Date of Lab 9/26 Date of Submission 10/3, 2018

Laboratory Report Cover for #1 Lab

Title Analyzing the Accelerating Motion with a Spark timer

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Summary

We recorded the movement of a Dynamics Cart descending on a slope by using a Spark timer. First, we changed the weight to add weights and then changed the angle of the slope. And we recorded data of displacement per seconds. Change of the angle affects acceleration of cart widely but change of the weight didn't affect acceleration of cart as much as change of the angle.

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

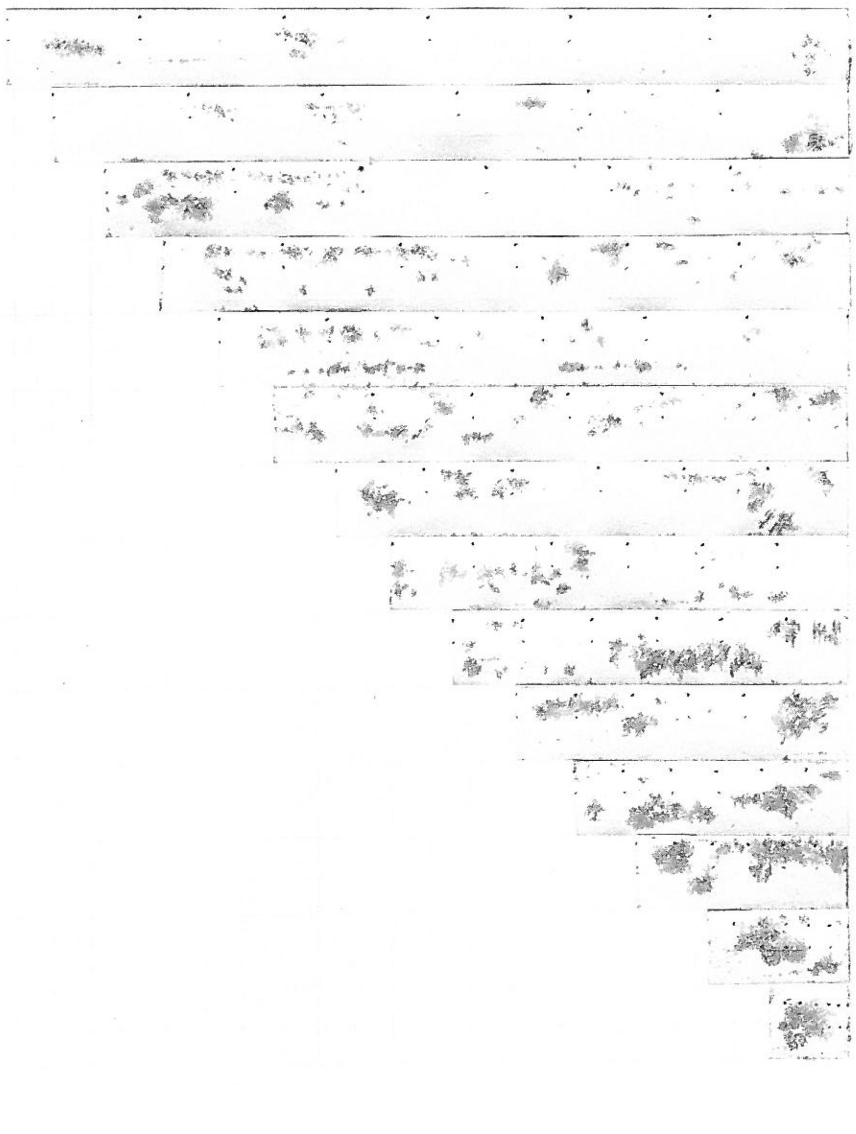
Teacher's Comments

Good data and graphs. Discussion is reasonable.

1	2	3	4	5	6	7	8	9
Due	Summary	Data copy	Results Tables	Fig. Graphs	Results Summary Table	Discussion & Opinions	Clearness	General

* Use this form as a cover sheet.
* Submit your reports by the seventh day after your lab.

No. 2



No. 3

PhysicsLab-001	Analyzing the Accelerating Motion with a Spark Timer

Example

Time	t	[s]	0	0.100	0.200	0.300	0.400	0.500	0.600	0.700	0.800	0.900
Displacement	x	[x 10^{-2} m]	0	2.35	6.25	11.65	18.60	27.15	37.24	48.85	61.95	76.65
Displacement per 0.100 s	Δx	[x 10^{-2} m]	2.35	3.90	5.40	6.95	8.55	10.09	11.61	13.10	14.70	
Average velocity	v	[x 10^{-2} m/s]	23.5	39.0	54.0	69.5	85.5	100.9	116.1	131.0	147.0	
Time at central point	t	[s]	0.05	0.15	0.25	0.35	0.45	0.55	0.65	0.75	0.85	

No. 1 Condition: $\theta = 11.6°$ No weight (540g) $a = \frac{14.0 - 30.0}{0.85 - 0.05} = \frac{1.14\ m/s}{0.80} =$ 1.42 m/s^2

Time	t	[s]	0	0.100	0.200	0.300	0.400	0.500	0.600	0.700	0.800	0.900
Displacement	x	[x 10^{-2} m]	0	3.0	7.5	13.4	20.7	29.4	39.5	50.9	63.8	78.2
Displacement per 0.100 s	Δx	[x 10^{-2} m]	3.0	4.5	5.9	7.3	8.7	10.1	11.4	12.9	14.4	
Average velocity	v	[x 10^{-2} m/s]	30.0	45.0	59.0	73.0	87.0	101.0	114.0	129.0	144.0	
Time at central point	t	[s]	0.05	0.15	0.25	0.35	0.45	0.55	0.65	0.75	0.85	

No. 2 Condition: $\theta = 11.6°$ 750g weight (+540g) $a = \frac{139.0 - 14.0}{0.85 - 0.05} = \frac{6.25\ m/s}{0.80} =$ 1.56 m/s^2

Time	t	[s]	0	0.100	0.200	0.300	0.400	0.500	0.600	0.700	0.800	0.900
Displacement	x	[x 10^{-2} m]	0	1.4	4.1	9.2	15.4	23.2	32.5	43.3	55.7	69.6
Displacement per 0.100 s	Δx	[x 10^{-2} m]	1.4	3.2	4.6	6.2	7.8	9.3	10.8	12.4	13.9	
Average velocity	v	[x 10^{-2} m/s]	14.0	32.0	46.0	62.0	78.0	93.0	108.0	124.0	139.0	
Time at central point	t	[s]	0.05	0.15	0.25	0.35	0.45	0.55	0.65	0.75	0.85	

No. 3 Condition: $\theta = 7.62°$ No weight (540g) $a = \frac{76.0 - 10.0}{0.85 - 0.05} = \frac{0.66\ m/s}{0.80} =$ 0.82 m/s^2

Time	t	[s]	0	0.100	0.200	0.300	0.400	0.500	0.600	0.700	0.800	0.900
Displacement	x	[x 10^{-2} m]	0	1.0	2.8	5.6	9.2	13.6	18.8	24.8	31.6	39.2
Displacement per 0.100 s	Δx	[x 10^{-2} m]	1.0	1.8	2.8	3.6	4.8	5.2	6.0	6.8	7.6	
Average velocity	v	[x 10^{-2} m/s]	10.0	18.0	28.0	36.0	48.0	52.0	60.0	68.0	76.0	
Time at central point	t	[s]	0.05	0.15	0.25	0.35	0.45	0.55	0.65	0.75	0.85	

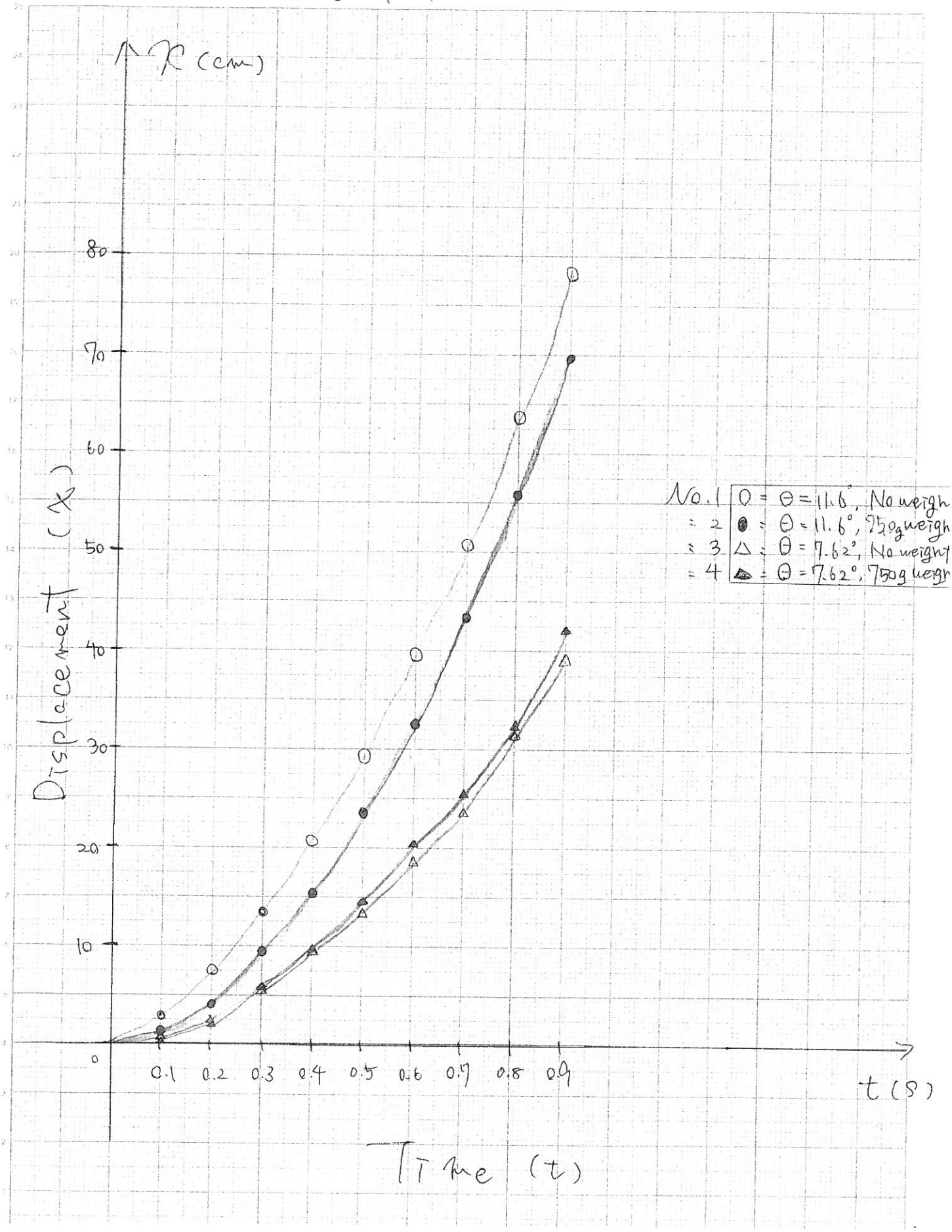
No. 4 Condition: $\theta = 7.62°$ 750g weight (+540g) $a = \frac{84.0 - 11.0}{0.85 - 0.05} = \frac{0.73\ m/s}{0.80} =$ 0.91 m/s^2

Time	t	[s]	0	0.100	0.200	0.300	0.400	0.500	0.600	0.700	0.800	0.900
Displacement	x	[x 10^{-2} m]	0	1.1	3.1	6.0	9.8	14.6	20.3	26.4	34.4	42.8
Displacement per 0.100 s	Δx	[x 10^{-2} m]	1.1	2.0	2.9	3.8	4.8	5.7	6.6	7.5	8.4	
Average velocity	v	[x 10^{-2} m/s]	11.0	20.0	29.0	38.0	48.0	57.0	66.0	75.0	84.0	
Time at central point	t	[s]	0.05	0.15	0.25	0.35	0.45	0.55	0.65	0.75	0.85	

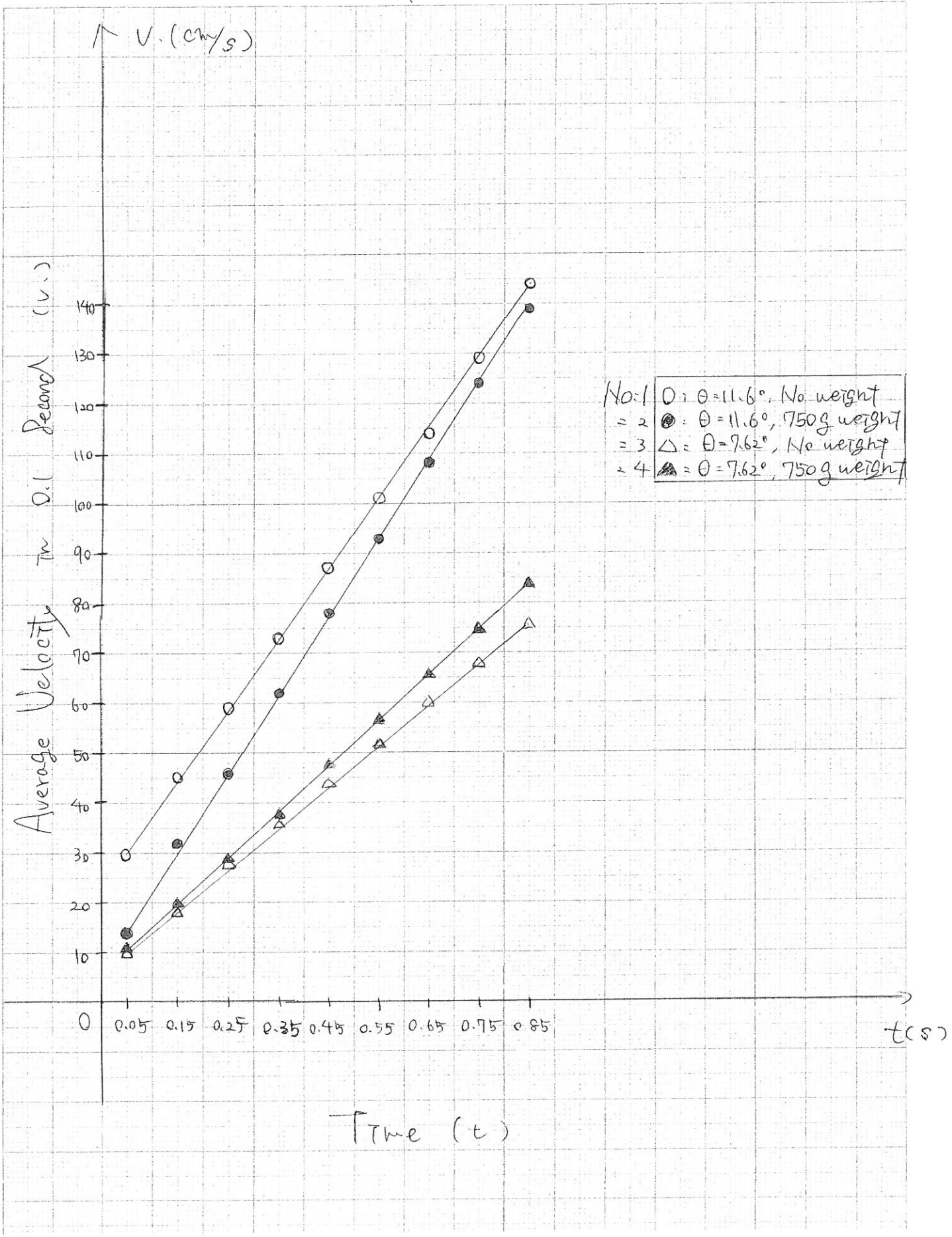
Condition:

Time	t	[s]										
Displacement	x	[x 10^{-2} m]										
Displacement per 0.100 s	Δx	[x 10^{-2} m]										
Average velocity	v	[x 10^{-2} m/s]										
Time at central point	t	[s]										

4. X-t graph


X (cm)
80
70
60
50
40
30
20
10
0
Displacement (X)
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
t (s)
Time (t)
No.1 ○ : θ = 11.6°, No weigh
: 2 ● : θ = 11.6°, 75g weigh
: 3 △ : θ = 7.62°, No weight
: 4 ▲ : θ = 7.62°, 75g weigh

5. V-t Graph 2


V. (cm/s)
Average Velocity in 0.1 Second (v.)
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
0.05
0.15
0.25
0.35
0.45
0.55
0.65
0.75
0.85
t(s)
Time (t)
No:1 ○ : θ = 11.6°, No weight
= 2 ● : θ = 11.6°, 750g weight
= 3 △ : θ = 7.62°, No weight
= 4 ▲ : θ = 7.62°, 750g weight

Summary of results

Experiment	Angleθ	Mass(gram)	Acceleration
No.1	11.6°	(540)	1.42m/s^2
No.2	11.6°	750+(540)	1.56m/s^2
No.3	7.62°	(540)	0.82m/s^2
No.4	7.62°	750+(540)	0.91m/s^2

Discussion

As shown in data 1, the acceleration rates of experiment No.1 and No. 2 are close and No. 3 and No. 4 are also close even the weight of the cart is different because we added weights to cart to change the weight. From this results, the acceleration rates of the cart do not depend on its weight. But when we changed the angle of slope, the acceleration changed widely.

And as shown in graph 2, slope of No.4 is bigger than slope of No.3 which has no weight. Therefore, the weight of the cart affects its average velocity.

Opinion

I was very surprised because I thought change of the weight of cart affects the acceleration. And I learned the acceleration is bigger when the angle of the slope is big.