ANSWERS

[redacted] **G** Name Period

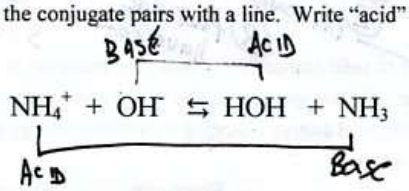
ACID BASE PROBLEMS:

Our memorized Formulas for Acid Base Math:	
pH = - log[H+]	$1x10^{-14}$ = [H+][OH-]
pOH = -log[OH-]	14 = pH + pOH

1. Solve these using your formulas (conveniently printed at the bottom of this page

pH	pOH	[H+]	[OH-]
6.6	7.4	2.51×10^{-7}	3.98×10^{-8}
13.0	1.0	1×10^{-13}	1×10^{-1}

2. In the reaction below, connect the conjugate pairs with a line. Write "acid" or "base" below each of the four substances.



3. Next to each, write its conjugate base:

NH_4^+ NH_3 NH_3 NH_2^- NH_2^- NH^{2-} H_2O OH^- H_3O^+ H_2O

4. Complete and balance each reaction

NOTE: all of the acidic H's will react. If a molecule has H_2SO_4, both of the H's will react, for example.

$Al(OH)_3$ reacting with HF Check a box first: This reaction is ☐metal with acid ☐ base with acid

SKIP + SKIP → SKIP + SKIP

Fe reacting with HNO_3 Hint: one of the products formed is named IRON(iii) NITRATE.
Check a box first: This reaction is ☐metal with acid ☐ base with acid

a. $2Fe + 6HNO_3 \rightarrow 3H_2 + 2Fe(NO_3)_3$

SORT OF A REVIEW OF UNIT 7 (FEB 13 TO MARCH 9)

5. What does the Law of Conservation of Mass say must ALWAYS ALWAYS ALWAYS be true about the mass of the Reactants in any reaction in the history of the entire Universe?

the mass of the reactants is always EQUAL to the total mass of the products

6. To change each sentence below into a correct chemical reaction you must .
   - write the correct formulas for each reactant and product by either making sure each compound has a neutral charge or by using a criss cross technique. (i.e. CaF is incorrect, CaF2 is correct)
   - only then should you proceed to write

a.. When solid potassium chlorate is strongly heated in a flame it forms oxygen gas and solid potassium chloride.

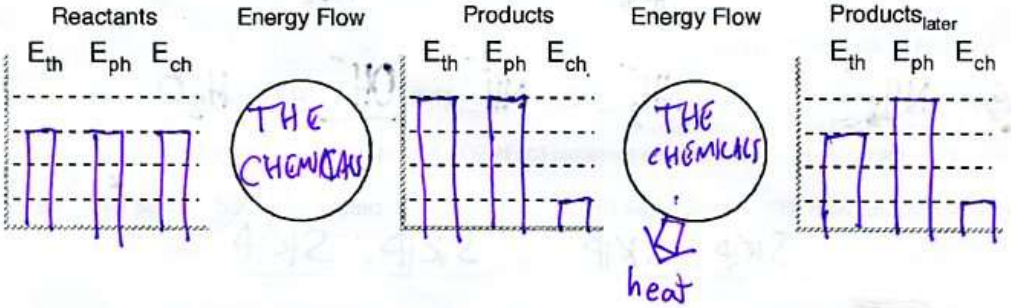
$2KClO_3 \rightarrow 3O_2 + 2KCl$

b. Zinc and lead (II) nitrate react to form zinc nitrate and lead.

$Zn + Pb(NO_3)_2 \rightarrow Zn(NO_3)_2 + Pb$

4. When 3M HCl is added to solid sodium carbonate, the contents of the test tube immediately starts bubbling and gets warm. Carbon dioxide gas, water vapor and sodium chloride are formed. In the LOL diagram below you should first show chemical energy changing to thermal energy and then in a separate step show heat leaving the system as an arrow.

① forms gas, increases Eph ② increases Eth ③ that energy must have come from somewhere; remove some of the Ech



6. What type of reactions are the following?

Matching. Use each choice once. What type of reactions are shown here?	
C AB + C → CB + A	a) combination (sometimes called synthesis)
A A + B → AB	b) decomposition
B AB → A + B	c) single replacement

Note choice D on next page!

D	AB + CD → CB + AD	d) double replacement

7. In an endothermic reaction, is the energy of the products less than or greater than that of the reactants?

Since heat ENTERED the products should have MORE energy

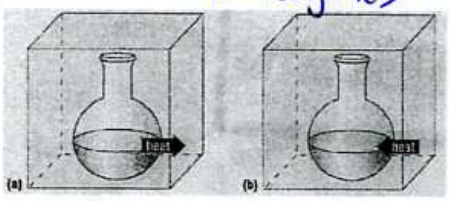
8. Convert each of the following energy units:

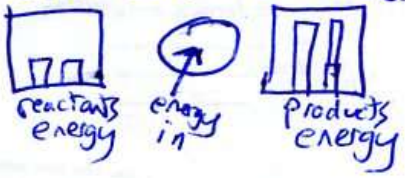
a. 8.1 kcal to cal

8100 calories

b. 2.50 kcal to J

10450 joules





Some substances reacted in two flaskes. For each stzatement below, choose either Reaction A or Reaction B

9. A For the substances in the reaction E_{ch} is decreasing
10. B The reaction could be written A + energy → B
11. A The reaction could be written A → B $\Delta H = -500kJ$
12. B The $\Delta H = +300$ kJ
13. A The reaction is exothermic
14. B The reaction would feel cold if you held the flask in your hand.

Energy in Chemical Reactions

15. Classify the following as exothermic or endothermic:

a. 550 kJ is released EXOTHERMIC

b. The energy level of the products is higher than that of the reactants. ENDO

16. Classify the following as exothermic or endothermic reaction and **give ΔH** for each:

a. Gas burning in a Bunsen burner: $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + 890$ kJ EXO, $\Delta H = -890kJ$

note the negative sign

b. Dehydrating limestone: $Ca(OH)_2 + 65.3$ kJ $\rightarrow CaO + H_2O$

ENDO, $\Delta H = +65.3kJ$

element - element - ide

1. Naming something with two elements, where one is a metal with known charge:

17. After each formula write the name.

a. Ca_3P_2 Calcium phosphide
b. ZnO Zinc oxide
c. Na_2S Sodium Sulfide
d. Al_2Se aluminum selenide
e. LiH lithium hydride
f. $BeBr_2$ Beryllium Bromide

2. Naming something with two elements, where one is a metal with VARIABLE charge*: element ROMAN NUMERAL ELEMENT - ide

*these are often transition metals from the middle of the periodic table

18. Just figure out the charge on the metal atom.

g. PbO_2 +4
h. $CoCl_2$ +2
i. $Au(OH)_2$ +2
j. $Fe_2(CrO_4)_3$ +3 on each iron

19. Name each. From your answers above, use the charge of the metal atom and then write a roman numeral

a. PbO_2 lead(IV)oxide
b. $CoCl_2$ cobalt(II)chloride
c. $Au(OH)_2$ gold(II)hydroxide
d. $Fe_2(CrO_4)_3$ iron(III)chromate

3. Naming anything with three or more elements: use the cheat sheet

20. Name each

e. $Na_2(CO_3)$ sodium carbonate
f. $Mg(MnO_4)_2$ magnesium PER Manganate
g. $(NH_4)_3PO_4$ ammonium phosphate
h. $Cu(ClO_3)_2$* copper(II) chlorate

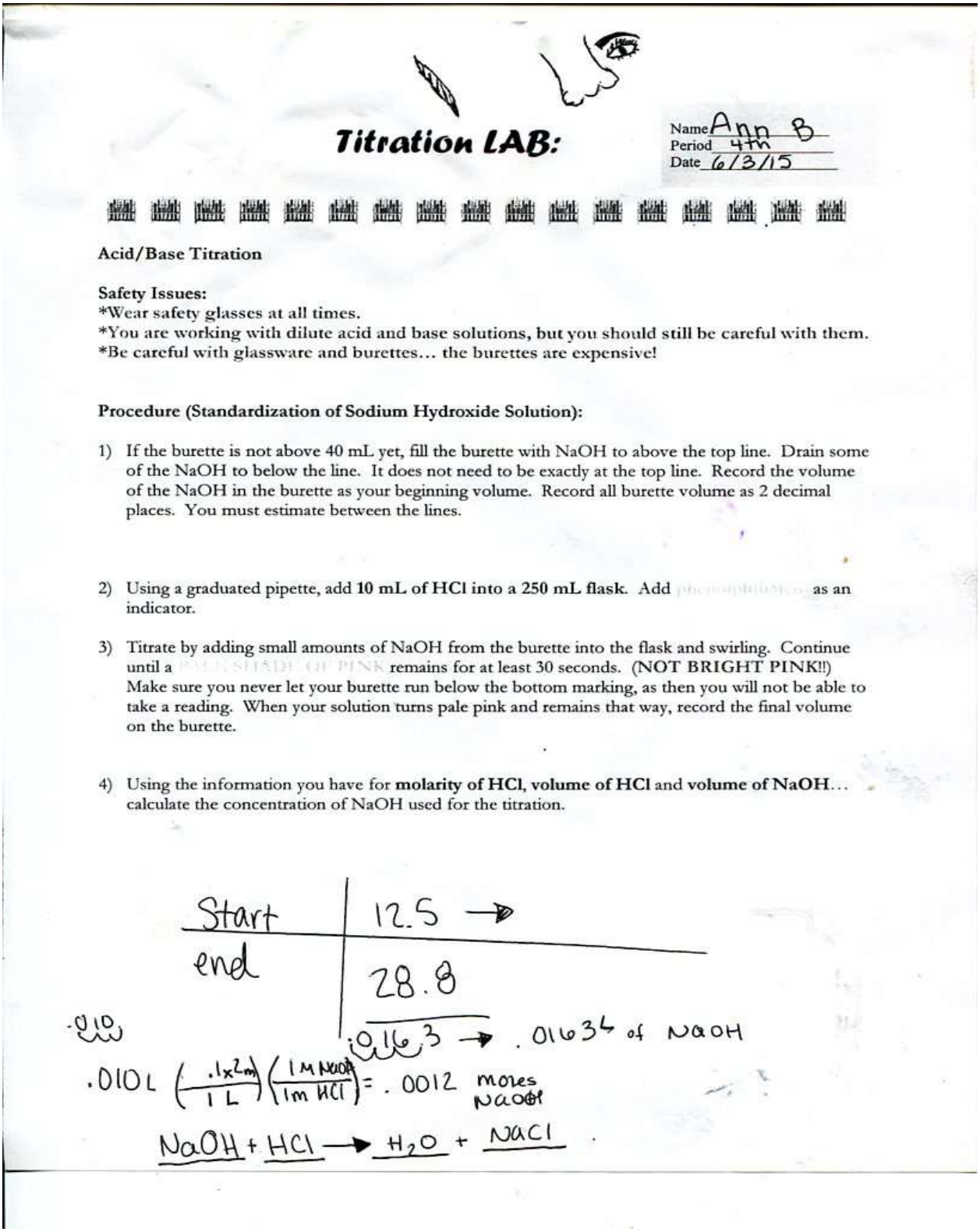
*remember to find the charge on the metal and give this one a roman numberal.

21. Circle any formula that would need a roman numeral when giving this a name.

$Na_2(CO_3)$ $FeCO_3$ $Sn_3(PO_4)_2$ $(NH_4)NO_3$ $CaSO_4$

IN class we titrated a strong acid (HCl) with a strong base (NaOH) using a phenolphthalein

indicator to detect the End Point:



Titration LAB:

Name Ann B
Period 4th
Date 6/3/15

Acid/Base Titration

Safety Issues:
*Wear safety glasses at all times.
*You are working with dilute acid and base solutions, but you should still be careful with them.
*Be careful with glassware and burettes… the burettes are expensive!

Procedure (Standardization of Sodium Hydroxide Solution):

1) If the burette is not above 40 mL yet, fill the burette with NaOH to above the top line. Drain some of the NaOH to below the line. It does not need to be exactly at the top line. Record the volume of the NaOH in the burette as your beginning volume. Record all burette volume as 2 decimal places. You must estimate between the lines.

2) Using a graduated pipette, add **10 mL of HCl into a 250 mL flask**. Add [illegible] as an indicator.

3) Titrate by adding small amounts of NaOH from the burette into the flask and swirling. Continue until a [illegible] remains for at least 30 seconds. (NOT BRIGHT PINK!!) Make sure you never let your burette run below the bottom marking, as then you will not be able to take a reading. When your solution turns pale pink and remains that way, record the final volume on the burette.

4) Using the information you have for **molarity of HCl, volume of HCl** and **volume of NaOH**… calculate the concentration of NaOH used for the titration.

Start	12.5 →
end	28.8
	.0163 → .01634 of NaOH

.010

$.0101\,L \left(\frac{.1 \times 2m}{1\,L}\right)\left(\frac{1\,M\,NaOH}{1m\,HCl}\right) = .0012$ moles NaOH

$NaOH + HCl \rightarrow H_2O + NaCl$

Themath for Step 4 was based on this: