Phys 11A – Eiteneer
Lab 08 Write-up

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Lab section: _15_
Names of partners, if any: _Jean Paul La, Irvin Garnica_

Please answer the following questions. The answers should be typed.

1. Make a graph of x vs. t, and a graph of y vs. t, as instructed in the lab manual. Make sure to carefully label the graphs and the axes. Also, make sure to include a legend so that I can tell which part of data belongs to which puck.

Done! *All graphs and data are posted below!

2. What is the time of the collision? Is this value the same for x vs. t graph and y vs. t graph?

While we don't have the exact time, we measure it in "flashes" for our data. In this case, we determined our collision to occur at "flash 4". When you look at the image, you will notice that the spacing for the first puck on the left is consistent for the first 3 flashes until flash 4, where it appears to have moved less. This is because it has made contact with the larger puck, which has more mass and is stationary. This time value would be the same for both the x vs. t and y vs. t graph.

3. What are the units of kinetic energy?

The units of kinetic energy are joules, which is equal to kgm^2/s^2.

4. Is velocity of CM conserved during collision (use your data to answer this)? Should it be?

The velocity of CM is not conserved, nor should it be. With a collision like this, the total momentum of the system should be conserved, but that is about it.

5. Make a graph of Vcmx vs. t, and a graph of Vcmy vs. t. What information can you get from these graphs?

After making a graph of Vcmx vs. t and a graph of Vcmy vs. t we can tell that for both graphs there is a steady increase of grids with each flash.

6. Is total momentum conserved during collision (use your data to answer this)? Why or why not?

The total momentum is not conserved. While this is an isolated system, we believe that the issue can be attributed to the fact that the larger puck was stationary and had no momentum. When an object starts with a velocity of 0 and then ends up with some velocity (and vice versa), the momentum is changed in a way that implies that an external force is acting on this system.

7. Is total kinetic energy conserved during collision (use your data to answer this)? Why or why not?

The kinetic energy conserved during the collision is not conserved because prior to the collision the total kinetic energy was 1642.6845 joules and after the collision it was 1308.49815 joules.

8. What is your % change in kinetic energy? What does this value tell you?

Our percent change in kinetic energy is 20.34391571%. This value tells us that the collision was not elastic.

9. What could contribute to the errors? List at least 2 or 3 sources of error, specifying whether each of them contributes to random error or systematic error. Note: no credit will be given for listing "human error."

    1. **Failure to account for a factor (systematic) - When the two pucks collide, there was a sound that came from the collision. That sound wave carries energy. This could help explain a part of the error in our results. Also, the table that the experiment was performed on was not perfectly leveled as explained by Dr. Jensen, which could significantly affect our results in the vertical direction.**
    2. **Instrument resolution (random) - In this case, the instrument would be our eyes as we look at the image result. We can only be so accurate in determining what "tenth" of a grid that the center of the puck was on.**

All tables and data posted below!

What to submit:

- ✔ Your four data tables
- ✔ Four graphs: x vs. t (one graph for both pucks), y vs. t (one graph for both pucks), Vcmx vs. t, Vcmy vs. t
- ✔ Your answers to these questions
- ✔ Put all your tables, graphs, and answers to these questions in ONE document. Convert this document to PDF form, and submit INDIVIDUALLY, by going to Assignments, Lab 08.
- ✔ This will be due at 6pm ONE week from today.

Table 1: Positions

ma [grams]	78.8		mb [grams]	114.74		
T [flashes]	Xa [grids]	Xb [grids]	Xcm [grids]	Ya [grids]	Yb [grids]	Ycm [grids]
0	0.1	19.9	11.83841066	2.3	10.8	.33921669
1	5.6	19.9	14.07774104	5.9	10.8	.80496021
2	11.2	19.9	16.3577865	8.9	10.8	0.0264131
3	15.1	21.2	18.71637904	11.1	10.9	0.9814302
4	14.3	25.7	21.05847887	13	11.3	1.9921566
5	13.6	30	23.32272398	15	12	3.2214529
6	12.7	34.4	25.56482381	16.8	12.6	4.3100341
7	11.9	39	27.96620854	18.7	13.2	5.4393303
8	11		4.478660742	20.5		.34659501
9	10.1		4.112224863	22.3		.07946677
10	9.2		3.745788984	24		.77162343

Table 2: Velocities

X-direction

Before			After		
Vax [grids/flash]	Vbx [grids/flash]	Vxcm [grids/flash]	Vax [grids/flash]	Vbx [grids/flash]	Vxcm [grids/flash]
5.55	0	2.25968792	-0.84	4.43	2.284314354

Y-direction

Before			After		
Vay [grids/flash]	Vby [grids/flash]	Vycm [grids/flash]	Vay [grids/flash]	Vby [grids/flash]	Vycm [grids/flash]
3.3	0	1.343598223	1.85	0.59	1.10301023

Table 3: Momenta

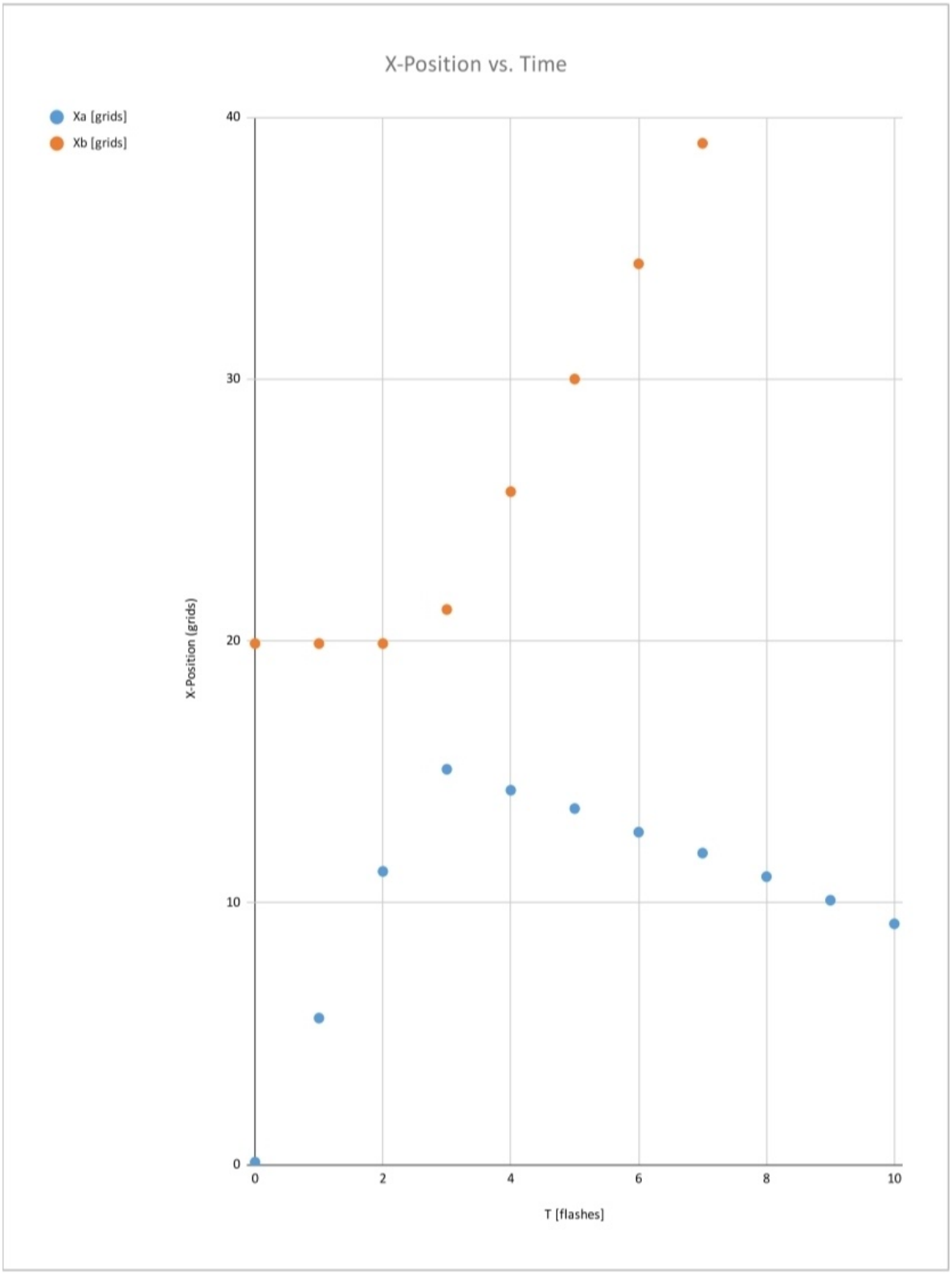
Before			After		
Pax [g*grid/flash]	Pbx [g*grid/flash]	Ptotal,x = Pax + Pbx	Pax [g*grid/flash]	Pbx [g*grid/flash]	Ptotal, x = Pax + Pbx
437.34	0	437.34	-66.192	508.2982	442.1062

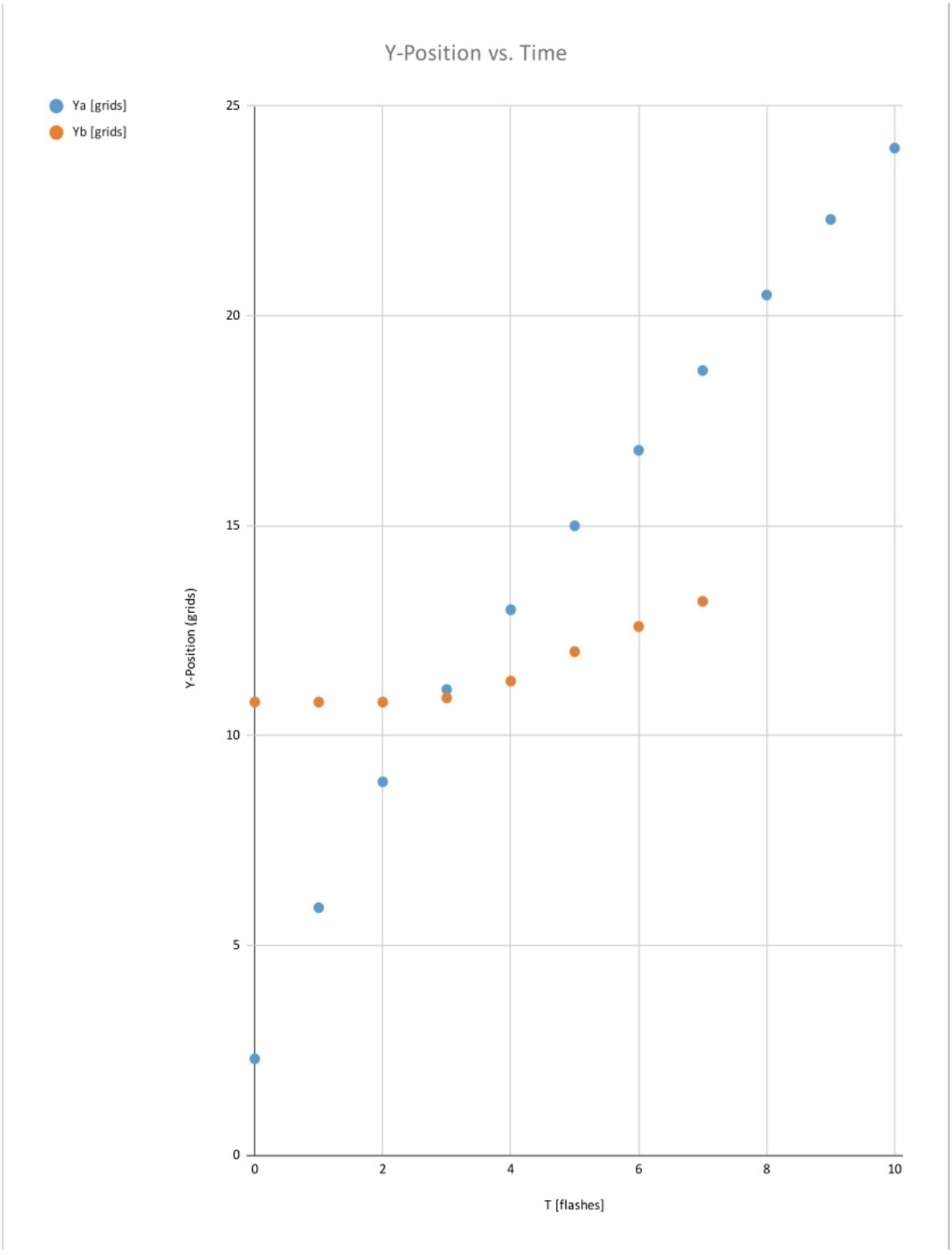
Before			After		
Pay [g*grid/flash]	Pby [g*grid/flash]	Ptotal,y = Pay + Pby	Pay [g*grid/flash]	Pby [g*grid/flash]	Ptotal,y = Pay + Pby
260.04	0	260.04	145.78	67.6966	213.4766

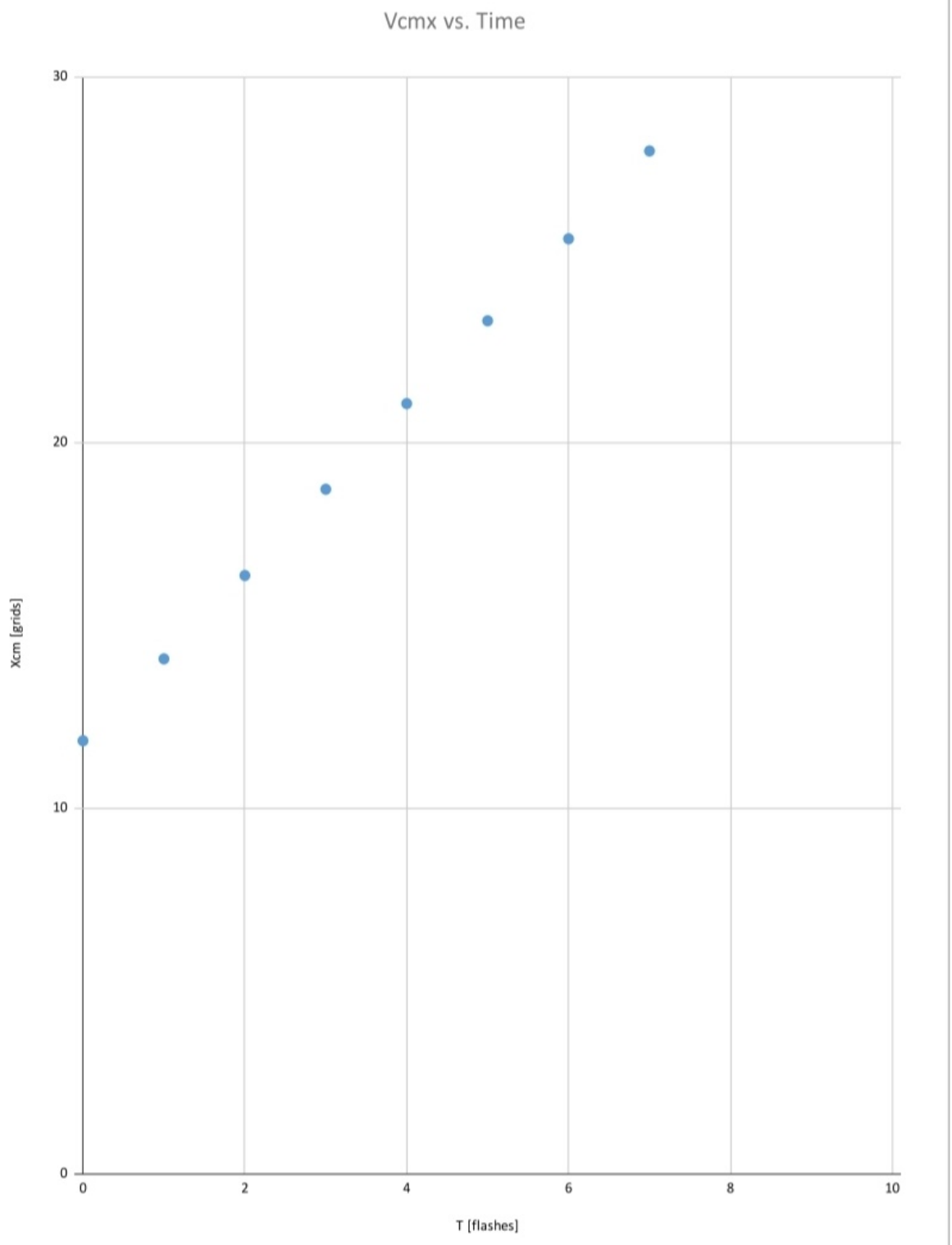
Table 4: Kinetic energies

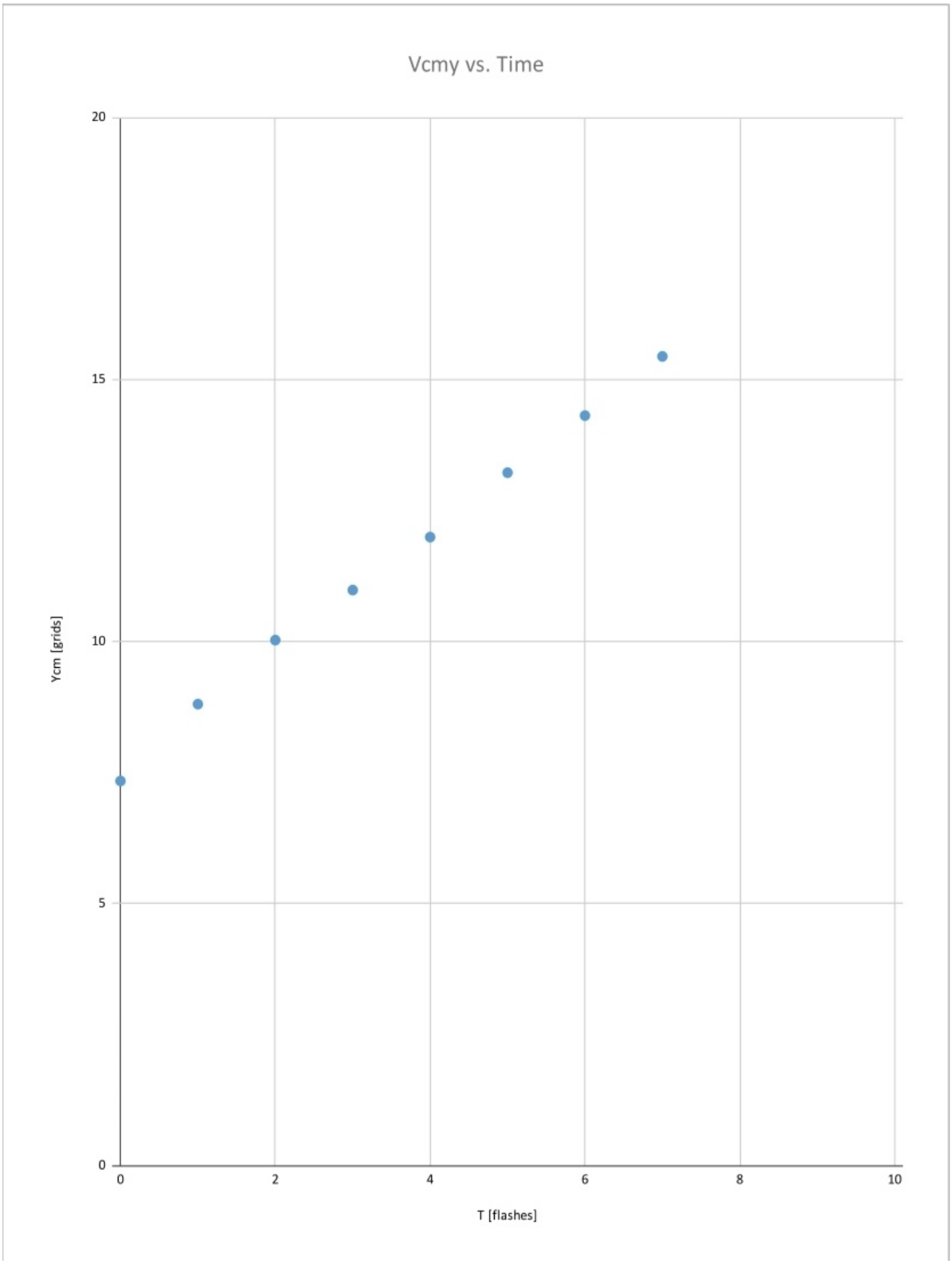
Ka, before [units]	Kb, before [units]	Ktotal, before [units]		Ka, after [units	Kb, after [units]	Ktotal, after [units]
1642.6845	0	1642.6845		162.64714	1145.85101	1308.49815
	Change in Ktotal, %	20.34391571				

*For all graphs below, Xa refers to the smaller puck on the left and Xb refers to the larger puck on the right.


X-Position vs. Time
Xa [grids]
Xb [grids]
X-Position (grids)
T [flashes]
0
10
20
30
40
0
2
4
6
8
10


Y-Position vs. Time
Ya [grids]
Yb [grids]
Y-Position (grids)
T [flashes]
0
5
10
15
20
25
0
2
4
6
8
10


Vcmx vs. Time
30
20
10
0
Xcm [grids]
0
2
4
6
8
10
T [flashes]


Vcmy vs. Time
20
15
10
5
0
Ycm [grids]
0
2
4
6
8
10
T [flashes]