

CHEMISTRY 226
EXAM 3
NOVEMBER 21, 2002

Name: _____

Student ID No.: _____

I. (2 pts. each) Match the following terms and definitions.

1. ____ When the amount of added titrant is chemically equivalent to the amount of analyte in the sample.
2. ____ The physical change associated with the condition of equivalence that we can observe.
3. _____ Added to the analyte solution to give an observable physical change at or near the equivalence point.
4. _____ Solution consisting of a conjugate acid/base pair formed when a weak acid is titrated with a strong base.
5. _____ Nine or more atoms in a cycle that form a three dimensional cavity that can just accept an appropriately sized ion.
6. _____ Compound whose purity has been established by chemical analysis and serves as a reference.
7. _____ The number mols of strong acid or base that causes 1L of the buffer to undergo 1 unit change in pH.
8. _____ $pK_a \pm 1$

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|--------------------------|-------------------------|
| A. Buffer | G. Indicator |
| B. Buffer Capacity | H. Indicator pH range |
| C. Chelate | I. Ligand |
| D. Coulometric Titration | J. Linear Segment Curve |
| E. End Point | K. Macrocyclic |
| F. Equivalence Point | L. Primary Standard |
| | M. Secondary Standard |

II. (2 pts) How many binding sites does EDTA have? _____

(2 pts) How many Al^{3+} ions bind/molecule EDTA? _____

- III. (8 pts). A 4.476 g sample of petroleum is burned and the SO_2 produced collected in 3% H_2O_2 in the following reaction:



A 250 mL portion of 0.00923 M NaOH was introduced into the solution of H_2SO_4 following which excess base was back-titrated with 13.33 mL 0.01007 M HCl. Calculate the ppm sulfur in the sample.

- IV. (8 pts) Calculate the pH of a solution that results from mixing 20 mL 0.200 M HCl with 25 mL 0.232 M NaOH.

- V. (10 pts) What is the pH of a solution prepared by dissolving 9.2 g lactic acid (90.08 g/mol) and 11.5 g sodium lactate (112.06 g/mol) in water and diluting to 1.00 L. $K_a = 1.38 \times 10^{-4}$.

VI. (10 pts) A 0.5843 g sample of plant food was analyzed for N content by the Kjeldahl method. The liberated NH_3 was collected in 50.00 mL 0.1062 M HCl and the excess acid was back-titrated with 11.89 mL 0.0925 M NaOH. Express the results of the analysis in terms of % nitrogen and % protein.

VII. (10 pts) A NaOH solution was 0.1019 M immediately after standardization. Exactly 500.0 mL of the reagent was exposed to air and absorbed 0.652 g CO_2 . Calculate the relative carbonate error in the determination of acetic acid using phenolphthalein as an indicator.

VIII. (8 pts) List four requirements of primary standards.