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Physics Laboratory Report

Title 表題

Analyzing the Accelerating Motion of a Dynamics Cart with a Spark Timer

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Summary
First, we recorded the speed of the Dynamics Cart and later figured out its acceleration rate. The result was the same as the prediction written on the "Hypothesis" section of the worksheet: The movement of a cart is in constant-acceleration motion and does not depend on its weight. However, the cart did accelerate at a faster rate when the angle of the slope was increased.

good summary!

Addition/Correction 追加／修正		

・Meet a deadline ・Write logically ・Write clearly ・Write with your own words

・締切り守って ・論理的に ・わかりやすく ・自分のことばで

1 Due 提出期限	2 Summary 要旨	3 Intro. 序	4 Exp. 実験	5 Results/Disc. 結果/考察	6 Table/Fig. 表/図	7 ConcL/Opinion 結論/感想	8 Clearness わかりやすさ	9 Others 他
+	+			+	−	+	+	

* Write your report in Japanese or in English * Use this form as a front cover.
* Submit your reports by the seventh day after your lab. You can add to or correct your report: note when you have done this.

2. INTRODUCTION:

Objectives:

1. Recording and analyzing the movement of Dynamics Cart descending on a slope.
2. Finding the Acceleration
3. Angle of Slope.
4. Finding the relationship between acceleration and the mass of the Dynamics Cart.
5. Finding the gravitational acceleration.

Safety:

Carefully use heavy objects such as the Dynamics Cart.

Hypothesis:

The movement of a cart is in constant-acceleration and does not depend on its weight.

3. Experiment:

Preparation:

1. Spark Timer: There are two kinds of Spark Timers, A and B.
2. Dynamic Cart,
3. Weight (100 grams each)
4. Rail
5. Wood Board
6. Cramp
7. Extension Cord
8. Scale

Measurements Before Experiment:

1. Dynamics Cart - 495 grams
2. Weight - 100 grams each
3. Height of Rail: Trials 1~5 - 25.5cm
   Trials 6~10 - 23.5cm
4. Length of Rail: Trials 1~5 - 107cm
   Trials 6~10 - 120 cm
5. Angles of Rail: $\frac{\text{Height of Rail}}{\text{Length of Rail}} = \text{Tan}\theta$

   Trials 1~5 - $\frac{25.5\text{cm}}{107\text{cm}} = 0.238 \approx 13^\circ$

Trials 6~10 - $\frac{23.5\text{cm}}{120\text{cm}} = 0.194 \approx 11^\circ$

6. Gravitational Acceleration (g) = 9.80m/s^2

Experimental Process:

1. Create a slope using a piece of wood and rail. Using the height and length, calculate Tanθ to figure out the angle of the slope.
2. Measure the weight of the Dynamics Cart. Use the wooden piece and clamp the spark timer to position in a fixed position.
3. Put the paper through the spark timer and connect it to the cart on the slope.
4. Position the cart on the top of the slope.
5. Turn on the spark timer, and let go of the cart simultaneously.
6. When the cart reached to the bottom of the slope, turn off the spark time and remove the tape.
7. For every 6 dots on the tape, cut the strip of paper.
8. Use the strips of paper and place it next to each other on graph paper to measure the height.
9. Create a x-t and v-t graph for each trial.

4. Calculations and Results From Experiment:

Let "A" equal the average acceleration.

It's better to summarize the results using a table

Trial 1:
Weight: 0 x 100 grams
Total Weight: 495 grams

$A = \frac{(14.8-0.50)\text{cm/s}}{0.960\text{ s}} \approx 1.49\text{m/s}^2$

Trial 2:
Weight: 1 x 100 grams
Total Weight: 595 grams

$A = \frac{(14.3-0.10)\text{cm/s}}{1.04\text{s}} \approx 1.37\text{m/s}^2$

Trial 3:
Weight: 2 x 100 grams
Total Weight: 695 grams

$A = \frac{(14.9-0.90)\text{cm/s}}{1.07\text{ s}} \approx 1.31\text{m/s}^2$

Trial 4:
Weight: 3 x 100 grams
Total Weight: 795 grams

$A = \frac{(14.6-0.80)\text{cm/s}}{0.960\text{ s}} \approx 1.41\text{m/s}^2$

Trial 5:
Weight: 4 x 100 grams
Total Weight: 895 grams

$A = \frac{(15.3-0.70)\text{cm/s}}{1.07\text{s}} \approx 1.36\text{m/s}^2$

Trial 6:
Weight: 0 x 100 grams
Total Weight: 495 grams

$A = \frac{(12.4-0.20)\text{cm/s}}{1.27\text{s}} \approx 0.961\text{ m/s}^2$

Trial 7:
Weight: 1 x 100 grams
Total Weight: 595 grams

$A = \frac{(12.2-0.50)\text{cm/s}}{1.26\text{s}} \approx 0.928\ \text{m/s}^2$

Trial 8:
Weight: 2 x 100 grams
Total Weight: 695 grams

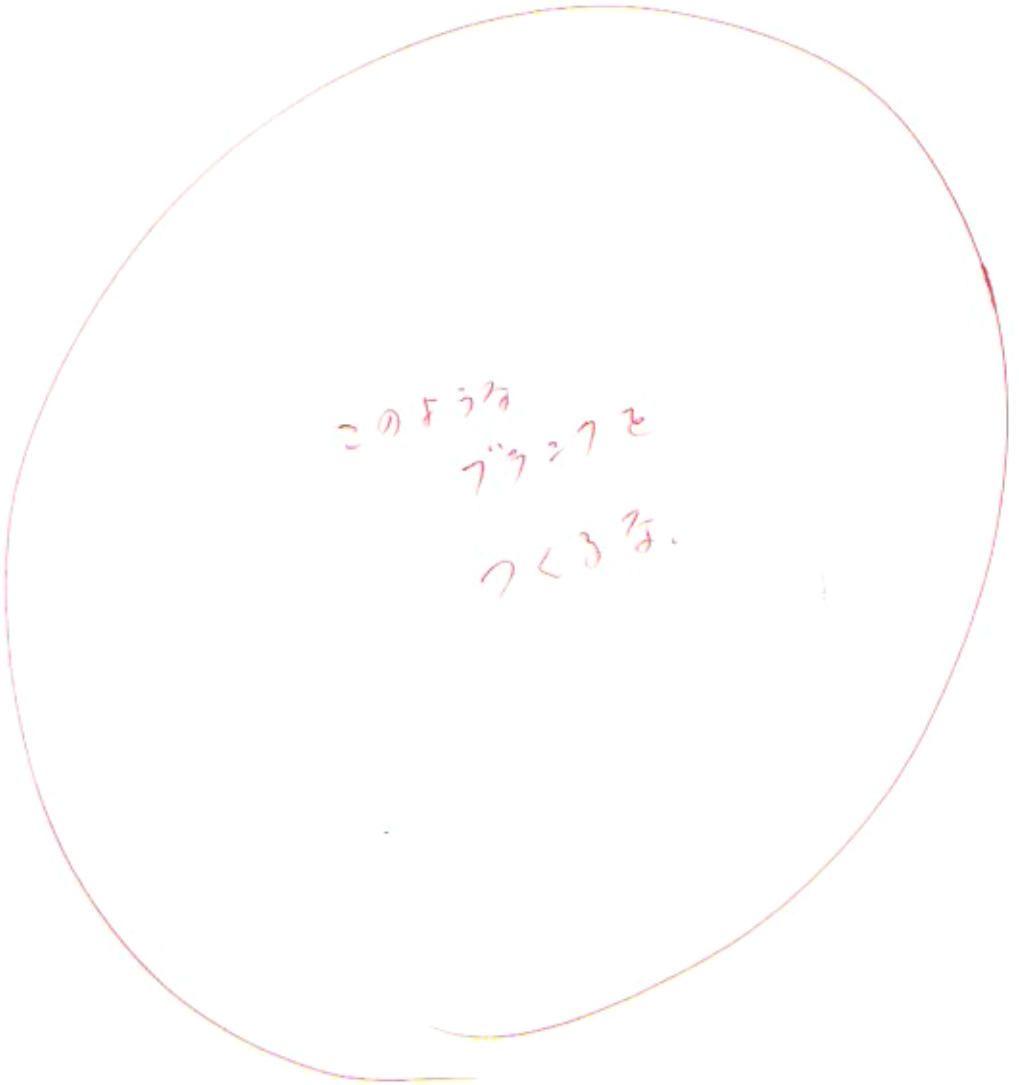
$A = \frac{(12.8-0.90)\text{cm/s}}{1.23\text{s}} \approx 0.967\ \text{m/s}^2$

Trial 9:
Weight 3 x 100 grams
Total Weight: 795 grams

$A = \frac{(12.4-0.90)\text{cm/s}}{1.12\text{s}} \approx 1.02\ \text{m/s}^2$

Trial 10:
Weight: 4 x 100 grams
Total Weight: 895 grams

$A = \frac{(12.7-0.70)\text{cm/s}}{1.13\text{s}} \approx 1.06\ \text{m/s}^2$



Observations:

From trials 1~5 the Dynamics Cart was at a 13° angle. For each trial the amount of weight put on the cart increased by 100 grams. All of the acceleration rates varied, but remained in the same range. The difference between the highest and lowest acceleration rates were 1.49 - 1.31 = 0.18 m/s^2. The similar patterns appeared in trials 6~10, (1.04 - 0.92 = 0.12 m/m^2).

However, when the angle was adjusted, the results changed drastically. When the angle was adjusted to a smaller value in trials 6~10, the acceleration rates had dropped as much as 5.7m/s^2 (13.7 - 9.2 = 5.7cm/s^2). Therefore it can be concluded that the angle of the slope has a great affect towards the acceleration of the cart. As the angle is closer to perpendicular to the ground, the acceleration rate increases.

Percent Error:

$$\frac{(\text{Largest Value}) - (\text{Smallest Value})}{\text{Average Value}}$$

Trials 1~5: $\frac{1.49-1.31}{1.39} \times 100\% = 12.9\%$

Trials 6~10: $\frac{1.06-0.928}{4.94} = 2.6\%$

5. Discussion

1. Why does the acceleration remain constant even if weight is added? Should there not be weight pushing the cart down the slope with the extra weight? Does it have to do anything with friction?
2. Why do vehicles and automobiles try to lighten their weight for a faster speed and acceleration if weight has no affect on acceleration?
3. Does the cart with less weight take in the resistance from the atmosphere?

What to Improve Next Time:

Next time, I would like to do the experiment with greater care in order to reduce the percent error of the experiment in general.

What Was Focused on During the Experiment:

1. Numbering the tapes so they do not get mixed up.
2. Flipped the cart over to prevent it from falling from damage.
3. Make sure the angle of the weight remains constant for each of the 5 trials.

6. Conclusion

The acceleration value and weight of the cart have no relevance with each other. The relevance that was found is that the angle controls the acceleration of the cart. If the acute angle is closer to perpendicular, the acceleration rate becomes greater.

7. Opinions About this Experiment:

Since this was the first experiment of the year, I was honestly worried that it may have been a failure. However all of the procedures went relatively smooth and I had a very fun time participating in this lab.

8. References

化学 I

Nice report.
Calculations, discussions and conclusion are reasonable
It must be much better if you draw a graph containing all of your data because readers can understand more easily.

生データをたくさんつけるのは良くない！

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