

Name: _____

Period: _____

Seat#: _____

Give the name of the following ionic compounds:

Name

- 1) Na_2CO_3 _____
- 2) NaOH _____
- 3) MgBr_2 _____
- 4) KCl _____
- 5) FeCl_2 _____
- 6) FeCl_3 _____
- 7) Zn(OH)_2 _____
- 8) BeSO_4 _____
- 9) CrF_2 _____
- 10) Al_2S_3 _____
- 11) PbO _____
- 12) Li_3PO_4 _____
- 13) TiI_4 _____
- 14) Co_3N_2 _____
- 15) Mg_3P_2 _____
- 16) $\text{Ga(NO}_2)_3$ _____
- 17) Ag_2SO_3 _____
- 18) NH_4OH _____
- 19) Al(CN)_3 _____
- 20) $\text{Be(CH}_3\text{COO)}_2$ _____

For the following compounds, give the formulas:

Formula

- 22) sodium phosphide _____
- 23) magnesium nitrate _____
- 24) lead (II) sulfite _____
- 25) calcium phosphate _____
- 26) ammonium sulfate _____
- 27) silver cyanide _____
- 28) aluminum sulfide _____
- 29) beryllium chloride _____
- 30) copper (I) arsenide _____
- 31) iron (III) oxide _____
- 32) gallium nitride _____
- 33) iron (II) bromide _____
- 34) vanadium (V) phosphate _____
- 35) calcium oxide _____
- 36) magnesium acetate _____
- 37) aluminum sulfate _____
- 38) copper (I) carbonate _____
- 39) barium oxide _____
- 40) ammonium sulfite _____
- 41) silver bromide _____
- 42) lead (IV) nitrite _____

Compound Names and Formulas

For the list on the left, name the compound. For the list on the right, give the chemical formula that corresponds to the name

Name		Formula	
1)	NaF	13)	potassium fluoride
2)	K ₂ CO ₃	14)	ammonium sulfate
3)	MgCl ₂	15)	magnesium iodide
4)	Be(OH) ₂	16)	Cupric sulfite
5)	SrS	17)	aluminum phosphate
6)	Cu ₂ S	18)	Plumbous nitrite
7)	ZnI ₂	19)	cobalt (II) selenide
8)	Ca ₃ (PO ₄) ₂	20)	silver cyanide
9)	NH ₄ I	21)	Cupric bicarbonate
10)	Mn(NO ₃) ₃	22)	Ferrous oxide
11)	FePO ₄	23)	lithium cyanide
12)	CoCO ₃	24)	lead (IV) sulfite

Name the compounds below and say if they are covalent or ionic.

Formula	Name	Bond Type
1. $(\text{NH}_4)_2\text{O}$	_____	_____
2. N_2O_2	_____	_____
3. SO_2	_____	_____
4. $\text{Mg}_3(\text{PO}_3)_2$	_____	_____
5. P_4O_{10}	_____	_____
6. _____	Phosphorus pentachloride	_____
7. _____	dioxygen difluoride	_____
8. _____	strontium borate	_____
9. _____	sulfur trioxide	_____
10. _____	sodium sulfate	_____

Naming Chemical Compounds

Ionic and Covalent Bonds

The following are a good mix of naming and formula writing problems to help you get some practice. I will expect that you know how to name both ionic and covalent compounds in your work. Remember that transition elements must have the Roman Numeral in the "NAME" to describe which charge it has

Name the following chemical compounds:

- 1) NaBr _____
- 2) $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$ _____
- 3) P_2O_5 _____
- 4) $\text{Ti}(\text{SO}_4)_2$ _____
- 5) FePO_4 _____
- 6) K_3N _____
- 7) SO_2 _____
- 8) CuOH _____
- 9) $\text{Zn}(\text{NO}_2)_2$ _____
- 10) V_2S_3 _____

Write the formulas for the following chemical compounds:

- 11) Silicon dioxide _____
- 12) Nickel (III) sulfide _____
- 13) Manganese (II) phosphate _____
- 14) Silver acetate _____
- 15) Diboron tetrabromide _____
- 16) Magnesium sulfate heptahydrate _____
- 17) Potassium carbonate _____
- 18) Ammonium oxide _____
- 19) Tin (IV) selenide _____
- 20) Carbon tetrachloride _____

Ionic Compounds Chemical Formulas Worksheet

→ For #1-12, write the correct name of the ionic compound for the chemical formula given.

- | | | |
|-----------------------------|--------------------------------|----------------------------------|
| 1. HI | 5. $\text{Pb}(\text{NO}_3)_2$ | 9. $\text{Sn}(\text{ClO}_3)_2$ |
| 2. $\text{Sr}(\text{OH})_2$ | 6. $\text{Al}(\text{MnO}_4)_3$ | 10. Hg_2S |
| 3. AgNO_3 | 7. NiO | 11. $\text{Cr}_2(\text{SO}_3)_3$ |
| 4. CuI_2 | 8. HgS | 12. $\text{Fe}(\text{SCN})_2$ |

→ For #13-24, write the correct chemical formula for the name of the ionic compound given.

- | | | |
|-----------------------|----------------------------|----------------------------|
| 13. Iron (II) Hydride | 17. Strontium Permanganate | 21. Magnesium Fluoride |
| 14. Calcium Acetate | 18. Potassium Phosphate | 22. Copper (III) Hydroxide |
| 15. Zinc Chlorate | 19. Barium Peroxide | 23. Calcium Nitrate |
| 16. Iron (II) Bromide | 20. Aluminum Carbonate | 24. Copper (I) Sulfate |

→ For #25-30, write the names of each ionic compound, the names and how many atoms of each element in each of the compounds. See example for help.

EXAMPLE: BaCl_2

Name of compound: barium chloride

Elements + # of atoms of each element: Barium (1 atom), chlorine (2 atoms)

- | | |
|---|--|
| 25. NaBr | Name of compound: |
| | Elements + # of atoms of each element: |
| 26. Ag_2CrO_4 | Name of compound: |
| | Elements + # of atoms of each element: |
| 27. CdCr_2O_7 | Name of compound: |
| | Elements + # of atoms of each element: |
| 28. $\text{Pb}_3(\text{PO}_4)_2$ | Name of compound: |
| | Elements + # of atoms of each element: |
| 29. $\text{Mn}(\text{C}_2\text{H}_3\text{O}_2)_2$ | Name of compound: |
| | Elements + # of atoms of each element: |
| 30. $\text{Fe}_2(\text{SO}_4)_3$ | Name of compound: |
| | Elements + # of atoms of each element: |

6-Naming Practice

Fill in the name or formula for the following **COVALENTLY** bonded **MOLECULES**:

Name	Formula
Sulfur trioxide	
	S_2Cl_2
	CSe_2
	CF_5

Name	Formula
	ICl_3
Phosphorous trichloride	
	N_2O_3
	As_2O_5

Fill in the name or formula for the following **IONICALLY** bonded **COMPOUNDS**:

Name	Formula
Lead (II) Chloride	
	$NaCl$
Tin (IV) Bromate	

Name	Formula
Calcium Chloride	
Iron (III) Oxide	
	Cr_2O_3

Identify as **Ionic** or **Covalent (Molecular)** and fill in the name or formula:

Ionic or Covalent (Molecular)	Name	Formula
	aluminum hydroxide	
	aluminum sulfate	
	ammonium nitrate	
	ammonium sulfate	
		P_4O_{10}
		BF_3^*
	bismuth trichloride	
		BrF_5
	calcium acetate	
	calcium perchlorate	
	carbon dioxide	
	carbon monoxide	

* In this compound try considering Boron to be a metal ion. Consider how many electrons it would typically lose to match the electron configuration of [He] to determine its charge. In fact, although we have drawn BF_3 as an example of a molecular compound with trigonal planar geometry, experiments have shown the bonding to be primarily ionic. Remember that although we describe non-metal/non-metal bonds as covalent, and metal/non-metal bonds as ionic, that many exceptions exist, and that no bond has solely ionic or covalent character.

COMPOUND WORKSHEET

Write chemical formula as requested. Show subscript numbers where needed.

- | | |
|---------------------------------|------------------------------------|
| 1. hydrochloric acid _____ | 2. sodium chloride _____ |
| 3. uranium hexafluoride _____ | 4. strontium nitrate _____ |
| 5. calcium chloride _____ | 6. acetic acid _____ |
| 7. phosphoric acid _____ | 8. ammonia _____ |
| 9. chlorine _____ | 10. lithium sulfate _____ |
| 11. potassium chromate _____ | 12. calcium hydroxide _____ |
| 13. aluminum foil _____ | 14. ammonium sulfate _____ |
| 15. sulfuric acid _____ | 16. ammonium iodide _____ |
| 17. acetylene _____ | 18. rubidium nitrite _____ |
| 19. lead (II) sulfite _____ | 20. copper (I) sulfide _____ |
| 21. aluminum oxide _____ | 22. magnesium bromide _____ |
| 23. sodium chlorate _____ | 24. iron (II) chloride _____ |
| 25. hydrogen gas _____ | 26. silver chromate _____ |
| 27. zinc bicarbonate _____ | 28. barium oxide _____ |
| 29. aluminum nitrate _____ | 30. diphosphorus pentoxide _____ |
| 31. aluminum hydroxide _____ | 32. chromium (III) oxide _____ |
| 33. lithium phosphate _____ | 34. ice _____ |
| 35. nitrogen dioxide _____ | 36. iron (III) oxide _____ |
| 37. sodium peroxide _____ | 38. copper (II) oxide _____ |
| 39. liquid nitrogen _____ | 40. lead (II) acetate _____ |
| 41. lead (IV) fluoride _____ | 42. ferrous bromide _____ |
| 43. carbonic acid _____ | 44. silver bisulfite _____ |
| 45. Copper (II) hydroxide _____ | 46. nitric acid _____ |
| 47. mercury (II) bromide _____ | 48. Tin (IV) sulfide _____ |
| 49. hydrofluoric acid _____ | 50. potassium phosphate _____ |
| 51. iodine tribromide _____ | 52. phosphorus pentafluoride _____ |

Inorganic Nomenclature Worksheet

- | | | |
|------------------------------------|---|----------------------------------|
| 1. ammonium phosphide | 51. aluminum acetate | 101. sodium acetate |
| 2. sodium nitrate | 52. calcium chloride | 102. zinc sulfite |
| 3. cupric bromide | 53. barium chromate | 103. silver bicarbonate |
| 4. aluminum sulfate | 54. Cobalt(III) chloride | 104. potassium iodide |
| 5. potassium nitrate | 55. barium chloride | 105. Lead(IV) chlorite |
| 6. Iron(II) carbonate | 56. sulfurous acid | 106. Mercury(I) chromate |
| 7. Lead(II) phosphate | 57. potassium hydroxide | 107. Plumbous nitrite |
| 8. diphosphorus pentoxide | 58. zinc hydrogen sulfite | 108. potassium dichromate |
| 9. cupric hydroxide | 59. sodium sulfite | 109. magnesium carbonate |
| 10. calcium fluoride | 60. Cobalt(II) sulfate | 110. calcium bicarbonate |
| 11. nickel(III) sulfate | 61. ferric oxide | 111. aluminum hydroxide |
| 12. silver cyanide | 62. silver phosphate | 112. Cobalt(II) oxide |
| 13. ammonium sulfite | 63. sodium hypochlorite | 113. ferric permanganate |
| 14. zinc sulfate | 64. ammonium chromate | 114. ammonium chromate |
| 15. tin(II) chloride | 65. barium carbonate | 115. nitrogen triiodide |
| 16. antimony(III) chloride | 66. calcium iodide | 116. sulfur trioxide |
| 17. silver sulfide | 67. cupric sulfate | 117. ammonium dichromate |
| 18. magnesium hydroxide | 68. cuprous chloride | 118. ferric bicarbonate |
| 19. ammonium carbonate | 69. ferric carbonate | 119. ammonium perchlorate |
| 20. nickel(III) acetate | 70. zinc phosphate | 120. Cobalt(III) acetate |
| 21. sodium chromate | 71. sodium nitrite | 121. Cobalt(II) hydroxide |
| 22. chromium(III) hydrogen sulfate | 72. silver oxide | 122. ferrous chromate |
| 23. potassium permanganate | 73. Nickel(II) bromide | 123. ferric bromide |
| 24. silver perchlorate | 74. magnesium oxide | 124. zinc sulfate |
| 25. potassium phosphate | 75. mercuric perchlorate | 125. boron phosphide |
| 26. nickel(III) iodide | 76. lithium hypochlorite | 126. ferric bicarbonate |
| 27. mercurous oxide | 77. oxygen difluoride | 127. cupric hydrogen sulfate |
| 28. Plumbous chlorite | 78. cobalt(II) hydrogen sulfate | 128. acetic acid (diff. from 79) |
| 29. hydrogen iodide | 79. acetic acid (see #128) | 129. barium hydrogen sulfite |
| 30. Iron (III) bicarbonate | 80. barium hypochlorite | 130. nitric acid |
| 31. magnesium nitrate | 81. ammonium hydroxide | 131. calcium sulfide |
| 32. iron(III) chromate | 82. cobalt(II) iodide | 132. copper(I) hydrogen sulfate |
| 33. Iron(II) chromate | 83. chromium(II) bicarbonate | 133. zinc permanganate |
| 34. copper(II) hydroxide | 84. sodium hydroxide | 134. ferric carbonate |
| 35. cuprous carbonate | 85. silver nitrate | 135. hydrobromic acid |
| 36. chromium(III) acetate | 86. mercury(II) nitrate | 136. hydrocyanic acid |
| 37. calcium chlorate | 87. hydrochloric acid | 137. hydrogen cyanide |
| 38. ammonium oxide | 88. aluminum hydrogen sulfite | 138. sulfuric acid |
| 39. aluminum perchlorate | 89. cobalt(III) hydrogen sulfate | 139. copper(I) sulfate |
| 40. zinc bicarbonate | 90. ferric hydrogen carbonate | 140. chromium(III) oxide |
| 41. Calcium phosphate | 91. phosphorus pentabromide | 141. aluminum oxide |
| 42. silver hypochlorite | 92. Nickel(II) chloride | 142. Cobalt(II) hydrogen sulfate |
| 43. ammonium phosphate | 93. ammonium aluminum sulfate | 143. barium carbonate |
| 44. ferrous chlorite | 94. iron(III) hydrogen carbonate | 144. mercuric chloride |
| 45. potassium sulfide | 95. mercury(I) hydrogen phosphate | 145. ferrous chromate |
| 46. tin(IV) bromide | 96. plumbic hydrogen carbonate | 146. cupric hydroxide |
| 47. lithium chromate | 97. mercuric hydrogen carbonate | 147. perchloric acid |
| 48. magnesium hydrogen sulfate | 98. mercurous hydrogen phosphate | 148. ferric phosphate |
| 49. Iron(II) phosphate | 99. copper(II) sulfate | 149. Plumbous oxide |
| 50. calcium sulfate | 100. chromium(III) dihydrogen phosphate | 150. Cobalt(III) chlorate |

If a formula can be named more than one correct way, then give all. For example, $\text{Fe}(\text{HCO}_3)_3$ can be named four different ways. They are iron(III) bicarbonate, iron(III) hydrogen carbonate, ferric bicarbonate, and ferric hydrogen carbonate. The second way would be best. (some will require prefixes)

- | | | | | | |
|--|--|---------------------------------------|------------------------------|--------------------------------|--|
| 151. HgF_2 | 191. KF | 231. N_2O_5 | 271. NaOH | 290. XeF_4 | 328. $\text{Be}(\text{ClO}_4)_2$ |
| 152. KCl | 192. CaSO_4 | 232. SnCrO_4 | 272. NI_3 | 291. $\text{Hg}(\text{OH})_2$ | 329. $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ |
| 153. KMnO_4 | 193. HCl | 233. Al_2O_3 | 273. ClF_3 | 292. CaH_2 | 330. $\text{Ba}(\text{BrO}_3)_2$ |
| 154. KClO_4 | 194. SbCl_3 | 234. CuCO_3 | 274. P_3N_5 | 293. As_4O_6 | 331. AuCl_3 |
| 155. ZnO | 195. As_4O_{10} | 235. ClO_2 | 275. UF_6 | 294. BN | 332. Al_2S_3 |
| 156. $\text{Ba}(\text{OH})_2$ | 196. NH_4Cl | 236. CuS | 276. NBr_3 | 295. CoS | 333. Na_2HPO_4 |
| 157. NH_4MnO_4 | 197. NH_4NO_3 | 237. MgI_2 | 277. Cl_2O_3 | 296. N_2O_4 | 334. $\text{Mg}_3(\text{PO}_4)_2$ |
| 158. CaCO_3 | 198. IF_5 | 238. CoCl_3 | 278. CsF | 297. H_3BO_3 | 335. CuSO_3 |
| 159. $\text{Ba}_3(\text{PO}_4)_2$ | 199. NaHCO_3 | 239. NaCN | 279. CO | 298. I_2O_5 | 336. $\text{KAl}(\text{C}_2\text{O}_4)_2$ |
| 160. Fe_2O_3 | 200. $\text{Ba}(\text{OH})_2$ | 240. Hg_3N_2 | 280. Cu_2S | 299. PbO | 337. $\text{Cr}_2(\text{SO}_3)_3$ |
| 161. CoF_3 | 201. FeCl_3 | 241. BrO_3 | 281. KHCO_3 | 300. NaBr | 338. HClO |
| 162. H_2CO_3 | 202. HF | 242. SiF_4 | 282. SbCl_5 | 301. Li_2CrO_4 | 339. HClO_2 |
| 163. K_2SO_4 | 203. PbSO_4 | 243. Sb_2O_5 | 283. CO_2 | 302. ICl | 340. HClO_3 |
| 164. NaHSO_4 | 204. KrF_2 | 244. LiH | 284. HgO | 303. SO_3 | 341. HClO_4 |
| 165. PF_5 | 205. NaCl | 245. SF_6 | 285. PCl_3 | 304. Hg_2O | 342. $\text{Mn}(\text{IO}_3)_2$ |
| 166. Ag_2O | 206. P_2O_5 | 246. SnI_4 | 286. PBr_5 | 305. NaH | 343. KBrO_3 |
| 167. $\text{Pb}(\text{ClO}_2)_2$ | 207. AlBr_3 | 247. KOH | 287. IF_7 | 306. OsO_4 | 344. $\text{Fe}(\text{ClO}_4)_3$ |
| 168. Cu_2CrO_4 | 208. $\text{Ba}(\text{NO}_3)_2$ | 248. K_2O | 288. Cl_2O | 307. XeF_2 | 345. $\text{Cr}(\text{OH})_3$ |
| 169. $\text{Ca}(\text{ClO}_4)_2$ | 209. BrF_5 | 249. H_2SO_4 | 289. CCl_4 | | 308. $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$ |
| 170. $\text{HC}_2\text{H}_3\text{O}_2$ | 210. P_4O_6 | 250. lithium oxide | | | 309. $\text{NaC}_2\text{H}_3\text{O}_2$ |
| 171. LiI | 211. FePO_4 | 251. xenon trioxide | | | 310. $\text{Al}(\text{OH})_3$ |
| 172. $\text{Al}_2(\text{SO}_4)_3$ | 212. Hg_2SO_4 | 252. gold(I) chloride | | | 311. Li_2HPO_4 |
| 173. HBr | 213. KH | 253. gold(I) cyanide | | | 312. $\text{Ca}(\text{NO}_3)_2$ |
| 174. $\text{Hg}_2(\text{ClO})_2$ | 214. $\text{Co}_2(\text{SO}_3)_3$ | 254. sodium oxide | | | 313. $\text{Ni}(\text{ClO}_4)_2$ |
| 175. CrCl_3 | 215. N_2O_3 | 255. potassium chlorate | | | 314. $\text{Mn}(\text{NO}_3)_2$ |
| 176. H_3PO_4 | 216. N_2O | 256. mercurous nitrite | | | 315. $\text{Au}(\text{H}_2\text{PO}_4)_3$ |
| 177. LiMnO_4 | 217. $\text{Fe}(\text{NO}_2)_3$ | 257. nickel(II) fluoride | | | 316. $\text{Al}(\text{C}_2\text{H}_3\text{O}_2)_3$ |
| 178. $\text{Fe}_2(\text{HPO}_4)_3$ | 218. $\text{Sn}_3(\text{PO}_4)_2$ | 258. potassium cyanide | | | 317. $\text{KAl}(\text{SO}_4)_2$ |
| 179. Na_2CO_3 | 219. H_2O_2 | 259. manganese dioxide | | | 318. $\text{Al}(\text{MnO}_4)_3$ |
| 180. $\text{Mg}(\text{HCO}_3)_2$ | 220. $\text{Be}(\text{OH})_2$ | 260. osmium tetrachloride | | | 319. $(\text{NH}_4)_3\text{PO}_4$ |
| 181. $\text{Sn}_3(\text{PO}_4)_4$ | 221. $\text{Sr}(\text{HCO}_3)_2$ | 261. rubidium carbonate | | | 320. CoSO_4 |
| 182. HNO_3 | 222. $\text{Sr}(\text{OH})_2$ | 262. trisulfur dinitride | | | 321. MgCl_2 |
| 183. ZnCl_2 | 223. P_4S_{10} | 263. nitrogen trichloride | | | 322. CuSO_4 |
| 184. NaH_2PO_4 | 224. Hg_2O_2 | 264. vanadium(V) oxide | | | 323. NaHS |
| 185. Hg_2Cl_2 | 225. $\text{Hg}_2(\text{OH})_2$ | 265. selenium tetrafluoride | | | 324. MgSO_4 |
| 186. $\text{Fe}(\text{NO}_2)_2$ | 226. NH_4F | 266. stannous hypochlorite | | | 325. NaH_2PO_4 |
| 187. CuNH_4PO_4 | 227. XeF_6 | 267. tellurium hexafluoride | | | 326. Na_2CrO_4 |
| 188. NaMgPO_4 | 228. $\text{K}_2\text{Cr}_2\text{O}_7$ | 268. lanthanum(III) phosphate | | | 327. $\text{Pb}(\text{CH}_3\text{COO})$ |
| 189. $\text{Sn}(\text{HCO}_3)_4$ | 229. NH_4OH | 269. sodium hydrogen sulfate | | | |
| 190. NaMnO_4 | 230. $(\text{NH}_4)_3\text{PO}_4$ | 270. chromium(III) hydrogen phosphate | | | |

Nomenclature Practice

Write correct formulas of the compounds formed when the positive ions in the vertical column combine with the negative ions listed across the top row. The first two are done for you.

	Nitrate NO_3^-	Sulfate SO_4^{2-}	carbonate	phosphate	hydroxide	chromate	Cyanide
Sodium	NaNO_3	Na_2SO_4					
Silver							
Ammonium							
Mercury (I)							
Zinc							
Calcium							
Magnesium							
Copper (I)							
Lead (IV)							
Aluminum							
Manganese (III)							
Cobalt (III)							
Copper (II)							
Iron (III)							
Lead (II)							
Potassium							
Barium							
Hydrogen							

	Carbonate CO_3^{2-}	Dichromate $\text{Cr}_2\text{O}_7^{2-}$	acetate	sulfide	chloride	sulfite
sodium	Na_2CO_3	$\text{Na}_2\text{Cr}_2\text{O}_7$				
silver						
ammonium						
Mercury (II)						
tin(II)						
calcium						
magnesium						
Copper (II)						
Lead (IV)						
aluminum						
manganese(III)						
cobalt(III)						
Copper (I)						
Iron (II)						
Lead (II)						
potassium						
barium						

Naming Ionic Compounds

Write the names for the following compounds.

1. LiOH _____
2. Na₂SO₄ _____
3. SbCl₃ _____
4. Al(OH)₃ _____
5. Sb(NO₃)₃ _____
6. Al₂(SO₄)₃ _____
7. HgO _____
8. Fe₂S₃ _____
9. Pb(NO₃)₂ _____
10. K₂SO₃ _____
11. ZnCl₂ _____
12. Ag₂S _____
13. NH₄CH₃COO _____
14. Al₂S₃ _____
15. NaOH _____
16. Fe₃(PO₄)₂ _____
17. AgNO₃ _____
18. MgSO₄ _____
19. Ni(ClO₃)₂ _____
20. CuCl _____
21. BaCO₃ _____
22. (NH₄)₂SO₄ _____
23. NaHCO₃ _____
24. Hg(NO₃)₂ _____
25. Na₂O _____

Write the formulas for the following compounds.

Remember—cross the charges to the subscripts.

Example: sodium sulfide is Na₂S because Na has a 1+ charge and S has a 2- charge.

26. Magnesium hydroxide _____
27. Sodium nitrate _____
28. Ammonium phosphate _____
29. Potassium chlorate _____
30. Zinc sulfate _____
31. Copper (II) sulfate _____
32. Calcium nitrate _____
33. Magnesium sulfite _____
34. Ammonium chloride _____
35. Iron (II) chloride _____
36. Chromium (III) chloride _____
37. Ammonium carbonate _____
38. Barium sulfate _____
39. Sodium carbonate _____
40. Potassium nitrate _____
41. Sodium peroxide _____

For each of the compounds below tell if it is a covalent or ionic bond. Write down the name or formula and draw the Lewis structure.

Name	Formula	Ionic/ Covalent	Lewis Structure
Sodium Chloride			
Carbon Tetrafluoride			
	MgCl ₂		
	K ₂ O		
Nitrogen trihydride			
	SF ₆		
Ammonium phosphate			
Calcium Phosphide			
	BH ₃		
Silicon Disulfide			
phosphorus trifluoride			
	H ₂ O		
	PCl ₃		
	CF ₄		
aluminum sulfate			

VSEPR Practice

Directions: For each of the following compounds answer the following items -

- [*] AXE formula
- [*] Electronic Geometry
- [*] Molecular Geometry
- [*] Bond Angle(s)
- [*] Draw the Lewis Structure below

[1] SeF_2

[2] CO_3^{2-}

[3] XeO_4

[4] ClF_5

[5] Br_3^-

[6] SO_3^{2-}

[7] CO_2

[8] KrF_4

[9] SF_4

[10] O_3

[11] CHCl_3

[12] NH_4^+

[13] SO_2

[14] IF_5

Answers Here

#1				
#2				
#3				
#4				
#5				
#6				
#7				
#8				
#9				
#10				
#11				
#12				
#13				
#14				

Lewis structure WS

[1] PBr_3

[2] N_2H_2

[3] CH_3OH

[4] NO_2^-

[5] C_2H_4

[6] Write the Lewis dot structure for each of these molecules. Some are easy, some are not. A few violate the octet rule. (ODD letters, A = 1, C = 3, E = 5...)

a. CF_4

b. HF

c. NBr_3

d. C_2H_2

e. CO

f. H_2S

g. CH_3Br

h. AsH_3

i. OF_2

j. N_2

k. CS_2

l. BF_3

m. H_2O_2

n. F_3NO

o. H_2CO

p. CH_3OH

q. BrF_5

r. SF_6

s. HCN

t. HNC

[7] Write the Lewis dot structure for each of these ions.

a. ammonium ion

b. hypochlorite ion

c. hydronium ion

d. hydroxide ion

e. nitride ion (N^{3-})

f. cyanide ion

g. cyanate ion, OCN^- (C = central atom)

h. peroxide ion

i. GaBr_4^-

j. $\text{P}_2\text{H}_6^{2+}$

[8] Compounds with the same formula, but different structures, are called isomers. For each formula below, draw the Lewis dot structure of each isomer obeying the octet rule (if you know how to, go ahead, if not, only write one Lewis structure).

a. $\text{C}_2\text{H}_6\text{O}$

b. $\text{C}_2\text{H}_4\text{O}$

c. C_4H_{10}

d. C_3H_6

e. C_3H_4

QUICK CHECK • 4

Using VSEPR Theory, name and sketch the shape of the following molecules.

1. N_2	7. HF
2. H_2O	8. CH_3OH
3. CO_2	9. H_2S
4. NH_3	10. I_2
5. CH_4	11. CHCl_3
6. SO_3	12. O_2

Determine whether the following molecules are polar or nonpolar.

1. N_2	7. HF
2. H_2O	8. CH_3OH
3. CO_2	9. H_2S
4. NH_3	10. I_2
5. CH_4	11. CHCl_3
6. SO_3	12. O_2

LEWIS STRUCTURES & SHAPES

PCl_5 SN = ____ Electron Shape _____ Molecular Shape _____	XeF_4 SN = ____ Electron Shape _____ Molecular Shape _____	SO_3 SN = ____ Electron Shape _____ Molecular Shape _____
XeF_2 SN = ____ Electron Shape _____ Molecular Shape _____	AlH_3 SN = ____ Electron Shape _____ Molecular Shape _____	GeF_2 SN = ____ Electron Shape _____ Molecular Shape _____
SiH_4 SN = ____ Electron Shape _____ Molecular Shape _____	SF_6 SN = ____ Electron Shape _____ Molecular Shape _____	NO_2 SN = ____ Electron Shape _____ Molecular Shape _____

SN	Bond Angle(s)	Electron Shape	Orbital Hybridization
2			
3			
4			
5			
6			

The BARE ESSENTIALS of POLARITY

by David R. Dudley

You don't have to go to the ends of the earth to find POLAR MOLECULES. They're all over the place. A polar molecule is just a molecule with a difference in electrical charge between two ends.

partial positive charge

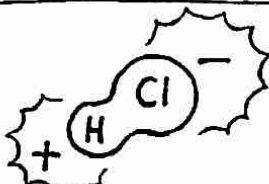
+



"Dipole vector" pointing toward negative charge.

- partial negative charge

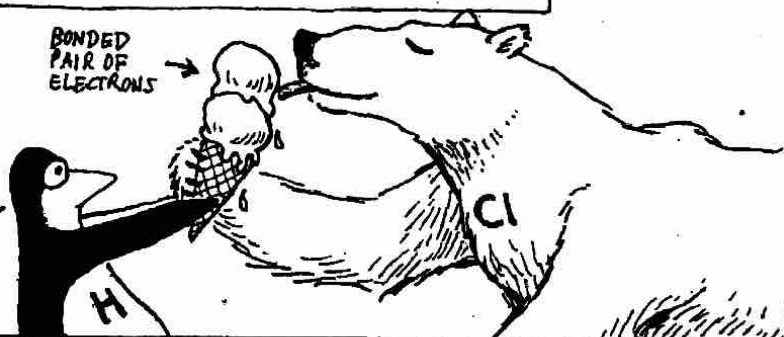
The electrical imbalance of POLARITY is caused by differences in ELECTRONEGATIVITY between atoms. Electronegativity is the ability of an atom/nucleus to attract bonding electrons toward itself.



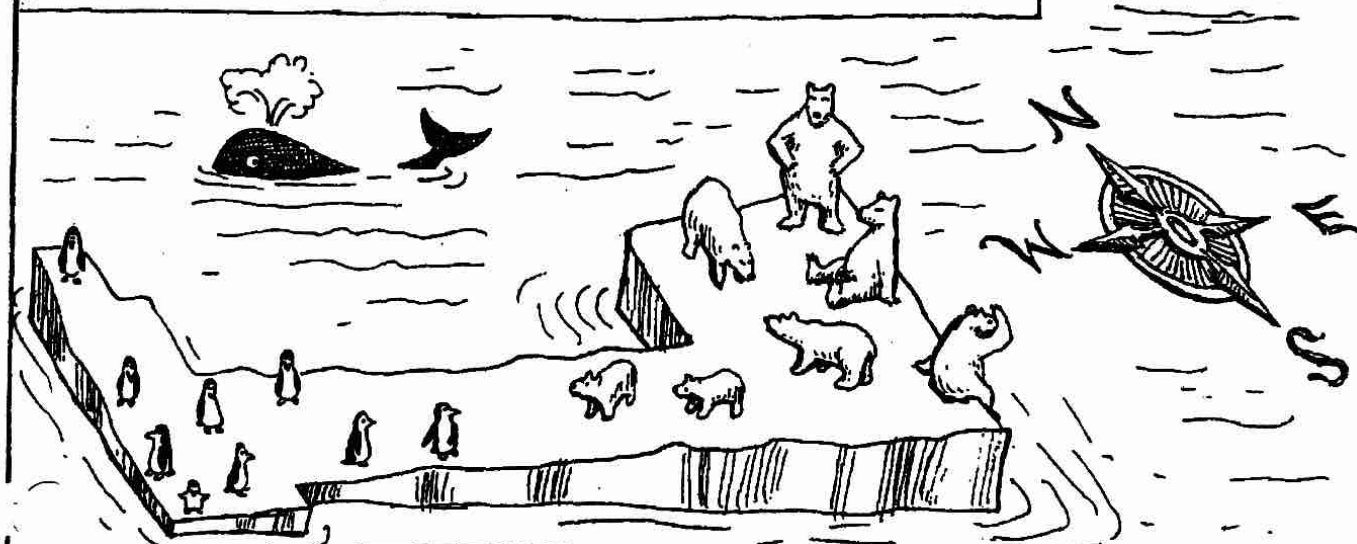
In HCl, the bonded pair of electrons spends more time near the chlorine's nucleus because chlorine is more electronegative than hydrogen.

HEY!

BONDED PAIR OF ELECTRONS



The periodic table shows a general trend in the electronegativity of the elements. Electronegativity tends to rise as you move "northeast" on the periodic table, and fall as you move "southwest."



Note: The noble gasses, in the periodic table's far right column, are often assigned an electronegativity value of zero because they are relatively nonreactive.

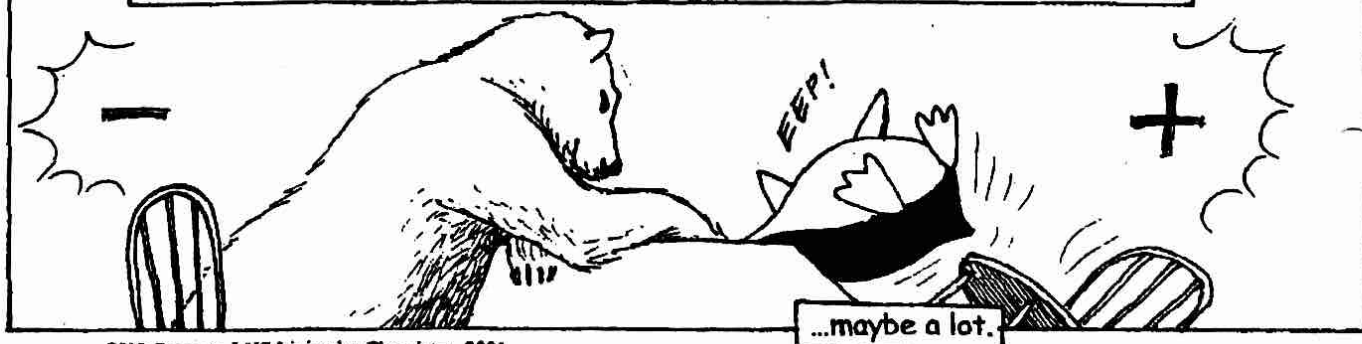
When two atoms with unequal electronegativity values bond, they do not share the bonding electrons evenly. The bonding electrons spend more time around the more electronegative atom, creating a **PARTIAL NEGATIVE CHARGE** on that atom. The other atom then has a **PARTIAL POSITIVE CHARGE**, and the bond is polar.



So the polarity of a bond is a function of the difference between the electronegativity values of two bonding atoms. Bonded atoms with equal electron-attracting strength will have nonpolar bonds.

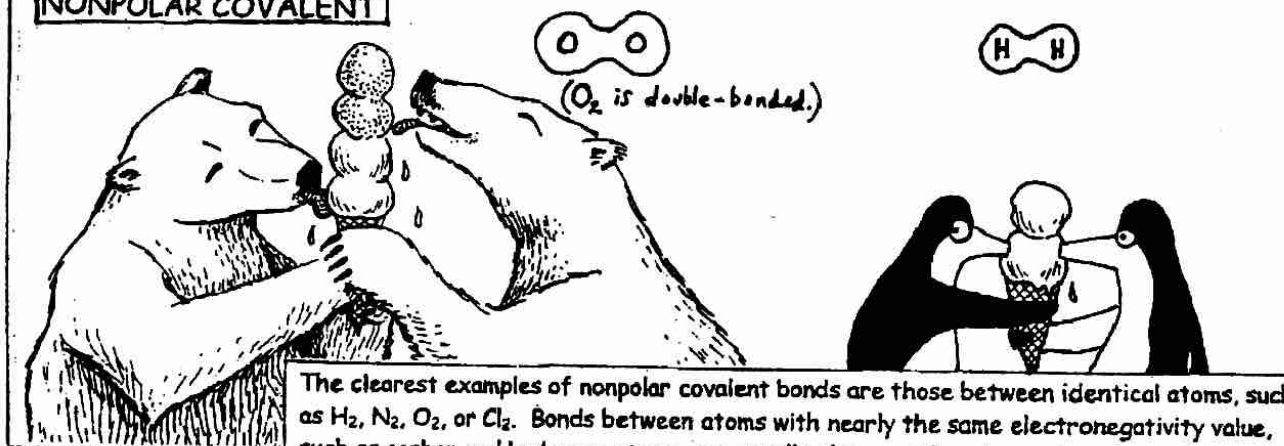


However, if the electronegativity of two bonded atoms is unequal, then their bond will be polarized—maybe a little...



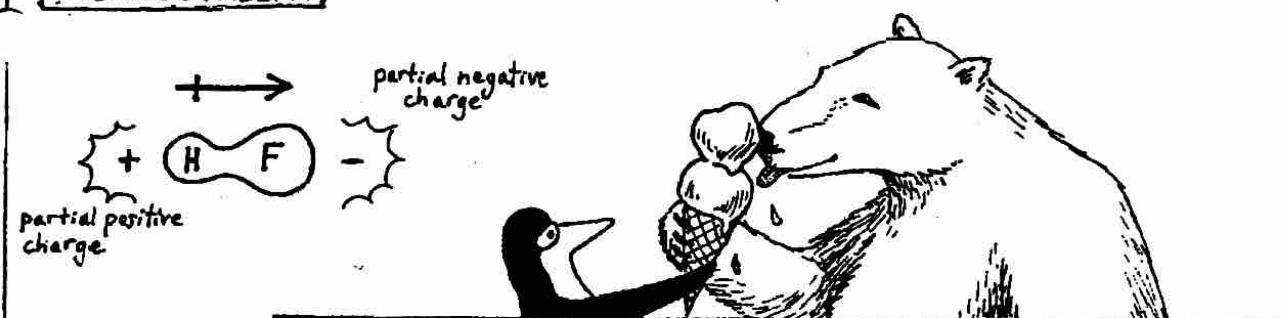
Because the elements have such varying electronegativities and can come together in so many different combinations, there is really a **CONTINUUM OF POLARITY IN BONDING**. For convenience, we can break the continuum down into three categories: (1) nonpolar covalent, (2) polar covalent, and (3) ionic.

NONPOLAR COVALENT



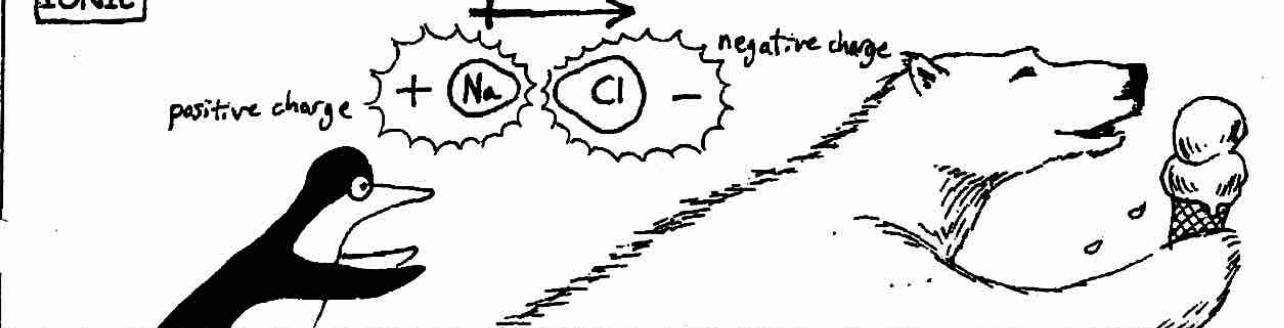
The clearest examples of nonpolar covalent bonds are those between identical atoms, such as H_2 , N_2 , O_2 , or Cl_2 . Bonds between atoms with nearly the same electronegativity value, such as carbon and hydrogen atoms, are usually also considered nonpolar. Remember, this is really a continuum, and conventional distinctions are somewhat artificial.

POLAR COVALENT



In a polar covalent bond, two atoms still share bonded pairs of electrons, but those electrons are decidedly more attracted to one atom than the other. Examples include bonds between carbon and oxygen atoms, or between hydrogen and fluorine atoms.

IONIC



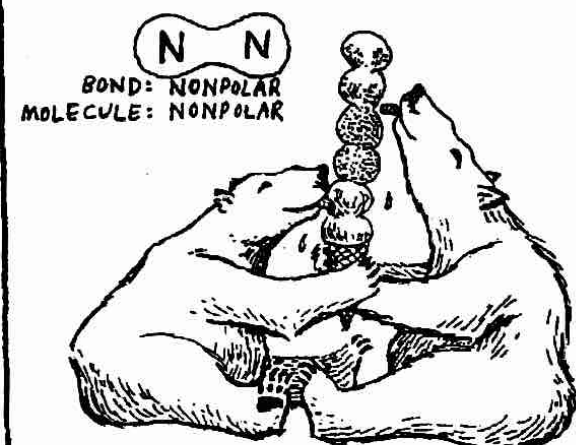
At the extreme of difference in electronegativity, polar covalence shades into the winner-take-all situation of ionic bonding. The more electronegative atom seizes all the bonding electrons and becomes a negative ion, while the other atom becomes a positive ion. The opposite charges on the ions attract each other.

Polar bonds between atoms constitute **DIPOLES**. Actually, the word "dipole" can refer to several different things that are relevant here: (1) the polarity of an individual polar bond between atoms, (2) the net polarity of a polar molecule that may have several polar covalent bonds within it, and (3) the polar molecule itself.

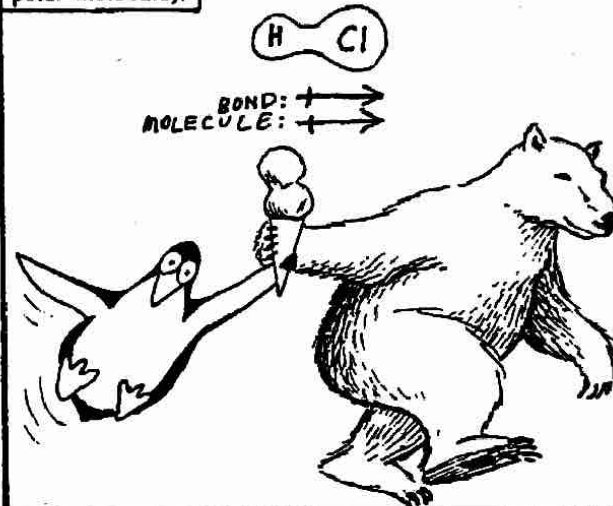


Confusing? Let's look at some examples:

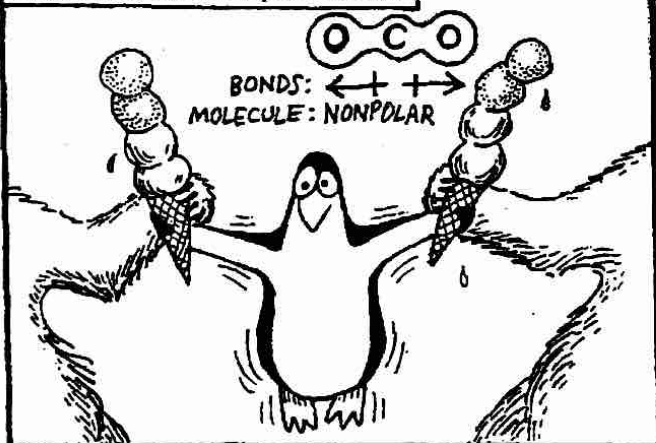
An N_2 molecule *isn't* a dipole (it's not a polar molecule), and it doesn't have any dipoles (polar bonds) within it.



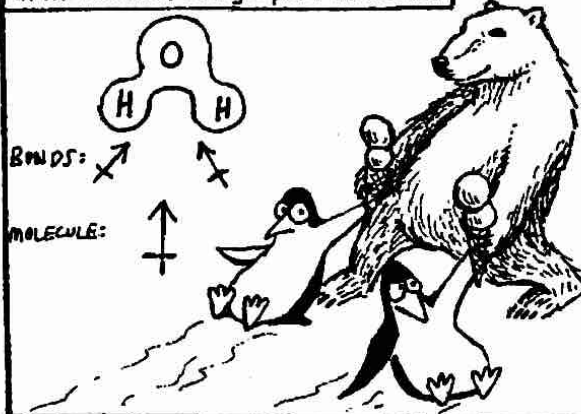
HCl has a dipole (a polar bond) and it *is* a dipole (a polar molecule).



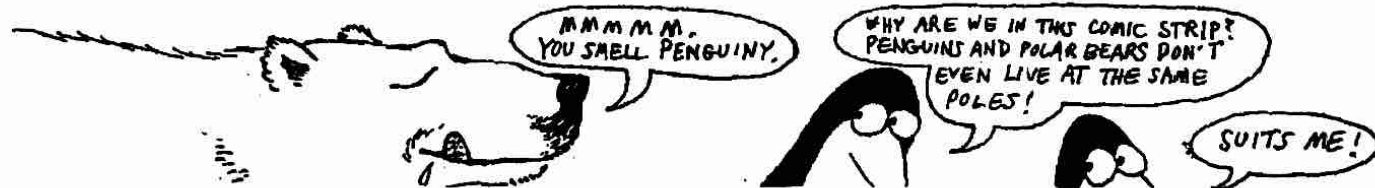
On the other hand, CO_2 has two dipoles (two polar bonds), but the CO_2 molecule itself *is not* a dipole because its polar bonds cancel each other out and make the molecule nonpolar overall.



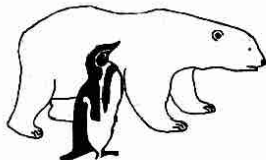
Like CO_2 , H_2O has two dipoles (two polar bonds). But because of H_2O 's bent shape (caused by lone pairs of electrons on the oxygen atom), H_2O also has a dipole in the sense of an overall polarity. So H_2O *is* a dipole in the sense of being a polar molecule.



The polarity of molecules can affect many of their other properties, such as their solubility, their boiling and melting points, and their odor.



Polar Bears and Penguins



Name: _____

Period: ____ Date: _____

Purpose: In this lesson you will be exploring polarity and bonding between atoms in greater detail. A comic book will provide new information about these topics and will introduce you to the concept of electronegativity, which helps us to understand partial charges.

Use the comic book called “The Bare Essentials of Polarity” to answer the following questions.

1. How does the comic book define a “polar molecule?”
2. Define electronegativity as you understand it, after reading the first two pages of the comic book.
3. Interpret the picture at the bottom of page 1. Explain how the iceberg, penguins, and polar bears represent trends in electronegativity.
4. What is the artist trying to represent when there are two polar bears arm wrestling together, or two penguins arm wrestling together?
5. What three types of bonds are represented on page 3 of the comic book? What happens to the bonding electrons in each type of bond?

6. Explain why there are four scoops of ice cream in the illustration of O_2 on page 3.
7. What do the six scoops of ice cream represent in the illustration of N_2 on page 4?
8. Describe what you think is happening to the penguin in the CO_2 molecule in the picture on page 4.
9. Name three things that the picture of CO_2 on page 4 illustrates about the molecule.
10. Describe what you think is happening to the penguins in the illustration of H_2O on page 4.
11. Explain what you think the crossed arrow represents in the comic book. 
12. What are the two definitions of “dipole” given in the comic book?

Making Sense

What does electronegativity have to do with polarity?

If you finish early...

Using polar bears and penguins, create an illustration showing a hydrogen sulfide molecule, H_2S . (Hint: You may wish to start with a Lewis dot structure.)

Sniffing It Out...



Name: _____

Period: _____ Date: _____

Part I – Review of Polarity: Use the comic strip called “The Bare Essentials of Polarity” to answer the following questions.

1. On page 1, the polar bear is licking the ice cream cone but the penguin can't reach it. Explain how this represents the bond in HCl. Be specific about what the scoops of ice cream represent and where they are positioned between the bear and the penguin.
2. Explain how the picture at the bottom of page 1 with the iceberg, penguins, and polar bears, represents trends in electronegativity.
3. Use the pictures on page 3 to explain the differences between a nonpolar covalent, polar covalent, and ionic bond.
4. Use the pictures on page 4 to explain why N_2 and CO_2 are nonpolar, while HCl and H_2O are polar.
5. Pick your favorite scene in the comic strip. Explain how it relates to polarity and why it appeals to you.