

How TO FIND A ROMAN NUMERAL

Chemistry: Form WS4.2.2A

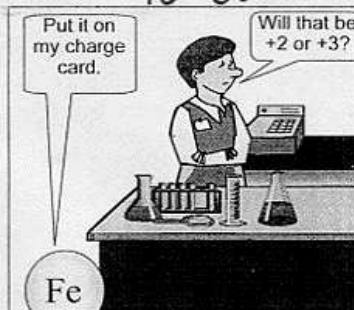
BONDING

Date _____ Period _____

Determining the Charge on a Metal Ion

Univalent metal ions, those with only one oxidation state, are named exactly the same as the element (Ba is named barium, and Ba^{+2} is also named barium), but polyvalent metal ions, those with multiple oxidation states, include a roman numeral in the name to indicate the oxidation state (Cu^{+1} is called copper I, while Cu^{+2} is called copper II). In order to name a compound, therefore, it is necessary to check on the *Periodic Table* to see if the metal ion has more than one oxidation state. If it does, it is necessary to figure out what the oxidation state is so the correct roman numeral can be included as part of the name. This can be done as in the following example based on the formula $Fe_2(S_2O_3)_3$.

ANSWERS TO CLASS WORK



When ions go shopping

$Fe_2(S_2O_3)_3$

ion	Fe	S_2O_3	
subscript	2	3	
oxidation state	+	-2	TOTAL
total	+6	-6	= 0

STEP 4 ↑
STEP 3 ↑

STEP 1 ←
STEP 2 ←

Prepare a table as above.

Step 1: List the subscripts for the metal and the nonmetal ions.

Step 2: Look up the oxidation state of the nonmetal ion on the *Periodic Table*.

Step 3: Multiply the oxidation state of the nonmetal by its subscript to get the total charge.

Step 4: Determine the total charge of the metal ions by calculating the number which, when added to the total charge of the nonmetal ion, gives the compound a total charge of zero.

Step 5: Divide the total charge of the metal ions by the subscript of the metal to get the oxidation state.

Using the procedures described above and to the left, determine the oxidation states of the metals in each of the compounds listed below.

1. $BaCl_2$ +2
2. PbO_2 +4
3. $MnCl_7$ +7
4. $Cr_3(PO_4)_2$ +2
5. $Al_2(SO_4)_3$ +3 ← NOT UNPREDICTABLE
6. Sn_3P_4 +4
7. $Ca(NO_3)_2$ +2
8. Cu_2S +1
9. FeO +2
10. $Fe_2(SO_4)_3$ +3

NOT UNPREDICTABLE

Answers to class work

Quiz AT 3:20 PM

PURPOSE: How Does CUTTING
A FORMULA IN HALF
HELP US NAME IT?

WARMUP:

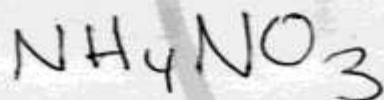
NaCl	<u>sodium chloride</u>
NaNO_3	<u>sodium nitrate</u>
NiNO_3	<u>nickel (I) nitrate</u>

#1 WHEN NAMING IONIC
COMPOUNDS, START BY
CUTTING OFF THE
CATION

(A) IT'S ON THE LEFT

(B) IT'S USUALLY A METAL

example



#2 If the right
is polyatomic, use
the name on the
sheet.

#3 ~~If the~~ Otherwise,
the right is
"ELEMENT + IDE"

#4 THE LEFT HALF
IS THE ELEMENT NAME.
IF THE CHARGE IS
UNPREDICTABLE ADD
~~USE~~ A ROMAN
NUMERAL

#6 What is the name of PbO_2 ?

ION	Pb	O
SUBSCRIPT	1	2
OXID. STATE	4	-2
total	4	-4

Lead(IV) oxide

Let's name $\text{Cr}_3(\text{PO}_4)_2$

ION	Cr_3	PO_2 PO_4
SUBSCRIPT	3	2 2
Ox. State	2	-3
Total	+6	-6

chromium(II) phosphate

#5 How To Find A ROMAN NUMERAL

ION	Fe	(S ₂ O ₃)
SUBSCRIPT	2	3
OXIDATION STATE	+3	-2
TOTAL	+6	-6

WHAT IS THE
NAME OF
 $\text{Fe}_2(\text{S}_2\text{O}_3)_3$?

The name is
Iron (III) thiosulfate