

## AP Chemistry: Laboratory Notebook Rubric

	<b>Meets or Exceeds Expectations 4 to 5 points</b>	<b>Below Expectations 2 to 3 points</b>	<b>Far Below Expectations 0 to 1 point</b>
<b>1. Format</b>	All sections are complete in correct order with no mistakes and easy to follow. No spelling or grammatical errors. The Title is appropriate.	Sections missing appropriate information. The title is not proper or the sections are out of order	Sections missing a significant amount of the required data
<b>2. Pre-Lab</b> <i>Intro/Back</i>  <i>Purpose</i>  <i>Pre-Lab Questions</i>  <i>Chemicals / Equipment</i> <i>MSDS</i>  <i>Methods</i>	<ol style="list-style-type: none"> <li>1. Introduction and Background is complete and not a copy of the Lab Instructions.</li> <li>2. Purpose accurately describes the theory that is intended to be reinforced by performing the lab.</li> <li>3. Pre-Lab Questions are included and answered with minimal errors and proper setup/calculations shown.</li> <li>4. Chemicals and Equipment are listed with included precision (+/-).</li> <li>5. MSDS section is complete.</li> <li>6. Methods are a brief summary of the steps taken in completing the lab, NOT an exhaustive description containing minute detail.</li> <li>7. Balanced Chemical Equations are included if applicable.</li> </ol>	The Pre-Lab fails to meet one of the expectations.	The Pre-Lab fails to meet two or more of the expectations.
<b>3. Data</b>	<ol style="list-style-type: none"> <li>1. All data from experiment is included – both qualitative and quantitative.</li> <li>2. Data is neatly organized (in tables if appropriate), and is easy to interpret.</li> <li>3. All data is correct with regards to significant figures and labels.</li> </ol>	The data fails to meet one of the expectations	The Data fails to meet two or more of the expectations
<b>4. Post-Lab</b> <i>Calculations</i>  <i>Results</i>  <i>Conclusion</i> <i>Discussion</i>  <i>Errors</i>  <i>Post-Questions</i>	<ol style="list-style-type: none"> <li>1. Includes all of the required graphs and all calculations (showing the fundamental equation used, has correct labels, descriptions, significant figures, etc...)</li> <li>2. The Results are collected in a Results Table</li> <li>3. Shows the appropriate statistics (mean, standard deviation, relative deviation, etc...)</li> <li>4. The Conclusion succinctly describes what can be concluded from the <b>experimental results</b>. It is aligned with a well-written statement of Purpose at the beginning of the lab. Also, observations of the accuracy and validity of the results are included.</li> <li>5. Any Post-Lab Questions are completed with work shown and minimal errors.</li> </ol>	The Post-Lab fails to meet one of the expectations.	The Post-Lab fails to meet two or more of the expectations.

## AP Chemistry: Laboratory Notebook Score Sheet

EXP: \_\_\_\_\_ NAME: \_\_\_\_\_ Per: \_\_\_\_\_ TOTAL: \_\_\_\_\_

	Meets or Exceeds Expectations 4 to 5 points		Below Expectations 2 to 3 points		Far Below Expectations 0 to 1 point	
	5	4	3	2	1	0
<b>1. Format</b>	5	4	3	2	1	0
<b>2. Pre-Lab</b>	5	4	3	2	1	0
<b>3. Data</b>	5	4	3	2	1	0
<b>4. Post-Lab</b>	5	4	3	2	1	0

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The following table gives examples of some laboratory answers for a “Density of Salt Solutions” lab.

	<b>Meets or Exceeds Expectations – 4 to 5 points</b>				<b>Below Expectations – 2 to 3 points</b>	<b>Far below 0 to 1</b>
<b>1. FORMAT:</b> <i>Title, Date, Neatness, and Organization.</i>	“Determination of the Relationship Between the Density and Concentration of Sodium Chloride Solutions”				“Salt Solution Density Lab”	
<b>2. PRE-LAB Purpose</b>	“The purpose of the lab is to develop a mathematical model relating the concentration of a solution to its density, and to use this model to determine the concentration of solutions of unknown concentration from their densities.”				“The purpose of the lab is to learn to find the density of salt solutions.”	
<i>Chemicals / Equipment MSDS</i>	“NaCl = Sodium Chloride MSDS = Reference #2 10-mL Graduated Cylinder (+/- 0.01mL) Analytical Balance (+/- 0.0001g)				“Measure out 10.00 mL of the 5% NaCl solution using a pipet and a graduated cylinder, being careful not to lose any solution. Place the graduated cylinder on an analytical balance and determine its mass to three decimal places. Record the mass in the lab book.”	
<i>Methods</i>	Using an analytical balance, masses of 10.00 mL NaCl samples of each of the solutions of known concentration and 2 unknown concentrations are measured. Density values are calculated and graphed against concentrations to determine the concentration of the 2 unknown NaCl solutions.					
<b>3. DATA</b>	<b>10</b>	<b>Trial 1 Mass (g)</b>	<b>Trial 2 Mass (g)</b>	<b>Trial 3 Mass (g)</b>		
	5%	10.012	10.017	10.005		
	10%	10.180	10.204	10.174		
	15%	10.230	10.242	10.233		
	U1	10.074	10.062	10.085		
<b>4. POST-LAB Calculations</b>	Density = m/V (fundamental equation shown) <u>Density 5%</u> Trial 1 = 10.012 g/10.00 mL = 1.001 g/mL Trial 2 = 10.017 g/10.00 mL = 1.002 g/mL Trial 3 = 10.005 g/10.00 mL = 1.001 g/mL (labels present throughout calculation, significant figures rules observed)				Density = 10.012 g/10.00 mL = 1.0012 g/mL (significant figures error) Density = 10.012/10.00 = 1.001 g/mL (labels not present in calculation)	Results table incomplete, Stats missing or not correct. Graphs (when appropriate or asked for) are missing, incomplete or contain mistakes.
<i>Results</i>		<b>Trial 1 Density (g/mL)</b>	<b>Trial 2 Density (g/mL)</b>	<b>Trial 3 Density (g/mL)</b>		
	<b>5%</b>	1.001	1.002	1.001		
	<b>10%</b>	1.016	1.015	1.017		
	<b>15%</b>	1.029	1.031	1.027		
	<b>U1</b>	1.010	1.012	1.008		
		<b>Mean</b>	<b>Standard Deviation</b>	<b>Relative Precision (ppt)</b>		
	<b>U1</b>	8.2 +/- 0.7	0.684931	83.33		
	Graphs are included. The graph is Density (y) vs Concentration (x) and is used to get the equation for the best fit line. The equation is $y = 0.00292x + 0.986$ . Solving for Concentration (x) = 8.2%					

<p><i>Conclusion</i></p>	<p>“It is demonstrated that a linear relationship exists between the density and concentration of sodium chloride solutions, and that the relationship can be used to make predictions about the properties of solutions of unknown concentration. The concentration of Unknown Solution 1 was 8.2% +/- 0.7 %.</p>	<p>“We demonstrated that it is possible to measure the densities of solutions, and to find the concentrations of unknowns. We showed that as the concentration of a solution increases, the density of the solution also increases linearly. Our data supports this conclusion. The purpose of the lab was fulfilled. We failed to take into account the mass of the graduated cylinder when finding the mass of the solutions.”</p>	
<p><i>Discussion</i></p>	<p>As the concentration of a solution increases, the density of the solution increases in linear fashion. The data supports this concept, within reasonable margins of error. The purpose of the lab was fulfilled by using the mathematical model for this linear relationship to predict the concentration of solutions of unknown</p>		
<p><i>Errors</i></p>	<p>concentration based on their densities. The mass of the empty graduated cylinder was not recorded when finding the mass of the solutions. As a result, the mass of each solution was too high, and the resulting density was also too large.”</p>		