Chemical Nomenclature

formula has a charge — **yes** →

ION

- cations with only one oxidation state are named as the element (Na^{1+} = sodium ion);
- monatomic anions have an *–ide* ending (O^{2-} = oxide)

polyatomic and multivalent cations	polyatomic anions
NH_4^{1+}.....ammonium	$C_2H_3O_2^{1-}$.....acetate
Cu^{1+}.....copper (I), cuprous	CO_3^{2-}.....carbonate
Cu^{2+}.....copper (II), cupric	ClO_3^{1-}.....chlorate
H_3O^{1+}.....hydronium	CrO_4^{2-}.....chromate
Fe^{2+}.....iron (II), ferrous	CN^{1-}.....cyanide
Fe^{3+}.....iron (III), ferric	HCO_3^{1-}.....hydrogen carbonate, bicarbonate
Pb^{2+}.....lead (II), plumbous	HSO_4^{1-}.....hydrogen sulfate, bisulfate
Pb^{4+}.....lead (IV), plumbic	OH^{1-}.....hydroxide
Hg_2^{2+}.....mercury (I), mercurous	NO_3^{1-}.....nitrate
Hg^{2+}.....mercury (II), mercuric	MnO_4^{1-}.....permanganate
Sn^{2+}.....tin (II), stannous	PO_4^{3-}.....phosphate
Sn^{4+}.....tin (IV), stannic	SO_4^{2-}.....sulfate

formula contains only one element — **yes** →

ELEMENT

Some elements exist as molecules

- diatomic HOFBrINCl (say it: hofbrincl!)
- more than two atoms: P_4, S_8

exception: O_3 is ozone

formula contains both carbon and hydrogen (may contain others) — **yes** →

ORGANIC COMPOUND

Organic nomenclature is based on number of carbon atoms in the longest chain.

the alkanes	functional groups
CH_4.....methane	R–OH.....alcohol
C_2H_6.....ethane	R–NH_2.....amine
C_3H_8.....propane	R–COOH.....carboxylic acid
C_4H_{10}.....butane	R–O–R.....ether
C_5H_{12}.....pentane	R–CO–H.....aldehyde
C_6H_{14}.....hexane	R–CO–R.....ketone

substitutions and functional groups use numbers to indicate their position in the carbon chain; prefixes are used for more than one group (example: 2,2,4–trimetylpentane)

first element listed in formula is hydrogen — **yes** →

ACID

Acid names are based on the anion in the acid.

if the anion is…	the name of the acid is…	example
root–*ide*	*hydro*-root–*ic acid*	chloride, Cl^{1-} makes hydrochloric acid, $HCl_{(aq)}$
root-*ate*	root–*ic acid*	carbonate, CO_3^{2-} makes carbonic acid, $H_2CO_{3(aq)}$
root-*ite*	root–*ous acid*	nitrite, NO_2^{1-} makes nitrous acid, $HNO_{2(aq)}$

Some molecular compounds dissolve in water to form acids. HCl is a gas unless specified $HCl_{(aq)}$.

formula contains only nonmetals and/or hydrogen — **yes** →

BINARY MOLECULAR COMPOUND

Binary molecular compounds use prefixes to indicate the number of atoms in a formula; the name always ends in *–ide*; *mono–* is not used except for the second element named.

- the less electronegative element is written and named first
- the more electronegative element is named second with an *–ide* ending

Greek prefixes:

one.....mono	five.....penta	nine.....nona
two.....di	six.....hexa	ten.....deca
three.....tri	seven....hepta	twelve...dodeca
four.....tetra	eight.....octa	

formula contains anion + cation (metal/nonmetal), may contain polyatomic ions — **yes** →

SALT

Salts are named as cation + anion.

cation—the name of the element or polyatomic ion; if the cation is multivalent, the oxidation number is indicated by one of the methods below:

- Stock system: include oxidation number in Roman numerals (Cu^{2+} = copper (II))
- traditional: lower oxidation number has *–ous* ending, higher has *–ic* ending (Cu^{2+} = cupric)

anion—binary compounds all end in *-ide*; polyatomic ions have their own names

derivatives of the oxygen–containing anions (end in *–ate*):

add one oxygen atom	*per*–root–*ate*	SO_4^{2-}, sulf*ate* to SO_5^{2-}, *per*sulf*ate*
subtract one oxygen atom	root–*ite*	NO_3^{1-}, nitr*ate* to NO_2^{1-}, nitr*ite*
subtract two oxygen atoms	*hypo*–root–*ite*	ClO_3^{1-}, chlor*ate* to ClO^{1-}, *hypo*chlor*ite*