Are up keeping up with CHEM 4?

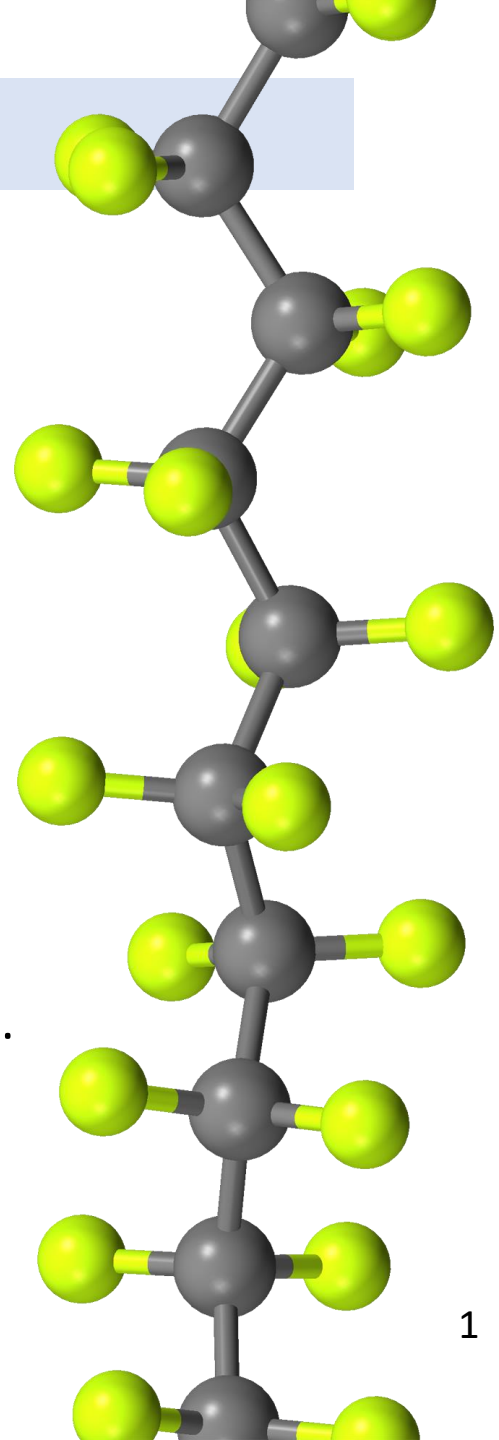
- ✓ **Aug/Sept calendar on our Website:** tinyurl.com/SacStateChem4

- ✓ **Help:** Exam #1 is 1 week from Wednesday.
  - ✓ Jeff's office hours: MWF 9 – 9:30 am and 11 – 11:30 am; and by appointment.
  - ✓ PAL office hours: link is on our CHEM 4 website.
  - ✓ Can email me questions: Show question and email picture of work.
  - ✓ Have you put together a study group?

- ✓ **Homework:** If you occasionally do your homework late, you will get credit for it.

- ✓ **Clickers:**
  - ✓ Automatic 2 pts for each time you vote (right or wrong).
  - ✓ If you're here, but can't vote or visiting from other section, message me in chat.

- ✓ **Optional:**
  - ✓ Last week to join *Peer Assisted Learning (PAL)* – MW 12 noon is full.
  - ✓ *Commit to Study (C2S)* – **Allows you to drop lowest exam.**



Welcome to Jeff's CHEM 4 lecture!
We'll be starting in just a bit…

While you are waiting:

1) Go to LearningCatalytics.com to prepare for today's clicker questions. Login with your MasteringChemistry login. **Session ID =**

2) Make sure your Zoom User ID is your "first name last name". You can open "participants", then find your name and click on it to change it.

*2) In the chat, let us know… what is your favorite possession and why? O*ne of my favorite possessions is the book "Poems Children Will Sit Still For". My parents gave it to me when I finished kindergarten. They wrote in the book that they were proud of me and it reminds me how much they valued education.

Review clicker question (Covers material from last lecture)

Go to LearningCatalytics.com and login with your MasteringChemistry. Session ID =

1) Which of the following formula/name pairs is incorrect?

A) K_3N = potassium nitride

B) PbO_2 = lead(IV) oxide

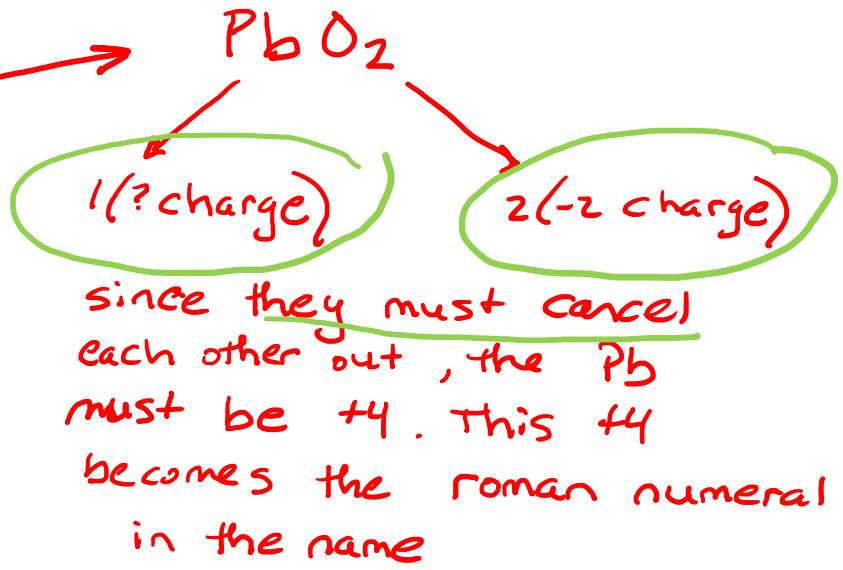
C) Al_2S_3 = aluminum sulfide

D) Pb_3N_4 = lead(IV) nitride

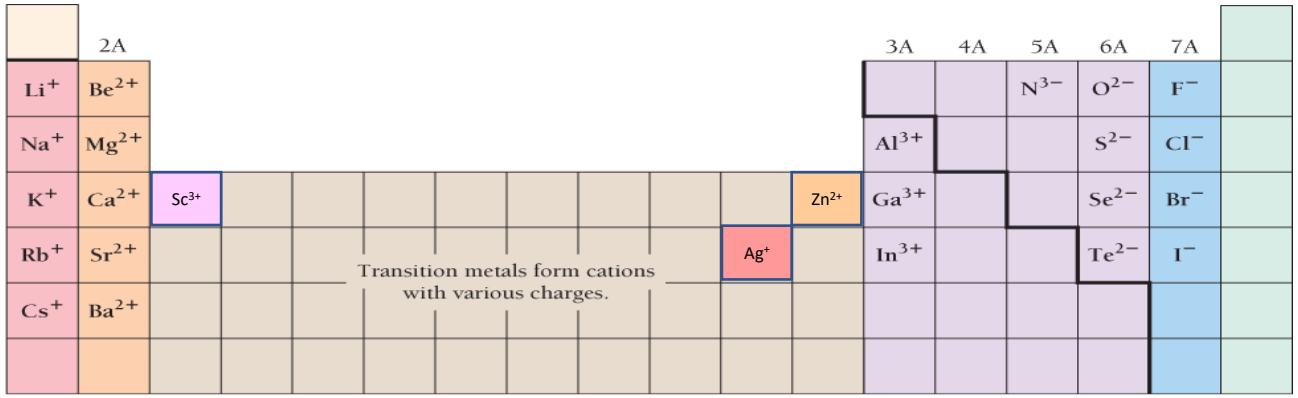
E) AgI = silver(I) iodide

F) $CuBr_2$ = copper(II) bromide

G) Ni_3N_2 = nickel(II) nitride



Ag is a type I metal, so it doesn't have roman numerals



CHEM 4 lecture

Monday – September 21, 2020

Sec 5.7 continued…

Naming ionic compounds containing polyatomic ions

Background: Important polyatomic ions

Monatomic ion	Symbol
bromide ion	Br^-
chloride ion	Cl^-
fluoride ion	F^-
iodide ion	I^-
nitride ion	N^{3-}
oxide ion	O^{2-}
sulfide ion	S^{2-}

Ions made by adding "H^+"	Symbol
hydrogen carbonate ion (bicarbonate)	HCO_3^-
hydrogen oxalate ion (bioxalate)	$HC_2O_4^-$
hydrogen phosphate ion	HPO_4^{2-}
dihydrogen phosphate ion	$H_2PO_4^-$
hydrogen sulfate ion (bisulfate)	HSO_4^-
hydrogen sulfide ion (bisulfide)	HS^-
hydrogen sulfite ion (bisulfite)	HSO_3^-

Polyatomic ion	Symbol
acetate ion	$C_2H_3O_2^-$
ammonium ion	NH_4^+
arsenate ion	AsO_4^{3-}
borate ion	BO_3^{3-}
bromate ion	BrO_3^-
bromite ion	BrO_2^-
carbonate ion	CO_3^{2-}
chlorate ion	ClO_3^-
chlorite ion	ClO_2^-
chromate ion	CrO_4^{2-}
cyanide ion	CN^-
dichromate ion	$Cr_2O_7^{2-}$
hydroxide ion	OH^-
hypobromite ion	BrO^-
hypochlorite ion	ClO^-

Polyatomic ion	Symbol
hypoiodite ion	IO^-
iodate ion	IO_3^-
iodite ion	IO_2^-
nitrate ion	NO_3^-
nitrite ion	NO_2^-
oxalate ion	$C_2O_4^{2-}$
perbromate ion	BrO_4^-
perchlorate ion	ClO_4^-
periodate ion	IO_4^-
permanganate ion	MnO_4^-
phosphate ion	PO_4^{3-}
phosphite ion	PO_3^{3-}
sulfate ion	SO_4^{2-}
sulfite ion	SO_3^{2-}
thiosulfate ion	$S_2O_3^{2-}$

Note: there is only one cation on our list, NH_4^+

Polyatomic ions are small molecules that are unstable when they have the same number of e- and p+. So, they gain or lose ≥ 1 e-.

For example, the NO_3^- ion has one more e- than p+.

As with **monatomic ions** this extra electron had to come from somewhere, like from a Na atom.

Just like we can have NaCl (made from Na^+ and Cl^-), we can have $NaNO_3$ (made from Na^+ and NO_3^-).

Background: Naming ionic compounds containing polyatomic ions

Name → Formula

- Can be type I or II metal (use roman numerals as needed).
- Write down the two ions. Combine ions in a ratio that cancels their charges.
- Use ( ) if there is > 1 of a polyatomic ion.

Examples:

Name	Ions	Ratio	Formula
manganese(II) dihydrogen phosphate	Mn^{2+} $H_2PO_4^-$	1:2	$Mn(H_2PO_4)_2$
lead(IV) sulfate	Pb^{4+} SO_4^{2-}	1:2	$Pb(SO_4)_2$
lead(II) sulfate	Pb^{2+} SO_4^{2-}	1:1	$PbSO_4$
aluminum cyanide	Al^{3+} CN^-	1:3	$Al(CN)_3$
ammonium carbonate	NH_4^+ CO_3^{2-}	2:1	$(NH_4)_2CO_3$

Progress clicker question (covers material we are learning now)

Go to LearningCatalytics.com and login with your MasteringChemistry. Session ID =

2) What is the formula for cobalt(III) chromate?

A) $Co_3(CrO_4)_2$

B) $CoCrO_4$

C) $Co_2(Cr_2O_7)_3$

D) $Co_3(CrO_3)_2$

E) $Co(CrO_4)_3$

F) $Co_3Cr_2O_7$

G) $Co_2(CrO_4)_3$

H) Co_3CrO_4

Cobalt(III) / chromate

Co^{3+} CrO_4^{2-}

→ 2:3 ratio to cancel charges

$Co_2(CrO_4)_3$

Background: Naming ionic compounds containing polyatomic ions

Formula → Name

- Name each ion. The name of the polyatomic ion does *not* change from our list.
- Use the charge on the polyatomic ion to determine the charge (and roman numeral) for the metal.
- **Examples:**

Formula	Metal type	Charges	Name
$Ni_2(Cr_2O_7)_3$	type II	2(? charge) ↔ 3(-2); +3	nickel (III) dichromate
$Mg(C_2H_3O_2)_2$	type I		magnesium acetate
$Pb(C_2O_4)_2$	type II	1(? charge) ↔ 2(-2); +4	lead (IV) oxalate
$Sn_3(PO_4)_2$	type II	3(? charge) ↔ 2(-3); +2	tin (II) phosphate
$Ca(IO_2)_2$	type I		calcium iodite

Progress clicker question (covers material we are learning now)

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3) What is the name of $CuBO_3$?

A) copper(I) perborate

B) copper borite

C) copper(I) bromate

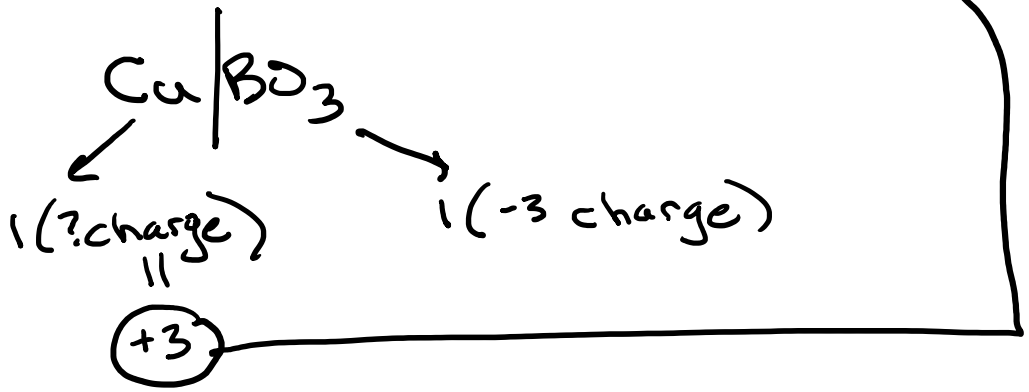
D) copper(I) borate

E) copper borate

F) copper(II) perborite

G) copper(III) borate

H) copper(II) borite



Progress clicker question (covers material we are learning now)

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4) Which of the following statements related to naming ionic compounds is false?

A) Fe^{2+} and Cu^{+} are Type II metals.

B) The cation is always named first and the anion second.

C) Zn^{2+} and Ag^{+} are Type I metals.

D) Ionic compounds have an overall neutral charge.

E) All ionic compounds contain a metal.

F) K_2CrO_4 is a Type I ionic compound.

Remember our exception: NH_4^+

Progress clicker question (covers material we are learning now)

Go to LearningCatalytics.com and login with your MasteringChemistry. Session ID =

5) Which of these formula/name pairs is correct?	**Possible correction:**
A) $(NH_4)_3C_2O_4$ = ammonium oxalate	$(NH_4)_2C_2O_4$
B) $KMnO_4$ = potassium(I) permanganate	potassium permanganate
C) $Pb(S_2O_3)_2$ = lead(II) thiosulfate PbS_2O_3	lead(IV) thiosulfate
D) AgCN = silver cyanate	silver cyanide
E) $Ni(HSO_4)_2$ = nickel(II) hydrogen sulfate	correct
F) $CuClO_3$ = copper(I) chlorite $CuClO_2$	copper(I) chlorate