

## A polite word from your TA

When writing your reports, please don't lump all the discussion questions into one gigantic incomprehensible paragraph.

Space out the answers instead.

You can even number them if you want.  
We sure would love that.

Dr. Anderson makes our lives a living hell, so please be nice to us. You're all we've got left.  
Thanks.

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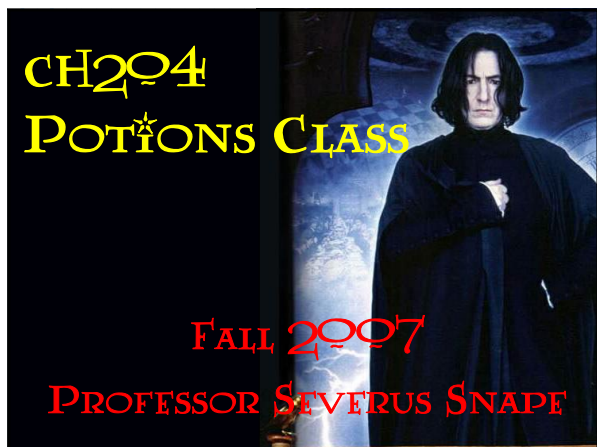
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## LAST WEEK IN THE POTIONS LABORATORY

SEPARATED MIXTURES BASED ON DIFFERING PHYSICAL AND CHEMICAL PROPERTIES

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

Q-TEST IN ACTION!

BÜCHNER 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

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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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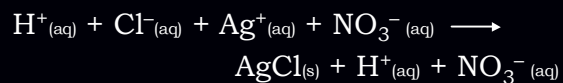
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## LET'S GET REAL



WRITE AQUEOUS COMPOUNDS AS INDIVIDUAL IONS:



THIS IS A TOTAL IONIC EQUATION.

LOTS OF SPECTATOR IONS.

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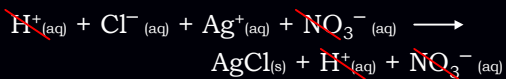
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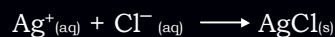
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## TIME TO CLEAN HOUSE

CROSS OUT SPECTATOR IONS



THIS LEAVES US WITH A NET IONIC EQUATION



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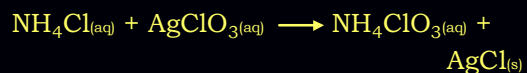
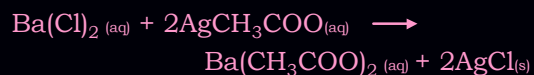
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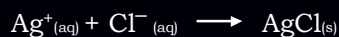
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## THE NET IONIC EQUATION



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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## 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  $\text{PO}_4^{3-}$ ,  $\text{CO}_3^{2-}$ ,  $\text{SO}_3^{2-}$ ,  $\text{OH}^-$  AND  $\text{S}^{2-}$  ARE INSOLUBLE EXCEPT THOSE THAT 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 YOUR SQUIRT BOTTLE 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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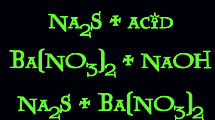
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## WARNING! DARK MAGIC!

FIVE REACTIONS WILL TURN CLOUDY  
EVEN THOUGH NO SOLID SHOULD BE FORMED.



THESE PRECIPITATES ARE DUE TO UNAVOIDABLE TRACE  
CONTAMINANTS IN THE SOLUTIONS (POLYSULFIDES IN  
 $\text{Na}_2\text{S}$  AND CARBONATE ION IN  $\text{NaOH}$ ).

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## SIMPLE LAB, MONSTER WRITE-UP

THE REPORT AND POST-LAB FOR THIS EXPERIMENT  
TAKE A LOT OF THOUGHT AND TIME.

ANSWER ALL THE QUESTIONS USING ONLY THE  
REAGENTS USED IN THIS EXPERIMENT!

GO TO THE [FREEBIES](#) PAGE OF THE CLASS WEB SITE  
FOR A HINT SHEET TO HELP YOU WITH THE  
REPORT AND POST-LAB

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## NEXT WEEK

### EXPERIMENT 4: ACID-BASE TITRATION

- MORE INVOLVED THAN THIS LAB.
- REQUIRES MORE PREPARATION THAN OUR PREVIOUS LABS FOR BOTH THE PRELIMINARY WRITE-UP AND THE PRE-LAB.
- START PREPARING EARLY

PRE-LAB QUESTION 1: THE ANSWER IS NOT 71!

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## FINAL EXAM, PART 2

\* 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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