**Measurement Lab**

**Your Name**

**Lab partner’s name(s)**

**Mr. Wakeman**

**Class, Period, Date**

**Introduction –**

 **The purpose of this lab is to measure the distance in paper, mass of pennies and water, times of a falling object, and volume of a room. A further purpose in this lab is to learn to use lab equipment, record data, calculate error, and write a formal lab report.**

**Materials –**

 **Micrometer**

 **Vernier caliper**

 **Textbook paper**

 **Meter sticks – tape measure**

 **Electronic scales (0.01 g)**

 **Stop watch (Cell Phone)**

 **Rubber ball**

 **Etc.**

**Methods –**

 **Use a micrometer and a vernier caliper to measure the thickness of one piece and 100 pieces of paper. Measurements should be done in 3 different places on the paper and are reported in the write-up as individual numbers and averages. The average is reported in meters with the conversion factor 1 meter = 39.37 inches or 1 inch = 0.0254 meters.**

**Use a balance or scale to measure each penny’s weight. Record the penny’s year and mass, . . . etc.**

**Data –**

 **Tables with data (numbers and units). Report all numbers with averages and error estimates ( The only number which is not an average of numbers is the volume of the room.)**

 **This lab should have error estimates which are your best guess of how accurate the measurements are to the average. Report the numbers like this: volume of room = 100 ± 5 m3**

|  |
| --- |
| US Pennies (10) |
| Year | Mass (g) |
| 1960 | 3.14 |
| 1964 | 3.20 |
| 1964 D | 3.11 |
| 1990 | 2.52 |
| Ave | 2.83 ± 0.1 g |
| etc. |

 **Example: Distance – meters (m)**

 **Mass – grams (g)**

 **Time – seconds (s)**

**Volume – meters**

**cubed(m3)**

 **Graph of pennies weights:**



**Results / Discussion / Analysis –**

**What does the data mean? What can be learned from the data/experiment? Are your hypotheses correct? If not why not? Were there any mistakes or errors in the data or lab?**

**This section is the most important part of the lab and should be completed with as much detail as possible.**

**What are the sources of error? What could you do differently to improve the lab or data or correct the errors? What could you calculate from the data? Density? Acceleration due to gravity? Are you measuring mass or weight and what is the difference?**

**Honors Physics Classes – 1) Calculate the correct time for the fall and discuss the reason for the difference between the calculated value and your measured value. 2) Why do the pennies have two distinct masses? 3) Which is the more accurate, 1 paper thickness or 100 papers divided by 100, and why? 4) What is the measured mass of 1 ml (cc) of water and what should it be?**

**Conclusion –**

 **Single paragraph – What you did in the lab.**

 **Are your hypotheses true or false?**

**Explain what happened or what was true or false.**

**Parts of the Lab Report**

**1) Title – Name(s), Date, Class, Period**

**2) Introduction – What you will test.**

**3) Materials – List of every piece of equipment used**

**4) Methods – How did you make your measurements**

**5) Data – Tables of numbers. All the numbers generated. Graphs**

**6) Results – Heart of the lab. Discuss hypotheses – Were you right?**

 **Observations, Concerns, Errors, Improvements, . . . etc.**

**7) Conclusion - What you did in the lab.**

**Rubric for Measurement Lab**

**Lab neatly typed, one sided – 10 pts**

**All seven parts complete – 10 pts**

**Hypotheses included - 10 pts**

**Graph of pennies - 10 pts**

**Well written Results/Discussion- 10 pts**

**Numbers well calculated - 10 pts**

**Actual ball drop times - 10 pts**

**Why pennies bimodal - 10 pts**

**Actual mass of water - 10 pts**

**Error correction included - 10 pts**