



CHE 1020: Exploring acid formulas and names¹

Acids are odd because most include covalent bonds, but they dissociate into ions when they are added to water. And H^{+1} is always one of the ions produced (or released) from acids. The H^{+1} ion combines with water molecules to form the powerful hydronium ion (H_3O^{+1}) that actually acts as the acid.

Acids have their own naming systems to reflect their unique nature.

1. Binary acids (aka monoatomic acids)
2. Ternary acids (aka polyatomic or oxyacids)

Part A: Binary acids: Have monoatomic anions (created from one element)

Acid formula	Name	Cation*	Anion
HCl	<u>hydrochloric acid</u>	H_3O^{+1}	Cl^{-1}
HBr			
H ₂ S			
HF			

* The cation is always hydronium ion = H^{+1} added to H_2O .

1. Complete the table. Be sure to show the charges of the ions and account for all atoms!
2. Why does H_2S have two hydrogen atoms?
3. What prefix is always added to the names of binary acids?
4. What suffix always ends the names of binary acids?
5. The prefix 'bi' means two. Form a hypothesis about why these acids are called binary?
6. Write a naming rule for binary acids.

¹ Adapted from a POGIL activity.



Part B: Ternary acids (aka polyatomic or oxyacids): polyatomic anions with oxygen atoms

Acid formula	Name	Cation*	Anion	Anion name
H(ClO ₃)	chloric acid	H ₃ O ⁺¹	ClO ₃ ⁻¹	chlorate
H ₂ (SO ₃)				
H ₂ (SO ₄)				
H ₃ (PO ₃)				
H ₃ (PO ₄)				
H(NO ₂)				
H(NO ₃)				
H ₂ (CO ₃)				

* The cation is always hydronium ion = H⁺¹ added to H₂O.

- How is the structure of ternary acids different from that of binary acids?
- What do you think the 'ter' prefix means?
- Complete the table above with names, cations, anions and anion names.
- Notice that acids containing S, P and N in the ternary acids table come in pairs. One member of each pair ends in '-ic acid' while the other ends in '-ous acid'. These endings are related to the endings of the anions the acids contain. Complete these statements to understand the pattern.
 - Polyatomic anions ending in '-ate' take this suffix _____.
 - Polyatomic anions ending in '-ite' take this suffix _____.
- If the prefix 'hydro-' were used in ternary acids, how would it change the name of HClO₃?
- Write naming rules for ternary acids.
- Predict the formula for chlorous acid.
- Circle the formula of the acids whose names would include the 'hydro-' prefix.
 - H₂(SO₃)
 - HF
 - H₂S
 - H₂(CO₃)
 - H(NO₂)



Part C: Halogen oxyacid acid families

Acid formula	Name	Cation*	Anion	Anion name
H(ClO ₄)	perchloric acid			perchlorate
H(ClO ₃)	chloric acid	H ₃ O ⁺		
H(ClO ₂)	chlorous acid			chlorite
H(ClO ₁)	hypochlorous acid			
H(BrO ₄)				perbromate
H(IO ₃)				
H(FO ₂)				
H(IO)			IO ⁻¹	hypoiodite

15. Find the pattern and complete the table! Note that the pattern for the chlorine oxyacids holds for all other halogen oxyacid acids.

16. Now test yourself! The table below has all sorts of acids. Fill in the missing information.

Name	anion	anion name	Acid formula
hydroiodic acid			
chlorous acid			
hypobromous acid			
phosphoric acid			
sulfurous acid			