ChemQuest 21

Transition Metals

Name: _____

Date: _____

Hour: _____

Information: Charges of Some Transition Elements

So far you have learned that you can predict the charge that an ion will have based on its location on the periodic table. However, the transition elements are not easy to predict. A few common transition elements are listed below. You should memorize their charges.

Silver: Ag^{+} Zinc: Zn^{2+} Cadmium: Cd^{2+}

Critical Thinking Questions

1. Write the formulas for the following compounds:

a) silver nitrate	b) zinc phosphate	c) cadmium chloride
$AgNO_3$	$Zn_3(PO_4)_2$	$CdCl_2$

Information: More Than One Possible Charge

Many transition elements can have more than one charge when they become an ion. Copper ions, for example, can be Cu^{+} or Cu^{2+}. As another example, iron ions are sometimes Fe^{2+} and sometimes Fe^{3+}.

Critical Thinking Questions

2. Copper and iron are in the "d block" and so you need to calculate their charge by comparing what bonds to them. Find the charge on copper and iron in each of the following compounds.

a) $CuCl_2$	b) $CuCl$	c) $FeSO_4$	d) $Fe_2(SO_4)_3$
+2	+1	+2	+3

(This is similar to what you did in question 10 for ChemQuest 16)

3. Give your best attempt at naming the compounds from question 2. (They are rewritten below.)

a) $CuCl_2$	b) $CuCl$	c) $FeSO_4$	d) $Fe_2(SO_4)_3$
copper chloride	copper chloride	iron sulfate	iron sulfate

Information: Formulas Containing Roman Numerals

You probably put the same name for the compounds in question 3a and 3b. You may also have put the same name for the compounds in 3c and 3d. BUT these are not the same compound! You cannot have the same name for two different compounds. Here are the correct names for the compounds in questions 2 and 3:

a) $CuCl_2$	b) CuCl	c) $FeSO_4$	d) $Fe_2(SO_4)_3$
copper(II) chloride	copper(I) chloride	iron(II) sulfate	iron(III) sulfate

Critical Thinking Questions

4. Compare your answers for questions 2 & 3 with the names of the compounds given in the information section. What do the Roman numerals stand for?
   The Roman numerals stand for the charge on the transition metal ion.

5. Why is MnO_2 called manganese(IV) oxide?
   Manganese has a charge of +4 indicated by the Roman numeral IV.

6. Name the following compounds. *Note: assume that anytime you have a transition element (d block element) you must use a Roman numeral unless the element is silver, zinc, or cadmium.* (The first one is done for you.)

a) $NiNO_3$	b) $Cr_2(CO_3)_3$	c) $FeNO_3$	d) $CoCl_2$
nickel(I) nitrate	chromium(III) carbonate	iron(I) nitrate	cobalt(II) chloride
e) $Cu_3(PO_4)_2$	f) MnS	g) $ZnCl_2$	h) $AgNO_3$
copper(II) phosphate	manganese(II) sulfide	zinc chloride	silver nitrate

(No Roman numerals are needed for zinc or silver, but if you included them it is OK.)

7. Write the formulas for the following compounds. (The first one is done for you.)

a) mercury(II) acetate	b) chromium(III) sulfate	c) iron(I) carbonate
$Hg(C_2H_3O_2)_2$	$Cr_2(SO_4)_3$	Fe_2CO_3
d) potassium carbonate	e) strontium nitride	f) manganese(IV) chlorate
K_2CO_3	Sr_3N_2	$Mn(ClO_3)_4$