Date_____Section _____

I. Indicator Solutions

Name one indicator with two forms, and two similarly-colored wells. _____

At which change in solution acidity does this indicator change forms:
(a) between strongly and weakly acidic, or (b) between strongly and weakly basic solutions.

Name an indicator with 2 forms, and 3 differently-colored wells because one well contains a mixture of both forms. _____

Name one indicator with three forms, one prominent in each well. _____

II. Meter Calibration Check
Reading of pH 7 buffer: _____ Reading of pH 4 buffer: _____
Comment on Meter Stability

III. Cation Hydrolysis

Salt	pH	Salt	pH	Salt	pH
$CuCl_2$	_____	$FeCl_3$	_____	KCl	_____
LiCl	_____	$MgCl_2$	_____	NH_4Cl	_____

IIIa. Hydrolysis of KCl is expected to be negligible. Is the pH of KCl solution significantly different from neutral? Yes Maybe No Difference, ΔpH = _____units

If so, what dissolved gas might be responsible? _____

IIIb. KCl and LiCl differ only by cation size. To what extent is your data consistent with a small-ion size effect, with small ions hydrolyzing more than larger ions?
$\Delta pH = pH_{KCl} - pH_{LiCl}$ = _____

IIIc. The cations of LiCl and $MgCl_2$ have nearly the same size. To what extent does higher or lower charge foster greater hydrolysis? $\Delta pH = pH_{LiCl} - pH_{MgCl_2}$ = _____

IIId. Charge and size differences are negligible between $MgCl_2$ and $CuCl_2$. To what extent does the incomplete d-subshell of copper affect the degree of hydrolysis?
$\Delta pH = pH_{MgCl_2} - pH_{CuCl_2}$ = _____

Date_____Section _____

IIIe. $Iron^{3+}$ is smaller than the ions compared above. Considering the effects of b through d, rationalize the pH of $FeCl_3$ solution.

IIIf. Give a balanced equation for the hydrolysis of ammonium ions in $NH_4Cl(aq)$.

Give a balanced equation for the hydrolysis of hydrated iron(III) ions in $FeCl_3$ solution

IV. Basic Character of Anions

$NaC_2H_3O_2$ pH:_____ Na_2CO_3 equation: _____

Na_2CO_3 pH:_____ $NH_4C_2H_3O_2$ equation: _____

Which base is stronger base by odor indication? by pH indication?

V. Degree of Dissociation

greatest $[H^+]/c_{acid}$ is _____ > median is _____> least dissociated _____

HCl equation $HC_2H_3O_2$ equation

How closely to 1/10 has $[H^+]$ dropped with dilution of each to 10× in volume:
of HCl? of $HC_2H_3O_2$? of the buffer?

greatest change in $[H^+]/c_{acid}$ _____ > median _____ > least change in degree of dissociation_____

VI. Buffering

Which solution showed the biggest pH increase? Explain.

What was the buffer capacity?

In part **VI** the pH increased with each NaOH addition; in part **I** the indicator did not change color with initial NaOH addition. In your words, explain how solutions of different acidity can have the same indicator color.