Writing a Lab Report

*\*Note: This is written with the conservation of energy lab in mind, but it works for all lab reports.*

**Basic Rules:**

1. Do NOT use first person pronouns! Never say “I”, “we”, “our” or anything like that.

If you were writing your procedure, do NOT write this:

* 1. First, we cleared out our area.
	2. Then, we hung our pair of tennis balls off the ring stand.

DO write this:
 a. Clear the work area of obstacles.
 b. Hang a pair of tennis balls next to each other at equal heights, as shown in the …………picture below.

1. Use correct spelling and grammar!

	1. Make sure you know the difference between “affect” and “effect”
	2. DON’T use abbreviations! I shouldn’t need to tell you that “Take out ur ruler” is not okay on a school paper, ESPECIALLY a professional lab report.
2. Use correct formatting.

	1. Always **bold** headings for each section, like how I bolded **Basic Rules** at the beginning of this section.
	2. Paragraphs should be single spaced in 12 pt font. Put an extra blank line in between paragraphs.

**Specific Sections: Introduction (2 paragraphs, 8 – 12 sentences)**

1. Start with 2 paragraphs (4 sentences minimum) with some background info. In this lab, you might talk about conservation of energy/momentum in the first one, and talk about your research you did on the materials our balls were made of in the second. This is why you did the research day in the first place, **make sure you record your sources to cite in the bibliography!**
2. The last, smaller paragraph will include your purpose and hypothesis.

	1. Purpose: This is a SENTENCE that says what you’re trying to do/figure out in the lab. It is SPECIFIC, and MEASUREABLE.

	GOOD Purpose: This experiment will test the extent to which sport balls of different materials conserve mechanical energy in collisions.

BAD Purpose: We wanted to know which ball bounced better.

* 1. Hypothesis: This is your guess as to the answer to your problem. USE THE IF…THEN…BECAUSE FORMAT! If (the independent variable) is (changed/increased/decreased), then (the dependent variable) will (change/increase/decrease) because (reasons). The “because” part can be a second sentence if it gets too long.

	GOOD hypothesis: If the golf balls are collided, then the most mechanical energy will be conserved. The research from coolscience.com suggests that the layered polymer core of a golf ball is more elastic than the materials of the other balls.

	BAD hypothesis: I think the superballs will bounce best.

**Specific Sections: Methods (2 paragraphs/lists, as long as needed)**

1. Materials should be listed first. Make a bulleted list, include EVERYTHING you used AND how much/how many.

GOOD materials:
- Tennis balls (2)
- Golf balls (2)
- Superballs (2)
- String (about 0.5 m per ball)
- Ring stand
- Meter stick
- Triple beam balance

BAD materials:
balls, string, measurement tools,
2. Procedures should be written as the EXACT steps you did, so someone else could repeat your experiment. It should be written in PAST TENSE, since you’re reporting what you already did. You can do it as a numbered list, or as a paragraph – but NO PRONOUNS!

\*If something is hard to describe in words, I encourage you to include pictures, just like textbooks do! Just say to look at Figure 1, then attach a picture with that label and a brief description at the end. Hand draw it, use MS Paint, whatever.

Example GOOD procedures:
1. The area was cleared of obstacles.
2. Tennis balls were suspended from the ring stand at the same height, as shown in Figure 1. (see back page)
3. One ball was pulled back to the chosen initial height.
4. (and so on)

Example BAD procedures:
First we hung up the balls next to each other. Then we pulled them back and let it go. Jack measured the initial height, and Jill watched for how high the second ball it went on the swing.

**Specific Sections: Analysis (around 2-3 paragraphs total)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Tennis Ball | Golf Ball | Superball |
| Mass (g) | 54.5544 ± 0.005 | 26.1960 ± 0.005 | 17.2283 ± 0.005 |
| Trial 1 Height (cm) | 27.22 ± 0.05 | 44.00 ± 0.05 | 39.62 ± 0.05 |
| Trial 2 Height (cm) | 28.51 ± 0.05 | 44.29 ± 0.05 | 36.45 ± 0.05 |
| Trial 3 Height (cm) | 27.64 ± 0.05 | 44.87 ± 0.05 | 40.99 ± 0.05 |
| Average Height (cm) | 27.79 ± 0.05 | 44.38 ± 0.05 | 39.02 ± 0.05 |

1. Data first! You will need AT LEAST 1 table and 1 graph of your data. It will probably make more sense to have more than that. Label them as Figure 1, Figure 2, etc., and put a brief description after it.

GOOD data:

FIGURE 1:

Figure 1 shows values of heights collected and their average. The measured mass of each ball is also included in the first row. Note that for calculations, these values are later converted to kilograms and meters. Initial drop height was 50 cm.

FIGURE 2:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Tennis Ball | Golf Ball | Superball |
| Initial GE (J) | 0.26731 ± 0.032 | 0.12836 ± 0.032 | 0.08441 ± 0.032 |
|   | 0.14857 ± 0.042 | 0.11393 ± 0.034 | 0.06588 ± 0.036 |
| % difference | -44.4% | -11.2% | -22.0% |

Figure 2 shows calculated values of the gravitational potential energies, given the masses and heights in Figure 1. The percentage of energy loss is listed in the bottom row. All energies are adjusted to the correct units from the original data.

FIGURE 3:

Figure 3 is a graphical representation of the data in Figure 2. It shows the initial and final gravitational energies, along with the percent difference for each ball.

BAD data: anything else. You should manage at least this much.

1. Analysis: This is a written paragraph (remember, ~4 sentences) describing what you can see from your data, and any other relevant info from the lab. You are making no inferences here, just facts.

GOOD analysis (example): The superball has the lowest overall energy. However, is did not lose as much of it in the collision as the larger tennis ball did. (and so on)

BAD analysis: We think the golf ball did the best because of its core robber. (no guesses here!) $Type equation here.$
2. Errors: This is another full paragraph (still at least 4 sentences). Here you explain how you got the ± error numbers in the chart. You don’t have to show an actual calculation (this time). You should also talk about things that happened in the experiment that might cause additional errors.

GOOD (example): A rather large source of error was caused by the inaccuracy of the collisions. Several drops caused the second ball to bounce off to the side and begin to spin. This was especially apparent in the superballs and accounts for their wider spread of height measurements.

BAD (example): Some sources of error are the balls spinning, not being on center, and our eyes not being able to read the final height very well.

**Specific Sections: Conclusion (1-2 paragraph, ~5-8 sentences)**

1. ACCEPT/REJECT your hypothesis. You need to officially state if your original hypothesis was supported (accept), or not supported (reject). Specifically point out which parts of your data are the reasons for this.

GOOD: The hypothesis that the superballs would conserve the most energy must be rejected. The data in figure 2 clearly shows that it is only second best, and at that it was only half as good as the golf ball.

BAD: We were wrong, the tennis ball was not the best.

1. FUTURE CHANGES. The end of your conclusion is where you state things that you would change about the experiment, and that you would investigate further. You should discuss some ways to help minimize the errors you identified in your analysis first. After that, you can discuss things you would want to test further. For example, if your golf ball did the best you might want to investigate whether different types work better than others (liquid core vs. solid core maybe?).