ACS CHEM 12 EXAM:

- Exam covers concepts and problems from Chapters 15-26 of the textbook.
- 70 Questions, Multiple Choice (a-d), 2-hour time limit.
- Scantron, #2 pencil, and non-programmable calculator required.
- No cheat sheets permitted.
- New seating chart. Scratch paper provided.

Memorize:

- Nomenclature rules
- Common oxidation states (charges) of ions (Al\(^{3+}\), Ca\(^{2+}\), Fe\(^{2+}\) or \(^{3+}\), SO\(_4\)\(^{2-}\), etc.)
- Solubility rules
- Electrolytes (identifying strong / weak / non)
- SI prefixes (milli, nano, micro, Mega, etc.)
- List of strong and weak acids

\[ PV = nRT \]

\[ pH = pK_a + \log \left( \frac{[\text{base}]_0}{[\text{acid}]_0} \right) \]

\[ E_{cell} = E_{cell}^\circ - \left( \frac{RT}{v_eF} \right) \ln Q \]

\[ \Delta G = \Delta H - T\Delta S \]

\[ \Delta G^\circ = -RT \ln K \]

\[ \Delta G = \Delta G^\circ + RT \ln Q \]

\[ \Delta G = RT \ln \left( \frac{Q}{K} \right) \]

<table>
<thead>
<tr>
<th>Order</th>
<th>Rate law</th>
<th>Units of ( k )</th>
<th>Dependence of [A] on time</th>
<th>Half-life</th>
<th>Test plot</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>( rate = k[A] )</td>
<td>( s^{-1} )</td>
<td>( \ln [A] = \ln [A]_0 - kt )</td>
<td>( t_{1/2} = \frac{0.693}{k} )</td>
<td>( \ln [A] ) vs. ( t )</td>
</tr>
<tr>
<td>2</td>
<td>( rate = k[A]^2 )</td>
<td>( M^{-1}s^{-1} )</td>
<td>( \frac{1}{[A]} = \frac{1}{[A]_0} + kt )</td>
<td>( t_{1/2} = \frac{1}{k[A]_0} )</td>
<td>( \frac{1}{[A]} ) vs. ( t )</td>
</tr>
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Review:

Stuff from Ch 15 on intermolecular forces and unit cells (from Chem 11)

Phase diagrams

Identifying zero, 1st and 2nd order reactions from data & plots.

Chemical mechanisms.

Nuclear equations.

Method of initial rates.

Identifying acids & bases & neutral species.

Definitions of Arrhenius, Bronsted-Lowry, and Lewis Acids.

Working with equilibrium constants, $K_c$, $K_p$, etc.

Solubility and $K_{sp}$

Entropy and Enthalpy concepts and calculations.

Delta G and Delta G standard.

Thermo concepts.

Identifying oxidizing and reducing agents.

Balancing redox equations.

Cell diagrams.

General equations from thermodynamics such as Hess' law & Calorimetry

pH & percent ionization calculations for species in solution.

Acid-base titrations for strong and weak species.

Le Chatelier's principle, Q and K.