3833 | Pb 207.2 | 83 Bi 208.98038 | Po (209) | 85 At (210) | 86 Rn (222) |
| Fr (223) | 88 Ra (226) | 89 Ac (227) | 104 Rf (261) | 105 Db (262) | 106 Sg (263) | 107 Bh (262) | 108 Hs (265) | 109 Mt (266) | (269) | (272) | (277) | | 114 (289) (287) | | 116 (289) | | |

O²- Oxide

S²- Sulfide

Se²⁻ Selenide

Group 6A: Gains 2 electrons to form

2-ions

| 1 H 1.00794 | | | | | | | | | | | | | | | * | | He 4.002602 |
|-----------------------|---------------------|-----------------------|--------------------|----------------------|--------------------|-----------------------|--------------------|-----------------------|---------------------|-----------------------|---|-----------------------|-----------------------|-----------------------|-------------------|----------------------|---------------------|
| Li 6.941 | 4 Be 9.012182 | | | | | | | | | | | B 10.811 | C 12.0107 | 7 N 14.00674 | 8 O 15.9994 | 9 F 18.9984032 | 10 Ne 20.1797 |
| 11 Na 22.989770 | 12 Mg 24.3050 | | | | | | | | | | | 13 Al 26.981538 | 14 Si 28.0855 | 15 P 30.973761 | 16 S 32.066 | 17 Cl 35.4527 | 18 Ar 39.948 |
| 19 K 39.0983 | Ca 40.078 | 21 Sc 44.955910 | Ti 47.867 | V 50.9415 | | 25 Mn 54.938049 | Fe 55.845 | Co 58.933200 | Ni 58.6934 | Cu 63.546 | $\overset{\scriptscriptstyle{30}}{\operatorname{Zn}}_{\scriptscriptstyle{65.39}}$ | 31 Ga ∞.723 | Ge 72.61 | 33 As 74.92160 | 34 Se 78.96 | Br 79.904 | Kr 83.80 |
| Rb 85.4678 | 38 Sr 87.62 | Y 88.90585 | Zr 91.224 | 41 Nb 92.90638 | 42 Mo 95.94 | Tc (98) | | 45 Rh 102.90550 | | Ag 107.8682 | 48 Cd 112.411 | 49 In 114.818 | 50 Sn 118.710 | 51 Sb 121.760 | Te 127.60 | 53 I 126.90447 | Xe 131.29 |
| Cs 132.90545 | Ba 137.327 | 57 La 138.9055 | 72 Hf 178.49 | 73 Ta 180.9479 | 74 W 183.84 | 75 Re 186.207 | 76 Os 190.23 | 77 Ir 192.217 | 78 Pt 195.078 | 79 Au 196.96655 | Hg 200.59 | 81 T1 204.3833 | Pb 207.2 | 83 Bi 208.98038 | PO (209) | At (210) | Rn (222) |
| Fr (223) | 88 Ra (226) | Ac (227) | 104 Rf (261) | Db (262) | 106 Sg (263) | 107 Bh (262) | 108 Hs (265) | 109 Mt (266) | (269) | (272) | (277) | | 114 (289) (287) | | (289) | | |

F¹⁻ Fluoride Br¹⁻ Bromide Group 7A: Gains 1 electron to form Cl1- Chloride l1- lodide 1- ions

Не 4.002602 1.00794 Ne 14.00674 15.9994 18.998403 20.1797 Mg Ar 30.97376 28.0855 35,4527 39.948 Mn Fe Ni Zn Kr Co Cu Br Ga Ge AsCa 44.955910 51.9961 58.933200 72.6174.92.160 Sr Nb Mo Tc Pd CdSn Sb Xe Ru Rh Ag 107.8682 In 112.411 88.90585 101.07 114.818 121.760 126.90447 131.29 W Hf Hg 200.59 Βi La Ta Αt Rn Os Αu 137.327 138.9055 178.49 180.9479 183.84 186.207 190.23 192.217 195.078 196.9665 204.3833 207.2 208.98038 (209)(210)Db Rf Βh Ac Hs Μt (287)(289)

Group 8A: Stable noble gases do not form ions!

| | ı | | | | | | | | | | | | | | | | * |
|-----------------------|---------------------|-----------------------|--------------------|----------------------|---------------------|-----------------------|--------------------|-----------------------|---------------------|-----------------------|--|-----------------------|-----------------------|-----------------------|-------------------|----------------------|---------------------|
| 1 H 1.00794 | | _ | | | | | | | | | | | | | | | He 4.002602 |
| 3 Li 6941 | 4 Be 9.012182 | | | | | | | | | | | B 10.811 | C 12,0107 | 7 N 14.00674 | 8 O 15.9994 | 9 F 18.998403 | 10 Ne 20,1797 |
| n Na | Mg | | | | | | | | | | | 13 Al 26.981538 | Si | 15 P 30.973761 | 16 S | 17 Cl 35.4527 | 18 Ar 39.948 |
| 19 K 39.0983 | 20 Ca 40.078 | 21 Sc 44.955910 | Ti 47.867 | V 50.9415 | 24 Cr 51.9961 | 25 Mn 54.938049 | Fe 55.845 | Co 58.933200 | Ni 58.6934 | Cu 63.546 | $\mathop{Zn}_{\scriptscriptstyle{65.39}}^{\scriptscriptstyle{30}}$ | 31 Ga 69.723 | Ge 72.61 | 33 As 74.92160 | 34 Se 78.96 | 35 Br 79.904 | 36 Kr 83.80 |
| 37 Rb 85.4678 | 38 Sr 87.62 | Y 88.90585 | 40 Zr 91.224 | 41 Nb 92.90638 | 42 Mo 95.94 | Tc (98) | 44 Ru 101.07 | 45 Rh 102.90550 | 46 Pd 106.42 | 47 Ag 107.8682 | 48 Cd 112.411 | 49 In 114.818 | 50 Sn 118.710 | 51 Sb 121.760 | Te 127.60 | 53 I 126.90447 | Xe 131.29 |
| 55 Cs 132.90545 | 56 Ba 137.327 | 57 La 138.9055 | 72 Hf 178.49 | 73 Ta 180.9479 | 74 W 183.84 | 75 Re 186.207 | 76 Os 190.23 | 77 Ir 192.217 | 78 Pt 195.078 | 79 Au 196.96655 | 80 Hg 200.59 | 81 T1 204.3833 | Pb 207.2 | 83 Bi 208.98038 | PO (209) | 85 At (210) | 86 Rn (222) |
| Fr (223) | 88 Ra (226) | Ac (227) | 104 Rf (261) | 105 Db (262) | 106 Sg (263) | 107 Bh (262) | 108 Hs (265) | 109 Mt (266) | (269) | (272) | (277) | | 114 (289) (287) | | 116 (289) | | |

Group B elements: transition metals have multiple charges and are harder to predict

Iron (II) = Fe^{2+} Iron (III) = Fe^{3+}

| 1 H 1.00794 | | | | | | | | | | | | | | | | | He 4.002602 |
|-----------------------|---------------------|-----------------------|--------------------|----------------------|---------------------|------------------------|--------------------|-----------------------|---------------------|-----------------------|---------------------|-----------------------|-----------------------|-----------------------|-------------------|----------------------|---------------------|
| Li 6.941 | 4 Be 9.012182 | | | | | 1 | | | | | | B 10.811 | C 12.0107 | 7 N 14.00674 | 8 O 15.9994 | 9 F 18.9984032 | 10 Ne 20.1797 |
| 11 Na 22.989770 | Mg 24.3050 | | | | | | | | | | | 13 Al 26.981538 | Si 28.0855 | 15 P 30.973761 | 16 S 32.066 | 17 Cl 35.4527 | 18 Ar 39.948 |
| 19 K 39.0983 | Ca 40.078 | 21 Sc 44.955910 | Ti 47.867 | V 50.9415 | 24 Cr 51.9961 | 25 Mil 54.9380 9 | Fe 55.845 | 27 Co 38.933200 | Ni 58.6934 | Cu 63.546 | Zn 65.39 | 31 Ga ∞.723 | Ge 72.61 | AS 74.92160 | 34 Se 78.96 | Br 79.904 | Kr 83.80 |
| Rb 85.4678 | 38 Sr 87.62 | 39 Y 88.90585 | 40 Zr 91.224 | 41 Nb 92.90638 | 42 Mo 95.94 | 43 Tc (98) | Ru 101.07 | 45 Rh 102.90550 | 46 Pd 106.42 | 47 Ag 197.8682 | 48 Cd 112.411 | 49 In 114.818 | 50 Sn 118.710 | 51 Sb 121.760 | Te 127.60 | 53 I 126.90447 | Xe 131.29 |
| 55 Cs 132.90545 | 56 Ba 137.327 | 57 La 138.9055 | 72 Hf 178.49 | 73 Ta 180.9479 | 74 W 183.84 | 75 Re 186.207 | 76 Os 190.23 | 77 Ir 192.217 | 78 Pt 195.078 | 79 Au 196.96655 | Hg 200.59 | 81 T1 204.3833 | Pb 207.2 | 83 Bi 208.98038 | PO (209) | 85 At (210) | Rn (222) |
| Fr (223) | 88 Ra (226) | 89 Ac (227) | 104 Rf (261) | 105 Db (262) | 106 Sg (263) | 107 Bh (262) | 108 Hs (265) | 109 Mt (266) | 110 (269) | 111 (272) | (277) | | 114 (289) (287) | | 116 (289) | | |

• Common Ion Charges 3- 2- 1-Ag Re Os

- A. Making compounds to balance charge
 - 1. charges should always add up to zero
 - 2. Add subscripts to show # of ions
 - 3. Write cation first and anion second



- A. Making compounds to balance charge
 - *4. Ex: Strontium and Fluorine

$$Sr = 2 + (group 2A) F = 1 - (group 7A)$$

$$SrF_2 = 0$$

subscripts show the # of ions

• Ex: Calcium and Phosphorous

White boards please

*Your Turn:

- -Lithium and Bromine
- -Calcium and Iodine
- -Oxygen and Barium



- · CaI2
- BaO



- 1. Name the cation first
 - a. Metals with multiple charges use roman numerals to show the charge on the metal (mostly transition metals)
 - Ex: Iron (II) is Fe2+

- 2. Name the anion second
 - a) Monatomic change ending to -ide
 - b) Polyatomic- name stays the same

• 3. To determine which is the cation and which is the anion, draw a line after the metal or ammonium (NH_4)

3. Examples

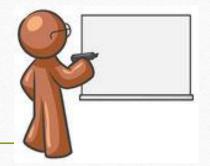
- CaCl₂ NaBr
- K_3N

- = Calcium chloride
- = Sodium bromide
- = potassium nitride

Your Turn

Na₂O

sodium oxide



 Ca_3N_2

Calcium Nitride

AICI₃

Aluminum chloride

C. Name to Formula

potassium chloride

 $K^+ CI^- \Rightarrow KCI$

magnesium Sulfide Mg²⁺ S^{2−} ⇒ MgS

C. Name to Formula

Aluminum oxide

 $AI^{3+}O^{2-} \Rightarrow AI_2O_3$

Al³⁺ O²⁻ O²⁻

D. Multi-Charge (Transition) Metals

- Roman numerals are only used if the metal has more than one possible charge. Use the periodic chart of charges.
- Do not use roman numerals for single charge transition metals (ex: AgCl = silver chloride)

NUMERALS 1-10

$$1 = I 6 = VI$$

 $2 = II 7 = VII$
 $3 = III 8 = VIII$
 $4 = IV 9 = IX$
 $5 = V 10 = X$



Remember the Magic Triangle

12.0107

14.00674

15.9994

16

If it is a metal (left of the stair case) in group 1A or 2A or in the magic triangle it has only one charge and

does not need roman numerals

| | | | | | | | | | 2+ | 1 24.98 538 | 28.0855 | 1 30.973761 | 32.066 |
|---------------------|--------------------|----------------------|---------------------|-----------------------|--------------------|-----------------------|---------------------|-----------------------|----------------------|----------------------|-----------------------|-----------------------|--------------------|
| 21 SC 955910 | Ti 47.867 | V 50.9415 | 24 Cr 51.9961 | 25 Mn 54.938049 | 26 Fe 55.845 | CO 58.933200 | 28 Ni 58.6934 | Cu 63.546 | 30 Z11 65.39 | Ga Ga Ba | + 32 Ge 72.61 | AS 74.92160 | 34 Se 78.96 |
| 39 Y .90585 | 40 Zr 91.224 | 41 Nb 92.90638 | 42 Mo 95.94 | 43 Tc (98) | 44 Ru 101.07 | 45 Rh 102.90550 | 46 Pd 106.42 | A5 A5 107.8682 | 28+ Cd 112.411 | 4 In 114.818 | + 50 Sn 118.710 | 51 Sb 121.760 | 52 Te 127.60 |
| 57 La .8.9055 | 72 Hf 178.49 | 73 Ta 180.9479 | 74 W 183.84 | 75 Re 186.207 | 76 Os 190.23 | 77 Ir 192.217 | 78 Pt 195.078 | 79 Au 196.96655 | 80 Hg 200.59 | 81 T1 204.3833 | Pb 207.2 | 83 Bi 208.98038 | 84 Po (209) |
| 89 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | | 114 | | 116 |

Examples: Write formula or Name

```
1. Iron (II) Sulfide Fe<sup>2+</sup> S<sup>2-</sup>

Separate Sepa
```

2. Gold (III) oxide Au3+ O2-

CuBr₂ = Copper (II) Bromide

When naming compounds with multi-charge metals, you must work backwards to determine the charge

Copper (I) =
$$Cu^+$$

Copper (II) = Cu^{2+}

FeO = Iron (II) Oxide

Fe? O²-

When naming compounds with multi-charge metals, you must work backwards to determine the charge

Fe₂S₃ = Iron (III) Sulfide

Fe? S²Fe? S²S²-

When naming compounds with multi-charge metals, you must work backwards to determine the charge