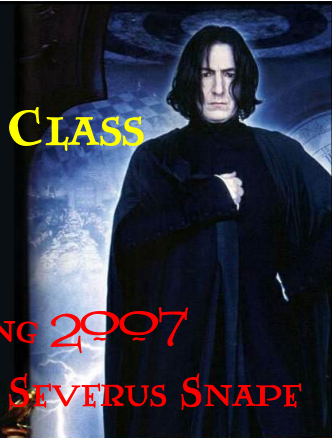


CH204  
POTIONS CLASS

SPRING 2007  
PROFESSOR SEVERUS SNAPE

A portrait of Professor Severus Snape from the Harry Potter series, wearing his signature black robes and standing in a dark, atmospheric setting.

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LAST WEEK IN THE  
POTIONS LABORATORY

SEPARATED MIXTURES BASED ON DIFFERING  
PHYSICAL AND CHEMICAL PROPERTIES

USED EXCEL TO CALCULATE AVERAGE, STANDARD  
DEVIATION, AND WEIGHT PERCENTS

Q-TEST IN ACTION!

BUCHNER FILTERING

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EXPERIMENT 3  
QUALITATIVE CHEMICAL ANALYSIS

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## “QUANT” VS “QUAL”

*QUANTITATIVE* – HOW MUCH IS THERE?

*QUALITATIVE* – WHAT IS IT?

YOU WILL IDENTIFY THE CHEMICAL IDENTITIES OF 5 UNKNOWN SOLUTIONS BASED ON HOW THEY REACT (OR DON'T REACT) WITH ONE ANOTHER.

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## PREVIOUS YEARS

GORGON'S BLOOD

LIQUID GOLD

VITREOUS HUMOR OF A BLIND MULE

2007

ACIDS

BASES

INORGANIC SALTS

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## TWO-PART LAB

- **PART 1:** MIX TEN KNOWN SOLUTIONS AND RECORD THE RESULTS OF THE REACTIONS
- **PART 2:** MIX YOUR FIVE UNKNOWN AND COMPARE THE RESULTS WITH WHAT YOU SAW IN PART ONE.

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## BE EXACT!

THE MORE ACCURATELY YOU RECORD  
YOUR OBSERVATIONS, THE EASIER IT  
WILL BE TO IDENTIFY YOUR  
UNKNOWN.

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## WHAT ARE WE LOOKING FOR?

\*EXPLOSIONS

\*SUPERNATURAL CREATURES

\*RASHES, MUTATIONS,  
TRANSFORMATIONS



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## WHAT ARE WE <sup>REALLY</sup> LOOKING FOR?

PRECIPITATES.

(SEE THE SOLUBILITY TABLE IN APPENDIX 2.)

DON'T EXPECT TO SEE ANY ACID-BASE ACTION.

WRITE CHEMICAL EQUATIONS FOR ALL OF THE  
REACTIONS THAT FORM A PRECIPITATE.

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## THE KNOWN SOLUTIONS

**ACIDS:** HCl H<sub>2</sub>SO<sub>4</sub> HNO<sub>3</sub>

**BASES:** NaOH Na<sub>2</sub>S

**SALTS:** Ba(NO<sub>3</sub>)<sub>2</sub> AgNO<sub>3</sub> K<sub>2</sub>CrO<sub>4</sub>  
Fe(NO<sub>3</sub>)<sub>3</sub> Ni(NO<sub>3</sub>)<sub>2</sub>

ALL SOLUTIONS ARE 0.10 OR 0.20 M.

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## RIDDLE ME THIS

WHAT DO YOU GET WHEN YOU CROSS  
HYDROCHLORIC ACID WITH SILVER NITRATE?

BALANCED CHEMICAL EQUATION



ADD THE PHYSICAL STATES OF EACH COMPOUND



THIS IS CALLED A MOLECULAR EQUATION.

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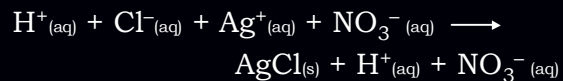
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## LET'S GET REAL



WRITE AQUEOUS COMPOUNDS AS INDIVIDUAL IONS:



THIS IS A TOTAL IONIC EQUATION.

LOTS OF SPECTATOR IONS.

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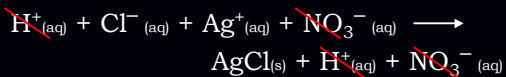
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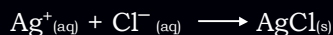
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## TIME TO CLEAN HOUSE

CROSS OUT SPECTATOR IONS



THIS LEAVES US WITH A NET IONIC EQUATION



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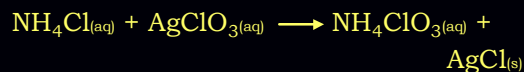
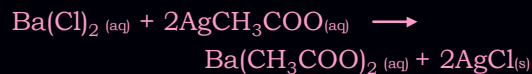
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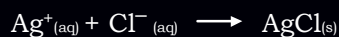
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## THE NET IONIC EQUATION



ALL OF THESE REACTIONS HAVE THE SAME NET IONIC EQUATION:



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## SIMPLE IS GOOD

- THE NET IONIC EQUATION DESCRIBES THE CHEMICAL REACTION THAT OCCURS, AND DOES NOT INCLUDE ANY IONS THAT DO NOT TAKE PART IN THE REACTION, EVEN THOUGH THOSE IONS ARE PRESENT IN SOLUTION.
- HOW DO WE KNOW WHICH IONS WILL REACT AND WHICH ONES WON'T?

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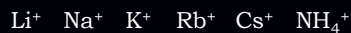
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## SOME QUICK SOLUBILITY RULES

\* ALL COMPOUNDS CONTAINING ALKALI METALS AND AMMONIUM ION ARE SOLUBLE.



\* ALL COMPOUNDS CONTAINING NITRATE, CHLORATE, PERCHLORATE, AND ACETATE ARE SOLUBLE.



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## SOME QUICK INSOLUBILITY RULES

\* ALL COMPOUNDS CONTAINING  $\text{PO}_4^{3-}$ ,  $\text{CO}_3^{2-}$ , AND  $\text{SO}_3^{2-}$  IONS ARE INSOLUBLE EXCEPT THOSE THAT ALSO CONTAIN ALKALI METALS OR  $\text{NH}_4^+$ .

\* ALL HYDROXIDES ( $\text{OH}^-$ ) AND SULFIDES ( $\text{S}^{2-}$ ) ARE INSOLUBLE EXCEPT THOSE THAT ALSO CONTAIN ALKALI METALS, OR  $\text{NH}_4^+$ . (EXCEPTION: SOME GROUP II HYDROXIDES ARE SLIGHTLY SOLUBLE.)

\* WHEN IN DOUBT,  $\text{Ag}^+$ ,  $\text{Pb}^{2+}$  AND  $\text{Hg}$  COMPOUNDS TEND TO BE INSOLUBLE.

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## IN THE POTIONS LABORATORY

\* CREATE AN ARRAY OF REACTIONS IN THE MICROWELL PLATE SIMILAR TO THE ONE IN THE LAB MANUAL.

\* USE ONLY 2 DROPS OF EACH REACTANT.

\* **DO NOT** TOUCH THE TIPS OF THE DROPPER BOTTLES TO THE SOLUTIONS IN THE MICROWELL PLATE OR YOU WILL DIE A MOST PAINFUL DEATH.

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## VILE, HIDEOUS FLUIDS!

EMPTY YOUR USED MICROWELL PLATES INTO THE DISGUSTING PLASTIC TRAY IN THE HOOD.

RINSE THE PLATES WITH ORDINARY TAP WATER, DO A FINAL RINSE WITH DEION WATER, AND STACK THE PLATES IN THE HOOD.

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## LAB REPORT

MOLECULAR EQUATIONS FOR  
11 PRECIPITATION REACTIONS.

NET IONIC EQUATIONS FOR  
11 PRECIPITATION REACTIONS.

11 \* 11 IS 22 EQUATIONS ALTOGETHER.

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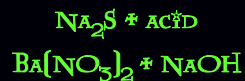
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## WARNING! EVIL MAGIC!

SOME REACTIONS WILL TURN CLOUDY EVEN THOUGH NO SOLID IS FORMED.



ALL PRECIPITATES WILL BE INSOLUBLE IN THE SOLUBILITY TABLE. DO NOT COUNT ANY "SLIGHTLY SOLUBLES" AS PRECIPITATES.

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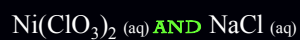
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## POST-LAB PREVIEW



WHAT WILL PRECIPITATE WITH  $\text{Ni}^{2+}$   
BUT NOT WITH  $\text{Na}^+$  ?

OR

WHAT WILL PRECIPITATE WITH  $\text{Cl}^-$   
BUT NOT WITH  $\text{ClO}_3^-$  ?

QUESTION 1D – WE DID THIS IN LAB LAST WEEK.

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## NEXT WEEK

### EXPERIMENT 4: ACID-BASE TITRATION

- MORE INVOLVED THAN THIS LAB.
- REQUIRES MORE PREPARATION THAN OUR PREVIOUS LABS.
- START PREPARING EARLY

PRE-LAB QUESTION 1: THE ANSWER IS NOT 711

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## QUIZ TIME

- \* YOU WILL NEED A CALCULATOR EVERY WEEK (EXCEPT NEXT WEEK).
- \* MAKE SURE YOU KNOW YOUR SECTION NUMBER AND YOUR TA'S NAME.

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