

Personal Guided Inquiry:

Naming Chemical Compounds and Writing Formulas

As you work through the online videos, make notes of important ideas and practice what you are learning. These skills are some of the most important you will learn this semester.

You will use these naming and formula writing skills everyday in Chemistry.

These videos will be available all semester. You are always welcome to come back and review later, as you need it. The best part about these videos is that you can pause them, rewind, and listen again if you aren't sure about something you hear. If you want more practice, go back and try the videos again. Or use the practice examples here in this worksheet.

Always use your naming guide that we have colored together in class.

This will serve as a helpful tool all semester long!

Video 1: Introduction to Chemical Nomenclature

After watching this video, complete part 1 of CHECKPOINT 1.

Video 2: Naming Category 1 compounds

After watching this video, complete part 2 of CHECKPOINT 1, for all of the Category 1 compounds in the first section.

Video 3: Writing formulas for Category 1 compounds

After watching this video, complete part 2 of CHECKPOINT 1, for all of the Category 1 compounds in the second section.

Video 4: Naming Category 2 compounds

After watching this video, complete part 2 of CHECKPOINT 1, for all of the Category 2 compounds in the first section.

Video 5: Writing formulas for Category 2 compounds

After watching this video, complete part 2 of CHECKPOINT 1, for all of the Category 2 compounds in the second section.

Video 6: Naming Category 3 compounds

After watching this video, complete part 2 of CHECKPOINT 1, for all of the Category 3 compounds in the first section.

Video 7: Writing formulas for Category 3 compounds

After watching this video, complete part 2 of CHECKPOINT 1, for all of the Category 3 compounds in the second section. This should complete all of CHECKPOINT 1.

Video 8: Working with polyatomic ions

After watching this video, complete CHECKPOINT 2.

Video 9: Naming and writing formulas for acids

After watching this video, complete CHECKPOINT 3.

After watching all 9 videos, and working through CHECKPOINTS 1-3, complete CHECKPOINTS 4 and 5 to pull all of these new skills together. Feel free to work with other students and ask questions when you need help. Keys will be posted on Blackboard so that you can check your work.

CHECKPOINT 1: Naming and Formula Writing, part 1

Complete this CHECKPOINT in parts. **Part 1:** Name the category for each compound (formula or name) given in this CHECKPOINT. Write a 1, 2, 3 under the "Category" column. **Part 2:** As you learn how to write names and formulas for different categories, fill in the missing information under the "Name" or "Formula" column. **By the end of video 7,** you should have all of your answers for this CHECKPOINT.

	Compound formula	Category	Name
1.	KCl $K^+ Cl^-$	1	potassium chloride
2.	Cs ₂ S $Cs^+ S^{2-}$	1	cesium sulfide
3.	MgBr ₂	1	magnesium bromide
4.	CrN $Cr^{+3} N^{-3}$ <i>Cr $\times 3 = +3$ but N has a charge of -3 so</i>	2	chromium(III) nitride
5.	NiCl ₂ $Ni^{+2} Cl_2^{-1}$ <i>Ni $\times 2 = +2$ but Cl has a charge of -1 so</i>	2	nickel(II) chloride
6.	Au ₂ O $Au^{+1} O^{-2}$ <i>Au $\times 2 = +2$ but O has a charge of -2 so</i>	2	gold(I) oxide
7.	Mn ₃ P ₂ $Mn^{+2} P^{-3}$ <i>Mn $\times 3 = +6$ but P has a charge of -3 so</i>	2	manganese(II) phosphide
8.	ZrS ₂ $Zr^{+4} S_2^{-2}$ <i>Zr $\times 2 = +4$ but S has a charge of -2 so</i>	2	zirconium(IV) sulfide
9.	NO ₁ <i>mono-</i>	3	nitrogen monoxide
10.	C ₂ H ₈ <i>di- octa-</i>	3	dicarbon octahydride
11.	SCl ₄ <i>mono- tetra-</i>	3	sulfur tetrachloride
12.	ZnO	1*	zinc oxide
13.	CaF ₂	1	calcium fluoride
14.	FeBr ₂ $Fe^{+2} Br_2^{-1}$ <i>Fe $\times 2 = +2$ but Br has a charge of -1 so</i>	2	iron(II) bromide
15.	MnI ₄ $Mn^{+4} I_4^{-1}$ <i>Mn $\times 4 = +4$ but I has a charge of -1 so</i>	2	manganese(IV) iodide
16.	SiF ₃ <i>mono- tri-</i>	3	silicon trifluoride
17.	Cu ₂ S $Cu^{+1} S^{-2}$ <i>Cu $\times 2 = +2$ but S has a charge of -2 so</i>	2	copper(I) sulfide
18.	Ag ₃ P	2	silver phosphide

*Al⁺³
Zn⁺² Cd⁺²
Ag⁺¹*

***category 1 with a special condition to remember, like a transition element who always uses the same charge**

Compound name	Category	Formula
19. Barium oxide $Ba^{+2} O^{-2}$	1	BaO
20. Potassium iodide $K^{+1} I^{-1}$	1	KI
21. Sodium nitride $Na^{+1} N^{-3}$	1	Na_3N
22. Strontium phosphide $Sr^{+2} P^{-3}$	1	Sr_3P_2
23. Cadmium chloride $Cd^{+2} Cl^{-1}$	1	$CdCl_2$
24. Vanadium (V) fluoride $V^{+5} F^{-1}$	2	VF_5
25. Cobalt (III) nitride $Co^{+3} N^{-3}$	2	CoN
26. Copper (I) sulfide $Cu^{+1} S^{-2}$	2	Cu_2S
27. Manganese (II) oxide $Mn^{+2} O^{-2}$	2	MnO
28. <u>mono</u> Phosphorus <u>dibromide</u>	3	PBr_2
29. <u>Trin</u> itrogen <u>pentasulfide</u>	3	N_3S_5
30. <u>Mono</u> iodine <u>dichloride</u>	3	ICl_2
31. <u>Dihydrogen pentacarbide</u>	3	H_2C_5
32. Mercury (II) sulfide $Hg^{+2} S^{-2}$	2	HgS
33. Magnesium phosphide $Mg^{+2} P^{-3}$	1	Mg_3P_2
34. Iron (III) iodide $Fe^{+3} I^{-1}$	2	FeI_3
35. <u>Cuprous</u> chloride $Cu^{+1} Cl^{-1}$	2	$CuCl$
36. <u>Triselenium tetroxide</u>	3	Se_3O_4
37. Chromium (III) sulfide $Cr^{+3} S^{-2}$	2	Cr_2S_3
38. Rubidium fluoride $Rb^{+1} F^{-1}$	1	RbF
39. Nickel (II) chloride $Ni^{+2} Cl^{-1}$	2	$NiCl_2$

while normally not used, mono- can be used as the first element to indicate 1 atom

this "-ous" is an old method but has been replaced by Roman numerals. "cuprous" refers to copper(I)

CHECKPOINT 2: Using Polyatomic Ions (PAIs)

Part 1: In the following chart, circle all the polyatomic ions. Then, write the name of each polyatomic ion you circled. If a box contains no PAIs, write a note to the side explaining why it is not a polyatomic ion.

CO ₂	OH ⁻¹ hydroxide	Cl ₂	ClO ₃ ⁻¹ chlorate	CO ₃ ⁻² carbonate
CN ⁻¹ cyanide	SO ₄	H ₂ SO ₄ sulfate	HSO ₄ ⁻¹ bisulfate (hydrogen sulfate)	Fe(OH) ₃ hydroxide
C ₂ H ₃ O ₂ ⁻¹ acetate	NH ₄ ⁺¹ ammonium	NO ₃ ⁻¹ nitrate	PO ₄ ⁻³ phosphate	NH ₄ Cl ammonium

Part 2: Name the category for each compound given in this CHECKPOINT. Write a 1, 2, 3 under the "Category" column. Then, fill in the missing piece of information in the "Name or Formula" column.

Compound	Category	Name or Formula
1. KOH hydroxide	1	potassium hydroxide
2. Iron (III) phosphate PO ₄ ⁻³	2	FePO ₄
3. Zinc chlorate Zn ⁺² (ClO ₃) ⁻¹	1*	Zn(ClO ₃) ₂
4. MgCO ₃ carbonate	1	magnesium carbonate
5. Cu(NO ₃) ₂ nitrate	2	copper (II) nitrate
6. CO ₃ (not carbonate! CO ₃ ⁻²)	3	carbon trioxide
7. Aluminum acetate Al ⁺³ (C ₂ H ₃ O ₂) ⁻¹	1*	Al(C ₂ H ₃ O ₂) ₃
8. Chromium (III) sulfate Cr ⁺³ (SO ₄) ⁻²	2	Cr ₂ (SO ₄) ₃
9. Calcium hydroxide Ca ⁺² (OH) ⁻¹	1	Ca(OH) ₂
10. Na ₂ SO ₄ sulfate	1	sodium sulfate
11. (NH ₄) ₂ CO ₃ ammonium carbonate	1*	ammonium carbonate
12. Ammonium hydroxide NH ₄ ⁺¹ OH ⁻¹	1*	NH ₄ OH

ATCH CUT!
DOES LIKE
BROMATE
NT NO CHARGE
EANS ITS NOT
A PAI!

NH₄OH!
POLY ATOMIC
IONS?
since NH₄⁺ is
positively charged,
this is possible.
Be careful with
parentheses!

MR. EDWARDS SAYS
"PROTECT
THE
BABIES!"

CHECKPOINT 3: Naming and Writing Formulas for Acids

Complete this CHECKPOINT in parts. **Part 1:** Read through the given list of compounds in this CHECKPOINT and circle anything that is NOT an acid. Write "Not an acid" in the "Name or Formula" column. **Part 2:** Fill in the missing information under the "Name or Formula" column.

Compound	Name or Formula
1. <u>H</u> ClO ₃ <small>chlorate → chloric</small>	chloric acid
2. <u>H</u> ₂ CO ₃ <small>carbonate → carbonic</small>	carbonic acid
3. <u>H</u> NO ₃ <small>nitrate → nitric</small>	nitric acid
4. <u>H</u> Br <small>bromide → hydrobromic</small>	hydrobromic acid
5. <u>NH</u> ₄ C ₂ H ₃ O ₂	* NOT AN ACID * (ammonium acetate)
6. Sulfuric acid <small>sulfuric → sulfate</small>	<u>H</u> ₂ SO ₄
7. Phosphoric acid <small>phosphoric → phosphate</small>	<u>H</u> ₃ PO ₄
8. Sulfur hexafluoride	* NOT AN ACID * (SF ₆)
9. Acetic acid <small>acetic → acetate</small>	<u>H</u> C ₂ H ₃ O ₂
10. Hydrochloric acid <small>hydrochloric → chloride</small>	<u>H</u> Cl
11. <u>H</u> BrO ₃ <small>bromate → bromic</small>	bromic acid
12. Hydrocyanic acid <small>hydrocyanic → cyanide</small>	<u>H</u> CN
13. <u>H</u> ₃ P <small>phosphide → hydrophosphoric</small>	hydrophosphoric acid
14. <u>H</u> MnO ₄ <small>permanganate → permanganic</small>	permanganic acid
15. Hydroiodic acid <small>hydroiodic → iodide</small>	<u>H</u> I

No H at the front so it's not an acid

No H at the front so it's not an acid

CHECKPOINT 4: Naming and Formula Writing, part 2

This CHECKPOINT mixes up all 3 categories of compounds, as well as Complete this CHECKPOINT in parts. **Part 1:** Read through the given list of compounds in this CHECKPOINT and circle all of the polyatomic ions (names or formulas) you recognize. Use your polyatomic ion list for help. **Part 2:** Read through the compounds and draw a box around all of the acids. Write "acid" for each of these in the "Category" column. **Part 3:** For each compound, write which category (1, 2, or 3) it fits into, and fill in the missing information under the "Name or Formula" column. By the end of video 9, you should have all of your answers for this CHECKPOINT.

Compound	Category	Name or Formula
1. Ammonium chloride NH_4^+ Cl^-	1*	NH_4Cl
2. SiO_2 mono- di-	3	silicon dioxide
3. Cadmium sulfate Cd^{+2} SO_4^{2-}	1*	CdSO_4
4. Cobalt (III) phosphide Co^{+3} P^{3-}	2	Co_2P_3
5. ZnNO_3 nitrate	1*	zinc nitrate
6. HBrO_4 bromate → bromic <small>acid</small>	ACID	bromic acid
7. SeF_6 mono- hexa-	3	selenium hexafluoride
8. Cr_2O_3 Cr^{+3} O^{2-}	2	chromium (III) oxide
9. Barium hydroxide Ba^{+2} $(\text{OH})_2$	1	$\text{Ba}(\text{OH})_2$
10. Chloric acid H^+ ClO_3^- chloric → chlorate <small>acid</small>	ACID	HClO_3
11. Copper (II) bromide Cu^{+2} Br^-	2	CuBr_2
12. SrF_2	1	strontium fluoride
13. Silver carbonate Ag^+ CO_3^{2-}	1*	Ag_2CO_3
14. Carbonic acid H^+ CO_3^{2-} carbonic → carbonate <small>acid</small>	ACID	H_2CO_3
15. H_2CO_3 carbonate → carbonic <small>acid</small>	ACID	carbonic acid
16. Nickel (II) nitrate Ni^{+2} $(\text{NO}_3)_2$	2	$\text{Ni}(\text{NO}_3)_2$
17. $\text{HC}_2\text{H}_3\text{O}_2$ acetate → acetic <small>acid</small>	ACID	acetic acid
18. F_3Br_5 tri- penta-	3	trifluorine pentabromide
19. Ammonium phosphate $(\text{NH}_4)^+$ PO_4^{3-}	1*	$(\text{NH}_4)_3\text{PO}_4$

CHECKPOINT 5: Putting it all together!

When atoms and ions form compounds, they form bonds made of energy that hold them together. Depending on the type of atoms, special types of bonds will form. Two of these types of bonds are ionic bonds and covalent bonds.

Ionic bonds form between metals and nonmetals. These bonds form when atoms or ions exchange electrons from one to another. Polyatomic ions also form ionic bonds.

(Category 1 and 2 compounds)

Covalent bonds form between nonmetals and other nonmetals. These bonds form when atoms share electrons without actually giving them away.

(Category 3 compounds)

Acids form ionic bonds, but behave in a very special way. So, we will say that acids form "**acidic**" bonds.

Categorize each of the compounds below according to the type of bonds they contain. For each, write ionic, covalent, or acidic.

1. ^{mono}Sulfur ^{dio}dioxide $S + O_2 \rightarrow NM-NM$ COVALENT BONDING → CAT. 3 SO_2
2. Manganese (IV) fluoride $Mn^{+4} + F_2 \rightarrow M-NM$ IONIC BONDING → CAT. 2 MnF_4
3. Li_3PO_4 phosphate $Li + PO_4^{-3} \rightarrow M-PAI$ IONIC BONDING → CAT. 1 lithium phosphate
4. Zinc chlorate $Zn + ClO_3^{-1} \rightarrow M-PAI$ IONIC BONDING → CAT. 1 $Zn(ClO_3)_2$
5. ^{ACID!} HNO_3 nitrate → nitric $H + NO_3^{-1} \rightarrow H-PAI$ "ACIDIC" BONDING → ACIDS nitric acid
6. PF_3 phosphorus trifluoride $P + F_3 \rightarrow NM-NM$ COVALENT BONDING → CAT. 3
7. $Ca(OH)_2$ calcium hydroxide $Ca + OH^{-1} \rightarrow M-PAI$ IONIC BONDING → CAT. 1
8. Aluminum nitrate $Al + NO_3^{-1} \rightarrow M-PAI$ IONIC BONDING → CAT. 1 $Al(NO_3)_3$
9. Ba_3N_2 barium nitride $Ba + N \rightarrow M-NM$ IONIC BONDING → CAT. 1
10. ^{ACID!} H_2SO_4 sulfate → sulfuric $H + SO_4^{-2} \rightarrow H-PAI$ "ACIDIC" BONDING → ACIDS sulfuric acid
11. Carbon tetrahydride $C + H_4 \rightarrow NM-NM$ COVALENT BONDING → CAT. 3 CH_4