The order of topics for the course is given below. To be useful above a trivial level these topics must have a quantitative capability ("calculations") associated with them. These calculations are presented during lectures and also formally as Problem Sets. More so than in Chem 111, Lectures and Problem Sets are embedded together in this course and it is neither feasible nor ultimately useful to think in terms of separating, i.e. "compartmentalizing", these two entities. In terms of study practices, problem sets should be engaged as soon as the material is introduced in the classroom lectures.

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**TOPICS AND EMBEDDED PROBLEM SETS**

**TEST DATES**

**NATURE OF A TITRATION -- OVERVIEW AND NECESSARY CALCULATIONS -- PS 100**

**INTRODUCTION TO MINOR REACTIONS AND TO WRITING SPECIALIZED K EXPRESSIONS -- PS 120**

**MEASUREMENTS AND DECISION MAKING (USE OF STATISTICS) -- PS 110**

(This material to be covered in laboratory discussion)

**CHARACTERIZATION OF AQUEOUS SOLUTIONS, EXEMPLIFIED BY THE PROCESS OF TITRATION -- THE pH AND pK FORMATS -- USE OF pH LINE METHODOLOGY -- PS 130**

**TITRATION CALCULATIONS COMPLETED -- CALCULATION OF pH AT EQUIVALENCE POINT AND AT ALL TITRATION STAGES -- PS 140**

**COMPLEXOMETRIC TITRATIONS -- WATER HARDNESS CALCULATIONS**

**POLYPROTIC ACID SYSTEMS -- PS 150**

**BUFFER SYSTEMS -- PS 160**

**SPECTROSCOPY -- THE BEER-LAMBERT LAW -- PS 190**

**REDOX CHEMISTRY -- INTRODUCTION TO REDOX COUPLES -- THE NERNST EQUATION -- PS 170**

**GALVANIC CELLS AND ASSOCIATED CALCULATIONS -- PS 180**

**THERMODYNAMICS -- RELATIONSHIP TO MINOR REACTIONS AND TO K_{eq} -- PS 215 A AND B**

**CHEMICAL KINETICS AND REACTION RATES**

**TEST #1: Fri, Jan 23**

**TEST #2: Fri, Feb. 13 (last day before Washington Holidays)**

**TEST #3: Fri, Mar 12**

**FINAL XM (cumulative)**

**GRADING:** The grading scheme indicated below is TENTATIVE. Changes can and do occur during the year. Independent cut regions for upper and underclassmen are possible. With regard to lab:

a) **NO LAB REPORTS WILL BE GRADED AFTER THE LAST DAY OF CLASSES (I.E. 5:00 PM) OF THE TERM. Failure to submit a report for an assigned determination = -20% with no replacement permitted.**

b) **The submission of miscellaneous data mistakenly reported = -60% with no replacement permitted.**

**Breakdown of Grading**

<table>
<thead>
<tr>
<th>Breakdown of Grading</th>
<th>LAB Breakdown by %</th>
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</thead>
<tbody>
<tr>
<td>Tests</td>
<td>Meas Lab 10%</td>
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<tr>
<td>Final</td>
<td>KHP +pH 25%</td>
</tr>
<tr>
<td>Lab</td>
<td>Vinegar 15%</td>
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<tr>
<td>TOTAL</td>
<td>Hard Water 15%</td>
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<tr>
<td></td>
<td>Spec Lab 35%</td>
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<td>TOTAL 100%</td>
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