

Chemistry: Laboratory Scoring Rubric

| | Meets or Exceeds Expectations 4 to 5 points | Below Expectations 2 to 3 points | Far Below Expectations 0 to 1 point |
|---|---|---|---|
| 1. Performance | Participates well within the group, supports group, helps setup and clean up after the lab. | Limited participation. Does help but could be better. Leaves station dirty. | Does not participate, leaves station dirty. |
| 2. Lab Prep <i>Purpose/Claim</i> <i>Chemicals / Equipment</i> <i>Methods</i> <i>Assignment</i> | 1. Lab Notebook is setup prior to lab day 2. Claim accurately describes the theory that is intended to be reinforced by performing the lab. 3. Chemicals and Equipment are listed. 4. Methods are a brief summary of the steps taken in completing the lab, NOT an exhaustive description containing minute detail. 5. Balanced Chemical Equations are included if applicable. 6. Pre-Lab Assignment Complete and Correct | The Lab Prep fails to meet one of the expectations. | The Lab Prep fails to meet two or more of the expectations. |
| 3. Data/ Evidence | 1. All data from experiment is included – both qualitative and quantitative. 2. Data is neatly organized (in tables if appropriate), and is easy to interpret. 3. All data is correct with regards to significant figures and labels. | The data fails to meet one of the expectations | The Data fails to meet two or more of the expectations |
| 4. Post-Lab <i>Analysis:</i> <i>Calculations</i> <i>Graphs</i> <i>Reasoning and Errors</i> | 1. Analysis complete and well thought out. 2. Includes all of the required calculations (showing the fundamental equation used, has correct labels, descriptions, significant figures, etc...) 3. Results of calculations are organized in Tables and (if needed) graphs completed properly. 4. Reasoning and Errors are included to state how the evidence refutes or supports the claim. Variables are discussed and experimental errors are included to show how they influenced results. | The Post-Lab fails to meet one of the expectations. | The Post-Lab fails to meet two or more of the expectations. |

Chemistry: Laboratory Score Sheet

LABS: _____ NAME: _____ Per: _____ TOTAL: _____

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|-------------------------|--|---|-------------------------------------|---|--|---|
| | 5 | 4 | 3 | 2 | 1 | 0 |
| 1. Performance | 5 | 4 | 3 | 2 | 1 | 0 |
| 2. Lab Prep | 5 | 4 | 3 | 2 | 1 | 0 |
| 3. Data/Evidence | 5 | 4 | 3 | 2 | 1 | 0 |
| 4. Post-Lab | 5 | 4 | 3 | 2 | 1 | 0 |

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| | 5 | 4 | 3 | 2 | 1 | 0 |
| 1. Performance | 5 | 4 | 3 | 2 | 1 | 0 |
| 2. Lab Prep | 5 | 4 | 3 | 2 | 1 | 0 |
| 3. Data/Evidence | 5 | 4 | 3 | 2 | 1 | 0 |
| 4. Post-Lab | 5 | 4 | 3 | 2 | 1 | 0 |

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

| | Meets or Exceeds Expectations – 4 to 5 points | | | | Below Expectations – 2 to 3 points | Far below 0 to 1 | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|-------------------------------|-------------------------------|-------------------------|---|-------------------------------|-------------------------------|-------------------------------|-----------|-------|-------|-------|------------|-------|-------|-------|------------|-------|-------|-------|-----------|-------|-------|-------|--|-----------------------------|-----------|-----|---|--|
| 1. PERFORM | Participates well, helps setup and clean up, keeps track of time well | | | | Could do better | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. LAB PREP <i>Lab Notebook Purpose/Claim</i> <i>Chemicals / Equipment</i> <i>Methods</i> | <p>The Lab Notebook is setup properly (see guide) prior to the date on which the lab will be started</p> <p>“The claim 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.”</p> <p>“NaCl = Sodium Chloride 10-mL Graduated Cylinder (+/- 0.01mL) Centogram Balance (+/- 0.001g)</p> <p>Using a centogram 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.</p> | | | | <p>Lab Notebook not prepared properly in advance</p> <p>“The claim of the lab is to learn to find the density of salt solutions.”</p> <p>“I measured out 10.00 mL of the 5% NaCl solution using a pipet and a graduated cylinder, being careful not to lose any solution. I placed the graduated cylinder on a centogram balance and determined its mass to three decimal places. I recorded the mass in the lab book.”</p> | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. DATA / EVIDENCE | % NaCl Masses for 10.00 mL Volumes | Trial 1 Mass (g) | Trial 2 Mass (g) | Trial 3 Mass (g) | 5% solution = 10.012 g 10% solution = 10.180 g 15% solution = 10.230 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 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 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. POST-LAB Analysis: <i>Calculations</i> <i>Graphs</i> <i>Organized Table</i> | <p>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)</p> <p>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> <table border="1" data-bbox="337 1654 917 1900"> <thead> <tr> <th></th> <th>Trial 1 Density (g/mL)</th> <th>Trial 2 Density (g/mL)</th> <th>Trial 3 Density (g/mL)</th> </tr> </thead> <tbody> <tr> <td>5%</td> <td>1.001</td> <td>1.002</td> <td>1.001</td> </tr> <tr> <td>10%</td> <td>1.016</td> <td>1.015</td> <td>1.017</td> </tr> <tr> <td>15%</td> <td>1.029</td> <td>1.031</td> <td>1.027</td> </tr> <tr> <td>U1</td> <td>1.010</td> <td>1.012</td> <td>1.008</td> </tr> </tbody> </table> <table border="1" data-bbox="337 1932 820 2003"> <thead> <tr> <th></th> <th>Mean Concentration %</th> </tr> </thead> <tbody> <tr> <td>U1</td> <td>8.2</td> </tr> </tbody> </table> | | | | | Trial 1 Density (g/mL) | Trial 2 Density (g/mL) | Trial 3 Density (g/mL) | 5% | 1.001 | 1.002 | 1.001 | 10% | 1.016 | 1.015 | 1.017 | 15% | 1.029 | 1.031 | 1.027 | U1 | 1.010 | 1.012 | 1.008 | | Mean Concentration % | U1 | 8.2 | <p>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)</p> <p>Results table incomplete, Stats missing or not correct. Graphs (when appropriate or asked for) are missing, incomplete or contain mistakes.</p> | |
| | Trial 1 Density (g/mL) | Trial 2 Density (g/mL) | Trial 3 Density (g/mL) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5% | 1.001 | 1.002 | 1.001 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10% | 1.016 | 1.015 | 1.017 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15% | 1.029 | 1.031 | 1.027 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| U1 | 1.010 | 1.012 | 1.008 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Mean Concentration % | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| U1 | 8.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | |
|------------------------------------|--|--|--|
| <p><i>Reasoning and Errors</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%. 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 claim of the lab was fulfilled by using the mathematical model for this linear relationship to predict the concentration of solutions of unknown 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> | <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 claim 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> | |
|------------------------------------|--|--|--|