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 acidic and neutral, or (b) between neutral and 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. _____

III. Cation Hydrolysis

Salt	pH	Salt	pH	Salt	pH
$AlCl_3$	_____	$CuCl_2$	_____	$FeCl_3$	_____
$LaCl_3$	_____	NaCl	_____	$ZnCl_2$	_____

IIIa. Hydrolysis of NaCl is expected to be negligible, the difference from pH 7.0 insignificant.

What difference did you find? pH of salt – 7.00 = _____

Is the pH of NaCl solution significantly different from neutral? Yes Maybe No

If significant, what dissolved gas might be responsible? _____

IIIb. $AlCl_3$ and $LaCl_3$ differ only by cation size. What pH difference did you find, *i.e.* calculate

$\Delta pH = pH_{LaCl_3} - pH_{AlCl_3}$ = _____

State the direction of a size effect if there is one.

IIIc. The cations of NaCl and $LaCl_3$ differ only in cation charge. What pH difference did you find? $\Delta pH = pH_{NaCl} - pH_{LaCl_3}$ = _____

State the direction of a charge effect if there is one.

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

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

IV. Basic Character of Anions

Molecular equation for $(NH_4)_2CO_3(s)$ equilibrium: _____

Net ionic equation for $Na_2CO_3(aq)$ equilibrium: _____

Which base, CO_3^{2-} or Cl^-, is stronger by odor indication? by pH indication?

V. Fraction of Ionization

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

HCl equation $HC_2H_3O_2$ equation

$10\{[H^+]_{dil}/ [H^+]_{init}\}$ for HCl

$10\{[H^+]_{dil}/ [H^+]_{init}\}$ for HOAc

$10\{[H^+]_{dil}/ [H^+]_{init}\}$ for buffer

acid of highest ratio _____ > median _____ > lowest ratio _____

Explain the highest or median case. Realize that $10\{[H^+]_{dil}/ [H^+]_{init}\}$ is also $\{[H^+]_{dil}/c_{dil}\}/\{[H^+]_{init}/c_{init}\}$.

VI. Buffering

Which solution showed the biggest pH increase with a single drop of 0.1 M NaOH?

Which tube would become basic with the fewest drops?

What was the buffer capacity (in drops)?

In **Part VI** the pH increases with each drop NaOH added; in **Part I** the indicator did not change color with each drop. Explain how solutions of different acidity can have the same indicator color.