## Chemistry Chapter 7

Chemical Formulas and
Chemical compounds $\xrightarrow[\oplus \oplus+]{\mathrm{Na+}}$


Heart cell mythm depends on the opening and closing of a complex series of valves on the cell membrane, called ion channels. Some valves let certain ions the potassium ( $\mathrm{K}+$ ) flow out, othens let different ions the sodium (Nat) flow in. There are also pumps that actively move ions one direction or another. <br> \section*{Ions <br> \section*{Ions <br> <br> Cation：A positive ion <br> <br> Cation：A positive ion ？ ？
}
}

## Anion：A negative ion

Tonic Bonding：Force of attraction
Ah an：


Force of attraction

## A negative ion

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 Tyrone： 41 4） ． ＂18
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$\frac{42}{1-2!}$
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$\frac{51}{21}$
$=$ $+$


## Predicting Ponic Charges



## Predicting Ponic Charges

## Group 2: Loses 2 electrons to form

| $\stackrel{\stackrel{1}{\mathrm{H}}}{1.0074}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $\stackrel{2}{\mathrm{He}}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3 |  |  |  |  |  |  |  |  |  |  |  | ${ }_{5}^{5}$ | ${ }^{6}$ | ${ }^{7}$ | $\stackrel{8}{8}$ | $\stackrel{ }{ }$ | 10 |
| Li | Be |  |  |  |  |  |  |  |  |  |  | B | C | N | O | F | Ne |
| 6941 | 9.812182 |  |  |  |  |  |  |  |  |  |  | 10.811 | 12.0107 | 14.0067 | 15.9594 | 18.998403. | 20.1797 |
| 11 | 12 |  |  |  |  |  |  |  |  |  |  | 13 | 14 | 15 | 16 | 17 | 18 |
| Na | Mg |  |  |  |  |  |  |  |  |  |  | Al | Si | P | S | Cl | Ar |
| 22.989770 | 24.3050 |  |  |  |  |  |  |  |  |  |  | 26.981588 | 28.8855 | 30973761 | 32.066 | 35.4527 | 30.948 |
| 19 | ${ }^{20}$ | 21 | 22. | ${ }^{23}$ | ${ }^{24}$ | 25 | ${ }^{26}$ | 27 | ${ }^{28}$ | ${ }^{29}$ | 36 | ${ }^{31}$ | 32 | ${ }^{33}$ | 34 | ${ }^{35}$ | ${ }^{36}$ |
| K | Ca | Sc | Ti | V | Cr | Mn | Fe | Co | Ni | Cu | Zn | Ga | Ge | As | Se | Br | Kr |
| 39,998 | 40.078 | 4955910 | 47.867 | 50.9415 | 519961 | 54.93804 | 55845 | 58.933200 | 58.0034 | 63.546 | 65.39 | 69.723 | 72.61 | 74.92100 | 78.96 | 79.504 | 81.80 |
| 37 | ${ }^{38}$ | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 |
| Rb | Sr | Y | Zr | Nb | Mo | Tc | Ru | Rh | Pd | Ag | Cd | In | Sn | Sb | Te | I | Xe |
| 85.4678 | 87.62 | 8.90585 | 91.224 | 92.90638 | 95.94 | (98) | 101.07 | 102.50550 | 106.42 | 107.8682 | 112.411 | 114.818 | 118.710 | 121760 | 127.60 | 126.9047 | 131.29 |
| 55 | 56 | 57 | 72 | 73 | 74 | 75 | 76 | 77 | ${ }^{78}$ | 79 | ${ }^{86}$ | ${ }^{81}$ | ${ }^{82}$ | 83 | ${ }^{84}$ | 85 | ${ }^{86}$ |
| Cs | Ba | La | Hf | Ta | W | Re | Os | Ir | Pt | Au | Hg | Tl | Pb | Bi | $\mathrm{PO}_{0}$ | At | Rn |
| 13290545 | 137.327 | 138.9055 | 178.49 | 180.9479 | 183.84 | 186.207 | 150.23 | 192.217 | 195.078 | 196.96655 | 200.59 | 2043833 | 207.2 | 208.58038 | (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 |  |  |  |  |  |  |  |  |  |
| (223) | (226) | (227) | (261) | (262) | (2ai) | (262) | (265) | (266) | (209) | (272) | (277) |  | ( $\begin{aligned} & (289) \\ & (287)\end{aligned}$ |  | (289) |  |  |

## Predicting Lonic Charges

## Group 13: Loses 3 elections to form

| $\begin{array}{\|c} \stackrel{1}{\mathrm{H}} \\ 1,0074 \end{array}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | He 4,002602 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3 | 4 |  |  |  |  |  |  |  |  |  |  | 5 | 6 | 7 | ${ }^{8}$ | 9 | 10 |
| Li | Be |  |  |  |  |  |  |  |  |  |  | B | C | N | O | F | Ne |
| 6941 | 9.812182 |  |  |  |  |  |  |  |  |  |  | 10.811 | 12.0107 | 14.00674 | 15.5994 | 18.998483: | 20.1797 |
| 11 | 12 |  |  |  |  |  |  |  |  |  |  | 13 | 14 | 15 | 16 | 17 | 18 |
| Na | Mg |  |  |  |  |  |  |  |  |  |  | Al | Si | P | S | Cl | Ar |
| 22.989770 | 24.3050 |  |  |  |  |  |  |  |  |  |  | 26.981588 | 28.0855 | 30973761 | 32.866 | 35.4527 | 39.948 |
| 19 | 20 | 21 | 22 | ${ }^{23}$ | ${ }^{24}$ | 25 | 26 | 27 | ${ }^{28}$ | ${ }^{29}$ | 30 | 31 | 32 | 33 | 34 | 35 | 36 |
| K | Ca | Sc | Ti | V | Cr | Mn | Fe | Co | Ni | Cu | Zn | Ga | Ge | As | Se | Br | Kr |
| 39,9983 | 40.078 | 44.959910 | 47.867 | 50.9415 | 51.9961 | 54.93804 | 55845 | 58.933200 | 58.6834 | 63.546 | 65.39 | 9.723 | 72.61 | 74.92100 | 78.96 | 79.504 | 81.80 |
| 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 |
| Rb | Sr | Y | Zr | Nb | Mo | Tc | Ru | Rh | Pd | Ag | Cd | In | Sn | Sb | Te | I | Xe |
| 85.4678 | 87.62 | 88.90585 | 91.224 | 92.90638 | 95.94 | (98) | 101.07 | 102.50550 | 106.42 | 107.8682 | 112.411 | 114.818 | 118.710 | 121.760 | 127.60 | 1259044 | 131.29 |
| 55 | 56 | 57 | 72 | 73 | 74 | 75 | 76 | 77 | ${ }^{78}$ | ${ }^{79}$ | ${ }^{80}$ | ${ }^{81}$ | 82 | ${ }^{83}$ | ${ }^{84}$ | 85 | ${ }^{86}$ |
| Cs | Ba | La | Hf | Ta | W | Re | Os | Ir | Pt | Au | Hg | Tl | Pb | Bi | PO | At | Rn |
| 132.9054 | 137.327 | 138.9055 | 178.49 | 180.9479 | 183.84 | 186.207 | 150.23 | 192.217 | 195.078 | 196.96655 | 200.59 | 2042883 | 207.2 | 208.58038 | (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 |  |  |  |  |  |  |  |  |  |
| (223) | (226) | (227) | (261) | (262) | (2ai) | (262) | (265) | (266) | (209) | (272) | (277) |  | (287) |  | (289) |  |  |



| $\begin{gathered} 1 \\ \mathrm{H} \\ 1.00794 \end{gathered}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| $\mathrm{L}_{6.941}^{3}$ | 4 Be 9.012182 |  |  |  |  |  |  |  |  |  |  | 5 B 10.811 | $\stackrel{6}{C}_{12.0107}^{C}$ |  | $\begin{gathered} 8 \\ 0 \\ 15.9994 \end{gathered}$ | 9 <br> F <br> 18.998403. | 10 <br> Ne <br> 20.1797${ }_{2}$ |
| 11 Na 22.989770 | $\mathrm{M}_{24.3050}^{12} \mathrm{~g}_{2}$ |  |  |  |  |  |  |  |  |  |  | 13 Al 26.981538 | $\begin{gathered} 14 \\ \mathrm{Si} \\ 28.0855 \end{gathered}$ | 15 P 30973761 | $\stackrel{16}{S}_{\substack{16.066}}$ | $\begin{gathered} 17 \\ C_{35.4527} \end{gathered}$ | $\begin{gathered} 18 \\ \mathrm{Ar} \\ 39.948 \\ \hline \end{gathered}$ |
| $\mathrm{K}_{39}^{19}$ | $\begin{gathered} 20 \\ C_{a}^{20.078} \end{gathered}$ | $\underset{44.955910}{21}$ | $T_{47.867}^{22} \mathrm{i}$ | $\begin{gathered} 23 \\ \mathrm{~V} \\ 50.9415 \end{gathered}$ | ${ }_{51.9961}^{24}$ | $\begin{array}{\|c\|} \hline 25 \\ \mathrm{Mn} \\ 54.938049 \\ \hline \end{array}$ | $\begin{gathered} 26 \\ \mathrm{Fe} \\ 55.845 \end{gathered}$ | $\stackrel{27}{\mathrm{Co}}_{58.933200}$ | $\stackrel{28}{\mathrm{Ni}}$ | $\stackrel{C u}{63.546}_{29}$ | $\begin{gathered} 30 \\ 7 n \\ 65.39 \end{gathered}$ | $\begin{gathered} 31 \\ \mathrm{Ca} \\ 69.723 \end{gathered}$ | $\stackrel{32}{\mathrm{Ge}}$ | $\begin{array}{\|c} \hline 33 \\ \mathrm{AS} \\ 74.92100 \end{array}$ | $\begin{gathered} 34 \\ \mathrm{Se} \\ 78.96 \end{gathered}$ | $\stackrel{35}{\mathrm{Br}}$ | $\underset{83.80}{\mathrm{Kr}^{36}}$ |
| $\begin{aligned} & 37 \\ & \mathrm{Rb} \\ & 85.4678 \end{aligned}$ | $\begin{gathered} 38 \\ \mathrm{Si} \\ 87.62 \end{gathered}$ | $\frac{39}{\mathrm{Y}}$ | $\begin{gathered} 40 \\ 71.224 \end{gathered}$ | $\stackrel{41}{\mathrm{Nb}}$ | $\stackrel{42}{\mathrm{MO}}$ | $\begin{gathered} 43 \\ \mathrm{TC} \\ \hline(98) \end{gathered}$ | $\begin{gathered} 44 \\ \mathrm{Ru} \\ 101.07 \end{gathered}$ | $\begin{gathered} 45 \\ \mathrm{Rh} \\ 102.90550 \end{gathered}$ | $\begin{gathered} 46 \\ \mathrm{Pd} \\ 106.42 \end{gathered}$ | $\begin{gathered} 47 \\ \mathrm{~A} \mathrm{G} \\ 107.8682 \end{gathered}$ | $\stackrel{48}{\mathrm{Cd}_{112.411}}$ | $\operatorname{In}_{114.818}^{49}$ | $\begin{gathered} 50 \\ \mathrm{Sn} \\ 118.710 \end{gathered}$ | $\begin{gathered} 51 \\ \mathrm{Sb} \\ 121.760 \end{gathered}$ | $\begin{gathered} 52 \\ T \mathrm{e} \\ 127.60 \end{gathered}$ |  | $\begin{gathered} \mathrm{Se}^{54} \\ 131.29 \end{gathered}$ |
| $\begin{gathered} 55 \\ \mathrm{CS} \\ 132.90545 \end{gathered}$ | $\begin{gathered} 56 \\ \mathrm{Ba} \\ 137.327 \end{gathered}$ | $L_{138.9055}^{57}$ | $\mathrm{Hf}_{178.49}^{72}$ | $\begin{gathered} 73 \\ \text { Ta } \\ 180.9479 \end{gathered}$ | $\begin{gathered} 74 \\ \mathrm{~W} \\ 183.84 \end{gathered}$ | 75 Re 186.207 | $\begin{gathered} \hline 76 \\ \mathrm{O} \\ 150.23 \end{gathered}$ | $\begin{gathered} 77 \\ \mathrm{Ir} \\ 192.217 \end{gathered}$ | $\begin{gathered} 78 \\ \mathrm{Pt} \\ 195.078 \end{gathered}$ | $\begin{gathered} \hline 79 \\ \mathrm{Au} \\ 196.96655 \end{gathered}$ | $\begin{gathered} 80 \\ \mathrm{Hg} \\ 200.59 \end{gathered}$ | 81 T1 204.3833 | $\begin{gathered} 82 \\ \mathrm{~Pb} \\ 207.2 \end{gathered}$ |  | $\begin{gathered} 84 \\ \mathrm{PO} \\ (209) \end{gathered}$ | 85 <br> At <br> (210) | $\begin{gathered} 86 \\ \mathrm{Rn} \\ (222) \end{gathered}$ |
| $\begin{gathered} 87 \\ \mathrm{Fr} \\ (223) \end{gathered}$ | $\begin{gathered} 88 \\ \mathrm{Ra} \\ (226) \end{gathered}$ | $\begin{gathered} 89 \\ \mathrm{~A} \mathrm{C} \\ (227) \end{gathered}$ | $\begin{gathered} 104 \\ \mathrm{Rf} \\ (261) \end{gathered}$ | $\begin{gathered} 105 \\ D \mathrm{D} \\ (262) \end{gathered}$ | $\begin{gathered} 106 \\ \mathrm{So} \\ (263) \end{gathered}$ | $\begin{gathered} 107 \\ \mathrm{Bh} \\ (262) \end{gathered}$ | $\begin{gathered} 108 \\ \mathrm{HS} \\ (265) \end{gathered}$ | 108 <br> Mt <br> (266) | $\begin{aligned} & 110 \\ & (2099) \end{aligned}$ | 111 (272) | $\begin{array}{r} 112 \\ (277) \\ \hline \end{array}$ |  | $\begin{gathered} 114 \\ (285) \\ (287) \end{gathered}$ |  | $\begin{gathered} 116 \\ (289) \end{gathered}$ |  |  |

## Group 16: Gains 2 electrons to form




## Group 18：Stable Noble gases do not form ions．

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| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| ${ }_{\text {Be }}$ |  |  |  |  |  |  |  |  | B |  | N | ¢ |  | Ne |
| ${ }^{\text {M }}$ |  |  |  |  |  |  |  |  | A |  | ${ }^{\text {P }}$ | 5 |  |  |
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| 为 ${ }_{\text {cher }}$ | \％ | ${ }^{\circ} \mathrm{A}$ | ${ }^{\text {bib }}$ | ${ }^{\text {it }}$ | ${ }_{\text {Rum }}^{\text {R }}$ | ${ }_{\text {kn }}$ | ${ }_{\text {pad }}^{\text {pad }}$ |  | ${ }^{\text {in }}$ |  | so |  |  |  |
| ${ }_{6}^{6}$ \％ | ${ }^{\text {La }}$ | ${ }^{\text {if }}$ | \％ | ${ }_{\text {Re }}$ | os | ${ }^{\text {r }}$ | ${ }^{\text {p }}$ | 4 | \＃1 |  | ${ }^{\text {B }}$ |  |  | ${ }_{\text {Rn }}^{\text {m }}$ |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

## Groups 3-12: Many <br> elements have more than one possible oxidation state.

| $\stackrel{1}{\mathrm{H}}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $\stackrel{2}{\mathrm{He}}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{Li}_{6941}^{3}$ | $\begin{gathered} 4 \\ \mathrm{Be}_{9.012182} \end{gathered}$ |  |  |  |  |  |  |  |  |  |  | $\begin{array}{\|c\|} \hline 5 \\ \mathrm{~B} \\ 10.811 \end{array}$ | $\stackrel{6}{\mathrm{C}}{ }_{12.0107}$ | $\stackrel{7}{\mathrm{~N}}$ | $\stackrel{8}{\stackrel{8}{\mathrm{O}}}$ |  | $\begin{array}{\|l\|} \hline 10 \\ \mathrm{Ne} \\ 20.1797 \end{array}$ |
| $\begin{gathered} 11 \\ \mathrm{Na}_{22.98970} \end{gathered}$ | ${\underset{24}{12} \mathrm{Mg}_{2}^{12}}^{2}$ |  |  |  |  | 1 |  |  |  |  |  | $\stackrel{13}{\mathrm{~A}_{26}^{\mathrm{Al}} 15158}$ | $\underset{28.0855}{14}$ |  | $\mathrm{S}_{32.066}^{16}$ | $\begin{gathered} 17 \\ { }_{35.4527}^{\mathrm{Cl}} \\ \hline \end{gathered}$ | $\begin{array}{\|c} \hline 18 \\ \mathrm{Ar} \\ 39948 \end{array}$ |
| $\begin{array}{\|c} 19 \\ \mathrm{~K}_{3}^{19} 983 \end{array}$ | $\begin{aligned} & 20 \\ & \mathrm{Ca} \\ & 40.078 \end{aligned}$ | $\stackrel{21}{21}_{\mathrm{SC}_{495910}}$ | ${\underset{47.867}{22}}_{22}$ | $\stackrel{23}{\mathrm{~V}}$ | $\stackrel{24}{\mathrm{Cr}_{519961}}$ |  | $\begin{gathered} 26 \\ { }_{55}^{26} 845 \end{gathered}$ | $\mathrm{C}_{8.933200}^{27}$ | $\stackrel{28}{28.0834}_{28}$ | $\begin{gathered} \hline 29 \\ \mathrm{Cu} \\ \mathrm{C}, 546 \end{gathered}$ | $\begin{aligned} & 30 \\ & \mathrm{Zn} 5.39 \end{aligned}$ | $\begin{gathered} { }_{c}^{31} \\ \mathrm{Ga} \\ \hline 9.723 \end{gathered}$ | $\begin{aligned} & 32 \\ & \mathrm{G} \end{aligned}$ | $\mathrm{T}_{7492160}^{\mathrm{A3}}$ | $\begin{aligned} & 34 \\ & { }_{7}^{3.96} \end{aligned}$ | $\begin{gathered} \hline \frac{35}{35} \\ 79.94 \end{gathered}$ | $\begin{aligned} & \text { 36 } \\ & \mathrm{Kr} \\ & 83 \end{aligned}$ |
| $\begin{gathered} 37 \\ \mathrm{Rb}_{85}{ }^{2} 678 \end{gathered}$ | $\begin{array}{\|c} \hline 38 \\ { }_{87.62}^{38} \end{array}$ |  | $\begin{aligned} & \mathrm{Zr}_{91.224}^{40} \end{aligned}$ | $\stackrel{41}{\mathrm{Ni}}{ }_{92.9638}$ | $\begin{aligned} & \mathrm{M}_{9594}^{42} \end{aligned}$ | $\begin{aligned} & \begin{array}{l} 43 \\ \mathrm{Tc} \\ (98) \end{array} \end{aligned}$ | $\underset{101.07}{\mathrm{Ru}}$ | 45 <br> Rh <br> 102.50550 | $\begin{aligned} & \hline 46 \\ & \mathrm{Pd} \\ & 106.42 \end{aligned}$ | $\underset{107.8622}{47}$ | $\stackrel{48}{\mathrm{Cd}_{112.411}}$ | $\operatorname{In}_{114.818}^{49}$ | ${\underset{118}{50} \mathrm{Sn}_{10}}^{2}$ | $\begin{gathered} \mathrm{S}_{121.760}^{51} \end{gathered}$ | $\begin{gathered} \mathrm{Te}_{127.60}^{52} \end{gathered}$ |  | $\begin{array}{\|c} \hline \begin{array}{c} 54 \\ \mathrm{Xe} \\ 131.29 \end{array} \\ \hline \end{array}$ |
| 55 | 56 | 57 | 72 | 73 | 74 | 75 | 76 | 77 | ${ }^{78}$ | 79 | 80 | 81 | 82 | 83 | 84 | 85 | ${ }^{86}$ |
| Cs | Ba | La | Hf | Ta | W | Re | Os | Ir | Pt | Au | Hg | Tl | Pb | Bi | Po | At | Rn |
| 13290545 | 137.327 | 138.9055 | 178.49 | 180.9479 | 183.84 | 186.207 | 150.23 | 192.217 | 195.078 | 196.96655 | 200.59 | 2043833 | 207.2 | 208.58038 | (209) | (210) | (222) |
| $\begin{aligned} & 87 \\ & \mathrm{Fr}_{223} \end{aligned}$ | $\begin{aligned} & 88 \\ & \text { Ra } \\ & \text { R2 } \end{aligned}$ | $\begin{aligned} & \mathrm{B9} \\ & \mathrm{Ac} \\ & (227) \end{aligned}$ | $\begin{gathered} 104 \\ \mathrm{Rf} \\ (261) \end{gathered}$ | $\begin{aligned} & \text { 1 } \\ & \text { Db } \\ & (262) \end{aligned}$ | $\begin{aligned} & 106 \\ & \mathrm{Sg} \\ & 20 \end{aligned}$ | $\begin{aligned} & \mathbf{c}^{107} \\ & { }_{(2622} \end{aligned}$ | $\begin{aligned} & \text { 108 } \\ & \text { Hs } \\ & (265) \end{aligned}$ | $\begin{aligned} & 109 \\ & \mathrm{Mt} \end{aligned}$ | 110 (209) | $\begin{aligned} & \hline 111 \\ & (272) \end{aligned}$ | $\begin{aligned} & 112 \\ & \text { (277) } \end{aligned}$ |  | 114 $(289)$ $(287)$ |  | $\begin{gathered} 116 \\ (289) \end{gathered}$ |  |  |

## Precicting Ionic Charges Groups 3 - 12: Some transition elements have only ont possible oxidation state.

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| ${ }^{\text {Na }}$ |  |  |  |  |  |  |  |  |  | P |  |  |
|  | \% |  | P | ${ }^{\text {an }}$ |  |  | Nin ${ }^{8}$ |  |  | is | se | kim |
| $\stackrel{\text { kib }}{ }$ | \% | ${ }^{4}$ | Nib | ${ }_{\text {Bio }}{ }^{\text {Io }}$ | ${ }_{\text {Run }}^{\text {Rn }}$ | ${ }^{\text {Rn }}$ | Br ${ }^{\circ}$ |  |  | sb | ${ }_{10}$ |  |
| ${ }^{\circ}$ | La | ${ }_{\text {it }}$ | S | ${ }^{*}$ | ${ }_{\text {os }}$ | ir | ${ }_{\text {prem }}$ | \#1 |  | Bi |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |

## Writing Ionic compound formulas

## Example:

1. Write the formulas for the cation and anion, including CHARCES:
2. Check to see if charges are balanced.
3. Balance charges, if necessary, using subscripts. Use parentheses if you need more than one of a
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## Writing Ionic Compound Formulas

## Example:

1. Write the formulas for the cation and anion, including CHAREES: are balanced.
2. Balance charges, if necessary,
using
3. Balance charges, if necessary,
using
if you need mope than one of a
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Not balanced!

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## Writing Ionic Compound Formulas

## Example: Tron( - TI) chloride <br> Example: Tron ( $1+1$ ) chlorite

1. White the formulas for the cation and anion, including CHARGES.
2. Check to see if charges are balanced.
3. Balance charges, if necessary, using subscripts. Use parentheses
s. if you need mope than one of a

Not balanced!


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In
 ( $-\sqrt{4}$


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\frac{415}{5-1}+
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+ a.
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## Writing Ionic Compound Formulas

## Example:

1. Write the formulas for the cation and anion, including CHARGES.
2. Check to see if charges are balanced.
3. Bolance-changes, if necessary. using sibberripis. Use parentheses

Arommun sulfite
if you need more than one of a
$\qquad$

Not balanced!


$73+5$ $40^{2}$ 5 1 billy dotimetras. $\square \square \square$
 1/2 tina 81 $\qquad$ S. Use parentheses
$\square$ $-$

## Writing Fonic Compound Formulas

## Example:

1. Write the formulas for the cation and arion, including CHARGES:
2. Check to see if charges are balanced.

## 1

They are balanced!

## Writing Ionic Compound Formulas

 Writing Ionic CompoundExample: Z ne hydroxide

1. Write the formulas for the cation Writing Ionic Compound
Example: Z ne hydroxide
2. Write the formulas for the cation and anion, including CHAREES!
3. Check to see if chargesuare balanced.
4. Balance charges, if necessary, using subscripts. Use parentheses Mncitanc ionic conn porno
Example: White the formulas for the cation if you end moke mon of
 morereutaliverola.

$2{ }^{2}$

$\square$

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 (1)
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## Writing Ionic Compound Formulas

## Example:

1. Write the formulas for the cation and anion, including CHAREES:
2. Check to see if charges are balanced.

## |

They ARE balanced! Naming Ionic Compounds

- 1. Cation first, then anion


## that realeilinion

-3. Monatomic anion $=$ not + -ide

## ide

$$
18 \mathrm{a}
$$ 3. Monatomic anion

 $\mathrm{Cl}_{2}$



## a de

 $=$w hor

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$$

## -2 Monatomic cation - =name of the <br> element

 $=$ :$\qquad$ <br> \section*{\section*{Naming Ionic Compounds <br> \section*{\section*{Naming Ionic Compounds <br> <br> (continued)} <br> <br> (continued)}

## Metals with multiple oxidation states <br> - Hit some metal forms more than one cation <br> - - use Roman numeral in name

$\because: \mathrm{PbCl}_{2}=\mathrm{lead}(\mathrm{H})$ ) chloride

## $\cdot \mathrm{PbCl}_{2}$ <br> Pb 2 is cation <br> <br> $P^{2}+$ is cation <br> <br> $P^{2}+$ is cation <br> 

$\square$
$\qquad$
$\square$ $\frac{21}{25}$
$\qquad$

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Naming Binary Compounds
Compounds between two nay metals
-

- Serendedemerti is named as if it were on cinder.
- Use prefixes
- Only use ninon on second element -

$$
\begin{aligned}
\mathrm{P}_{2} \mathrm{O}_{5} & =\text { ephosphorus } \\
\mathrm{CO}_{2} & =\text { carbon oxide } \\
\mathrm{CO} & =\text { carbon monoxide } \\
\mathrm{N}_{2} & =\text { initrogen }
\end{aligned}
$$

## Galculatina Formula Mass

calculate the formula mass of magnesium carbonate, $\mathrm{MgCO}_{3}$.


Calculating Percentage Composition
Calculate the percentage composition of magnesium carbonate, $\mathrm{MgCO}_{3}$.
From previous slide:

$$
\begin{aligned}
& \left.M g=\frac{243}{843 \%}\right)+100=28.83 \% \\
& \frac{120.020}{84.32}-300=30
\end{aligned}
$$

## Formulas <br> Empirical formula: the lowest whole number ratio of atoms in a compound. atoms of each element in the formula of a atoms of each element in the formula of a compound. <br> ucla: the lowest whole number <br>  <br> $\qquad$ <br> $\qquad$ <br> 䟮 amber of 

$$
\begin{aligned}
& \text { molecular formula }=\text { (empirical } \\
& \text { formula) } n=\text { integer } \\
& \text { molecular formula }=C_{6} H_{6}=(\mathrm{CH})_{6} \\
& \text { empirical formula }=\mathrm{CH}_{6}
\end{aligned}
$$ 8

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8
8

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$\square$ $\frac{1}{1}$

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\frac{F}{5}
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Formulas（continued）
Formulas for montane resources 1 ike this on Ecourbooks．com
empirical（lowest whole number ratio）．
Examples：
$\mathrm{NaCl} \quad \mathrm{MgCl}_{2} \quad \mathrm{Al}_{2}\left(\mathrm{SO}_{4}\right)_{3} \quad \mathrm{~K}_{2} \mathrm{CO}_{3}$
mulls for went whole number ratio）．
irical（lowest ways
dimples：
$\mathrm{Cl}_{1}$
$\mathrm{MOCl}_{2}$ $\mathrm{Al}_{2}\left(\mathrm{SO}_{4}\right)_{3} \quad \mathrm{~K}_{2} \mathrm{CO}_{3}$ are ALWAYS
ben ratio）． 24
24
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Formulas（continued）
Formulas for ionise resources 1 ike this on Ecorebooss．com
empirical（lowest whole number ratio）．
Examples：
$\mathrm{NaCl} \quad \mathrm{MgCl}_{2} \quad \mathrm{Al}_{2}\left(\mathrm{SO}_{4}\right)_{5} \quad \mathrm{~K}_{2} \mathrm{CO}$
mulls（continued）
mulls for on con
irical（lowest whole number ratio）．
implies：
$\mathrm{Cl} \mathrm{MgCl}_{2} \quad \mathrm{Al}_{2}\left(\mathrm{SO}_{4} 7_{5} \quad \mathrm{Kinin}_{2} \mathrm{CCO}_{2}\right.$
mulls（continued）
mulls for conf eon ponds are ALWAYS
irical（lowest whole number ratio）．
imples： $\mathrm{MgCl}_{2} \quad \mathrm{Al}_{2}\left(\mathrm{SO}_{4}\right)_{5} \quad \mathrm{~K}_{2} \mathrm{CO}_{3}$

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$\qquad$

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mulls（continued）
mulls for on con
irical（lowest whole number ratio）．
implies：
$\mathrm{CoCl}_{2} \quad \mathrm{Al}_{2}\left(\mathrm{SO}_{4} \mathrm{P}_{5} \quad \mathrm{Kinin}_{2} \mathrm{CCO}_{8}\right.$


$\qquad$


$\qquad$

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$\qquad$
mf

Formulas (continued)
Formulas for molectlan compoulds MIGHI be empirical (lowest whole number ratio).
$\begin{array}{lccc}\text { Lolgeular } & \mathrm{H}_{2} \mathrm{O} & \mathrm{C}_{6} \mathrm{H}_{12} \mathrm{O}_{6} & \mathrm{C}_{12} \mathrm{H}_{22} \mathrm{O}_{11} \\ \text { Enpirical } & \mathrm{H}_{2} \mathrm{O} & \mathrm{CH}_{2} \mathrm{O} & \mathrm{C}_{12} \mathrm{H}_{22} \mathrm{O}_{11}\end{array}$

Empirical Formula Determination

$$
1
$$

1. Base calculation on $\mathbf{1 0 0}$ grams of compound.
2. Determine moles of each element in 100
3. Divide each value of moles by the smallest of the values.
4. Multiply each number by an integer to obtain all whole numbers. Hit it $\square$ all. who \#


## 

$\qquad$ $1+84$
$4+24$
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4 ti
$4+12$
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grams of compound. 4 4-4 $\qquad$
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$\qquad$ $+\frac{1}{5}$ $\frac{5}{4}+$

## Empirical Formula Determination

Adipic acid contains $49.32 \%$ C, $43.84 \%$ 0, and $6.85 \%$ He mass. What is the empirical formula of adipic acid?


## Empirical Formula Determination (pant 2)

Divide each value of moles by the smallest of the values.

$$
\frac{40 \mathrm{molog}}{2.74 \mathrm{molog}}
$$

2.74
m

1
 Carbon
$\square$


## 

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coteries

$\qquad$

$$
\begin{array}{r}
3.2 .0 \\
1.46
\end{array}
$$ 12 (9) ar (0)



## Finding the Molecular Formula

The empirical formula for adipic acid is $\mathrm{C}_{3} \mathrm{H}_{5} \mathrm{O}_{2}$. The molecular mass of adipic acid is 146 g hot. What is the indecular formula of adipic acid?
3. Multiply the empirical formula by this number to get the molecular formula.

$$
\left(C_{3} H_{5} \Theta_{2}\right) \times 2
$$

