

EXERCISE 1 - Postlab

1. Calculate the mean, the percent error of mean, and the standard deviation for the volumes of water delivered when using the 100 mL beaker, the 100 mL graduated cylinder, the 10 mL graduated cylinder, the 5 mL pipette, and the automatic pipettors. Display your calculated values in a clearly labeled table. Give the table an appropriate title, and be sure to use the correct number of significant digits and appropriate units when reporting your results.
2.
 - a) When measuring 60 mL of dH₂O, which measuring device seems to be more accurate, the 100 mL beaker or the 100 mL graduated cylinder? Be sure to **explain** your answer.
 - b) When measuring 60 mL of dH₂O, which measuring device seems to be more precise, the 100 mL beaker or the 100 mL graduated cylinder? Be sure to **explain** your answer.
 - c) Use the Student's t-test to test the null hypothesis that there is no difference in the accuracy of the 100 mL beaker and the 100 mL graduated cylinder when measuring 60 mL of dH₂O. Be sure to show your p value and explain your conclusions. **Remember, if your data support your hypothesis you should NOT conclude that your hypothesis is correct.**
3.
 - a) When measuring 3 mL of dH₂O, which measuring device seems to be more accurate, the 10 mL graduated cylinder or the 5 mL pipet? Be sure to **explain** your answer.
 - b) When measuring 3 mL of dH₂O, which measuring device seems to be more precise, the 10 mL graduated cylinder or the 5 mL pipet? Be sure to **explain** your answer.
 - c) Use the Student's t-test to test the null hypothesis that there is no difference in the accuracy of the 10 mL graduated cylinder and the 5 mL pipet when measuring 3 mL of dH₂O. Be sure to show your p value and explain your conclusions. **Remember, if your data support your hypothesis you should NOT conclude that your hypothesis is correct.**
4.
 - a) When measuring 0.17 mL of dH₂O, which measuring device seems to be more accurate, the 20 – 200 µL micropipettor or the 100 – 1,000 µL micropipettor? Be sure to **explain** your answer.
 - b) When measuring 0.17 mL of dH₂O, which measuring device seems to be more precise, the 20 – 200 µL micropipettor or the 100 – 1,000 µL micropipettor? Be sure to **explain** your answer.
 - c) Use the Student's t-test to test the null hypothesis that there is no difference in the accuracy of the 20 – 200 µL micropipettor and the 100 – 1,000 µL micropipettor when measuring 0.17 mL of dH₂O. Be sure to show your p value and explain your conclusions. **Remember, if your data support your hypothesis you should NOT conclude that your hypothesis is correct.**
5. Describe the experiment you carried out to answer the question in part E of the lab procedures. Display your results in a clearly labeled table. Explain your conclusions and support them by referencing your data and any statistical tests you performed. **Remember, if your data support your hypothesis you should NOT conclude that your hypothesis is correct.**
6. Describe the experiment you carried out to answer the question in part F of the lab procedures. Display your results in a clearly labeled table. Explain your conclusions and support them by referencing your data and any statistical tests you performed. **Remember, if your data support your hypothesis you should NOT conclude that your hypothesis is correct.**
7. Show the 3 digits that would appear in the display of each micropipettor when it is set to measure its minimum and maximum volumes. (Note: you need to draw 2 diagrams for each micropipettor, one showing the display when it is set to measure the minimum volume and another showing the display when it is set to measure the maximum volume.)