
Part A: Naming ionic compounds that contain polyatomic ions

Table 1:

Formula	Name
NaBrO ₄	sodium perbromate
Na ₂ SO ₄	sodium sulfate
Na ₃ PO ₄	sodium phosphate

1. Explain why the different compounds in Table 1 above have different numbers of Na atoms in their formulas. Your answer should discuss the charges on the various polyatomic ions in the three compounds.

Table 2:

Formula	Name
MgCrO ₄	
Al(C ₂ H ₃ O ₂) ₃	
K ₂ CO ₃	
Ca ₃ (BO ₃) ₂	
(NH ₄) ₂ S ₂ O ₃	

2. Looking at Table 2 above, explain when we use parenthesis in writing the formulas for ionic compounds.
3. Explain why the formula for Ca₃(BO₃)₂ makes sense.
4. Complete Table 2 above by filling the missing compound names.

Table 3:

Formula	Name
$\text{Fe}(\text{NO}_3)_2$	iron(II) nitrate
$\text{Fe}(\text{NO}_3)_3$	iron(III) nitrate
FeCO_3	iron(II) carbonate
$\text{Fe}_2(\text{CO}_3)_3$	iron(III) carbonate

5. Looking at Table 3 above, explain how you can figure out the roman numerals in the names based on the charges of the polyatomic ions in the formulas.

Part B: Check your current knowledge

6. Fill in the names of the ionic compounds in the table below (notice there is a mix of binary and polyatomic compounds as well as those containing type I and II metals).

Product	Formula of ingredient	Name of Ionic Compound
shampoo	MgSO_4	
conditioner	$\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2$	
body wash	NH_4Cl	
sunscreen	ZnO	
baking soda	NaHCO_3	
hand soap	FeO	
toothpaste	SnCl_2	
hair coloring	Li_2CO_3	

Part C: The Ultimate Naming Game

- Break up into PAL teams. Each team will need one pair of “The Ultimate Naming Game” game boards. Take turns rolling the die. If you don’t have die, you could write the numbers 1-6 on post-it notes and put them in a hat for students to draw. Each student rolls the die three times:
 1. The first roll indicates which set of game boards that student will play with for that turn. The first page of game boards should be used when an EVEN number is rolled; the second page of game boards is used when an ODD number is rolled.
 2. The second roll of the die indicates how many spaces to move the place marker on the first game board (CATIONS).
 3. The die is then rolled a third time indicating how many spaces to move on the second board (ANIONS). After each person’s turn, write the name and formula rolled in the table below.
- When playing with the *EVEN-number boards*, **each student** should write down the name and formula for the resulting ionic compound that is formed. Compare answers with the others in your group.
- When playing with the *ODD-number boards*, **each student** should write down the name and formula of the resulting ionic compound. When naming compounds, remember to consider when roman numerals are needed. Compare answers with the others in your group.
- Students should only check their “*Important elements/ions to know for CHM 4*” handout if no one in their group knows the name or formula of a given ion.

The Ultimate Naming Game: Use these boards when the first roll of the die is **EVEN**.

START → tin(IV)	silver	iron(II)	lead(II)
calcium	CATIONS		aluminum
rubidium			lead(IV)
copper(II)			tin(II)
magnesium			copper(I)
ammonium			zinc
iron(III)	strontium	potassium	sodium

START → borate	chloride	sulfite	perchlorate
hydrogen carbonate	ANIONS		oxide
acetate			nitride
phosphate			hydroxide
hypobromite			arsenate
carbonate			dichromate
iodite	cyanide	nitrate	sulfate

The Ultimate Naming Game: Use these boards when the first roll of the die is **ODD**.

START → Ca^{2+}	Li^+	Fe^{2+}	Cu^+
Pb^{2+}	CATIONS		Sr^{2+}
Mg^{2+}			Al^{3+}
Ba^{2+}			Pb^{4+}
Zn^{2+}			NH_4^+
K^+			Fe^{3+}
Na^+	Ag^+	Cu^{2+}	Sn^{2+}

START → BrO^-	F^-	H_2PO_4^-	NO_3^-
$\text{S}_2\text{O}_3^{2-}$	ANIONS		$\text{C}_2\text{O}_4^{2-}$
CN^-			N^{3-}
OH^-			ClO_4^-
Br^-			S^{2-}
$\text{C}_2\text{H}_3\text{O}_2^-$			MnO_4^-
SO_4^{2-}	CO_3^{2-}	PO_3^{3-}	HCO_3^-