

Topic:	INORGANIC ACIDS
Objective:	FK_04_01
Given some compounds and elements the student must be capable of doing the following: <ul style="list-style-type: none"> • write the formulas • write the names • write the Lewis structures 	

Definition and types	
An acid is any chemical compound that contains nonmetals and hydrogens (It can have oxygen atoms).	
<ul style="list-style-type: none"> • Binary acids: they only contain a nonmetal and hydrogen 	
$\begin{array}{c} \text{O} \quad \text{O} \\ \diagdown \quad / \\ \text{X} - \text{H} \\ / \quad \diagdown \\ \text{O} \quad \text{O} \end{array} \quad \begin{array}{c} \text{O} \quad \text{O} \\ / \quad \diagdown \\ \text{H} - \text{X} - \text{H} \\ \diagdown \quad / \\ \text{O} \quad \text{O} \end{array}$	
<ul style="list-style-type: none"> • Oxoacids: they contain a nonmetal, hydrogen and oxygen 	
$\begin{array}{c} \text{O} \quad \text{O} \quad \text{O} \quad \text{O} \\ \diagdown \quad / \quad \diagdown \quad / \\ \text{O} - \text{X} - \text{O} - \text{H} \\ / \quad \diagdown \quad / \quad \diagdown \\ \text{O} \quad \text{O} \quad \text{O} \quad \text{O} \end{array}$	

Binary acids			
Binary acids are those that have hydrogen and one other nonmetal. The nonmetal acts with its lowest valence (the lowest sharing of electrons).			
$\text{:}\ddot{\text{F}}\text{:}$	\longrightarrow	$\text{H} - \ddot{\text{F}}\text{:}$	hydrofluoric acid hydrogen fluoride HF
$\text{:}\ddot{\text{Cl}}\text{:}$	\longrightarrow	$\text{H} - \ddot{\text{Cl}}\text{:}$	hydrochloric acid hydrogen chloride HCl
$\text{:}\ddot{\text{Br}}\text{:}$	\longrightarrow	$\text{H} - \ddot{\text{Br}}\text{:}$	hydrobromic acid hydrogen bromide HBr
$\text{:}\ddot{\text{I}}\text{:}$	\longrightarrow	$\text{H} - \ddot{\text{I}}\text{:}$	hydroiodic acid hydrogen iodide HI
$\text{:}\ddot{\text{S}}\text{:}$	\longrightarrow	$\begin{array}{c} \text{:}\ddot{\text{S}}\text{-H} \\ \\ \text{H} \end{array}$	hydrosulfuric acid hydrogen sulfide H ₂ S

The names of negative ions and binary acids are related as follows:

Anion	Corresponding binary acid: hydro- prefix and -ic ending
Cl ⁻ (chloride)	HCl (hydrochloric acid)
S ²⁻ (sulfide)	H ₂ S (hydrosulfuric acid)

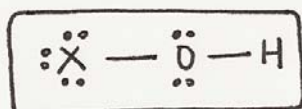
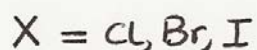
ANION	ACID
_____ide (chloride Cl ⁻)	hydro_____ic acid (hydrochloric acid HCl)

$\xrightarrow{\text{add H}}$

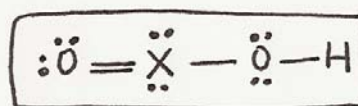
Oxoacids from halogens

Oxoacids have oxygen, hydrogen and another nonmetal.

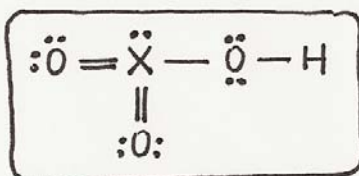
Halogens (with the exception of fluorine) can share one, three, five or seven electrons, giving four different acids:



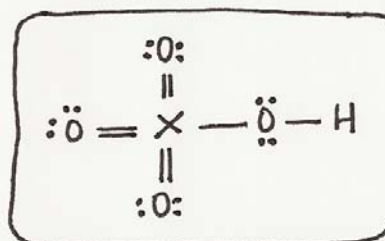
HClO... **hypochlorous acid**
 HBrO... **hypobromous acid**
 HIO... **hypoiodous acid**



HClO₂... **chlorous acid**
 HBrO₂... **bromous acid**
 HIO₂... **iodous acid**



HClO₃... **chloric acid**
 HBrO₃... **bromic acid**
 HIO₃... **iodic acid**



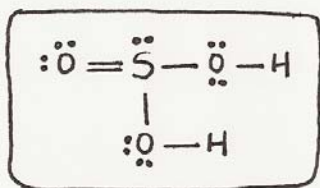
HClO₄... **perchloric acid**
 HBrO₄... **perbromic acid**
 HIO₄... **periodic acid**

The names of negative ions and binary acids are related as follows:

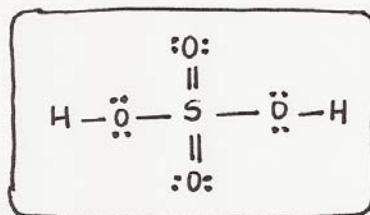
Anion	Corresponding acid
ClO ⁻ (hypochlorite)	HClO (hypochlorous acid)
ClO ₂ ⁻ (chlorite)	HClO ₂ (chlorous acid)
ClO ₃ ⁻ (chlorate)	HClO ₃ (chloric acid)
ClO ₄ ⁻ (perchlorate)	HClO ₄ (perchloric acid)

Oxoacids from sulfur (S)

Sulfur can share 2, 4 or 6 electrons. The most common oxoacids are those in which sulfur shares 4 and 6 electrons:



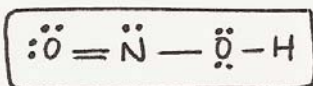
H_2SO_3 ... *sulfurous acid*



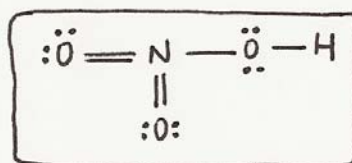
H_2SO_4 ... *sulfuric acid*

Oxoacids from nitrogen (N)

Nitrogen can share 3 or 5 electrons. The oxoacids are:



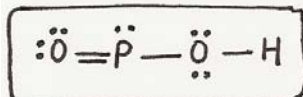
HNO_2 ... *nitrous acid*



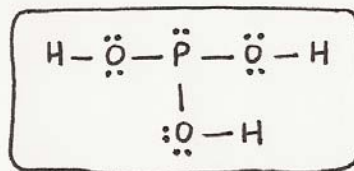
HNO_3 ... *nitric acid*

Oxoacids from phosphorus (P)

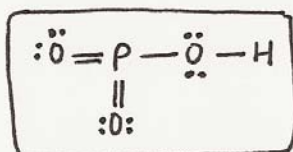
Phosphorus can share 3 or 5 electrons. The oxoacids are



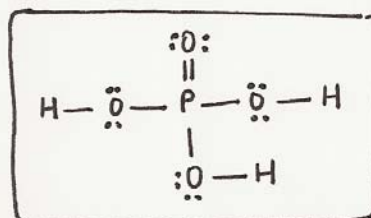
HPO_2 ... *metaphosphorous acid*



H_3PO_3 ... *phosphorous acid*



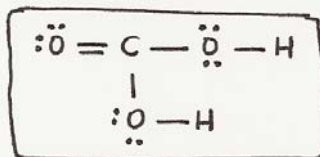
HPO_3 ... *metaphosphoric acid*



H_3PO_4 ... *phosphoric acid*

Oxoacids from carbon (C)

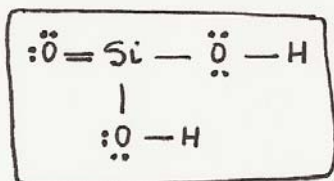
Carbon shares 4 electrons. The oxoacid it forms is:



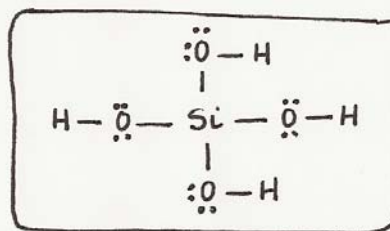
H_2CO_3 ... carbonic acid

Oxoacids from silicon (Si)

Silicon shares 4 electrons. The oxoacids it forms are:



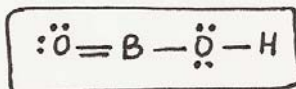
H_2SiO_3 ... metasilicic acid



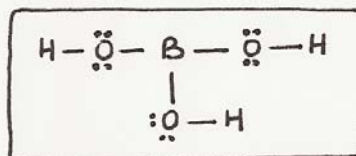
H_4SiO_4 ... silicic acid

Oxiacids from boron (B)

Boron shares 3 electrons. The oxoacids it forms are:



HBO_2 ... metaboric acid



H_3BO_3 ... boric acid