I. (15 pts.) Define five of the following seven terms. Clearly mark the five to be graded.

1. Null Hypothesis

2. Specific Gravity

3. Sample

4. Parallax

5. Precision

6. Bias

7. Population standard deviation
II.  

A.  (5 pts) What is the mass in micrograms of $K_4Fe(CN)_6$ in 1.5 L of a solution that is 12.0 ppm $K^+$?

B.  (5 pts) Calculate the molar concentration of $Fe(CN)_6^{4-}$

C.  (5 pts) What is the pH of $Fe(CN)_6^{4-}$?

D.  (5 pts) What is the w/v% concentration of $K_4Fe(CN)_6$ in the solution?
III. Consider the following set of data:

<table>
<thead>
<tr>
<th>Trial Number</th>
<th>Value</th>
<th>Trail Number</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>4</td>
<td>0.00447</td>
</tr>
<tr>
<td>2</td>
<td>0.00463</td>
<td>5</td>
<td>0.00448</td>
</tr>
<tr>
<td>3</td>
<td>0.00453</td>
<td>6</td>
<td>0.00458</td>
</tr>
</tbody>
</table>

For question 1 – 5 calculate the following. Show all work including equations. (4 pts each).

1. Mean

2. Median

3. Range

4. Standard Deviation

5. Relative Standard Deviation

If the accepted value is 0.00450 calculate:

6. absolute error of the mean

7. relative error of the mean.
IV. (5 pts each) Estimate the absolute standard deviation and coefficient of variation for the results of the following calculation. Round results to include only significant figures. The numbers in parentheses are the standard deviations.

1. \( Y = 251 \pm 1 \times (860 \pm 2/1.673 \pm 0.006) \)

2. \( Y = 90.31 \pm 0.08 - 89.32 \pm 0.06 + 0.200 \pm 0.004 \)

V. Consider the following set of replicate measurements:

0.624, 0.613, 0.596, 0.607, 0.582

1. (5 pts) Calculate the 95% confidence limit.

2. (5 pts) Calculate the 95% confidence limit if \( s \rightarrow \sigma = 0.015 \)

VI. (7 pts) If 50.00 mL 0.4230 M \( \text{Na}_3\text{PO}_4 \) is mixed with 100 mL 0.5151 M \( \text{HgNO}_3 \), what is the mass of \( \text{Hg}_3\text{PO}_4 \) formed?
VII. (10 pts) Samples of spring water were taken from two sources, presumably from the same spring. On the basis of 6 analyses, the mean sodium content of the first sample is 3.92 ppm. Eight analyses of a second sample gave a mean of 3.52 ppm sodium. The pooled analyses yielded a pooled standard deviation of $s = 0.20$ ppm. Do the data indicate a difference between the sources of water at the 99% confidence level?