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

Laboratory Report Cover for #1 Lab

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

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Summary
In this lab, we analyzed the motion of a ~~dynastics~~ dynamic cart with a spark time. To ~~such~~ investigate the motion, we changed the slope of ~~the~~ a track, and the mass of the cart. We checked these situation by using a spark timer, then we wrote the table of them and v-t, and x-t graph. By these results, the mass of the cart ~~is~~ does not ~~connect to the change of~~ affect the acceleration a lot. However, the slope of the track affects the acceleration of the cart directly. Also, by the v-t graph, the motion of the cart ~~is~~ has been confirmed as constant acceleration motion.

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

Teacher's Comments
Good data, beautiful graph and reasonable discussion. Method to obtain acceleration is correct.

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.

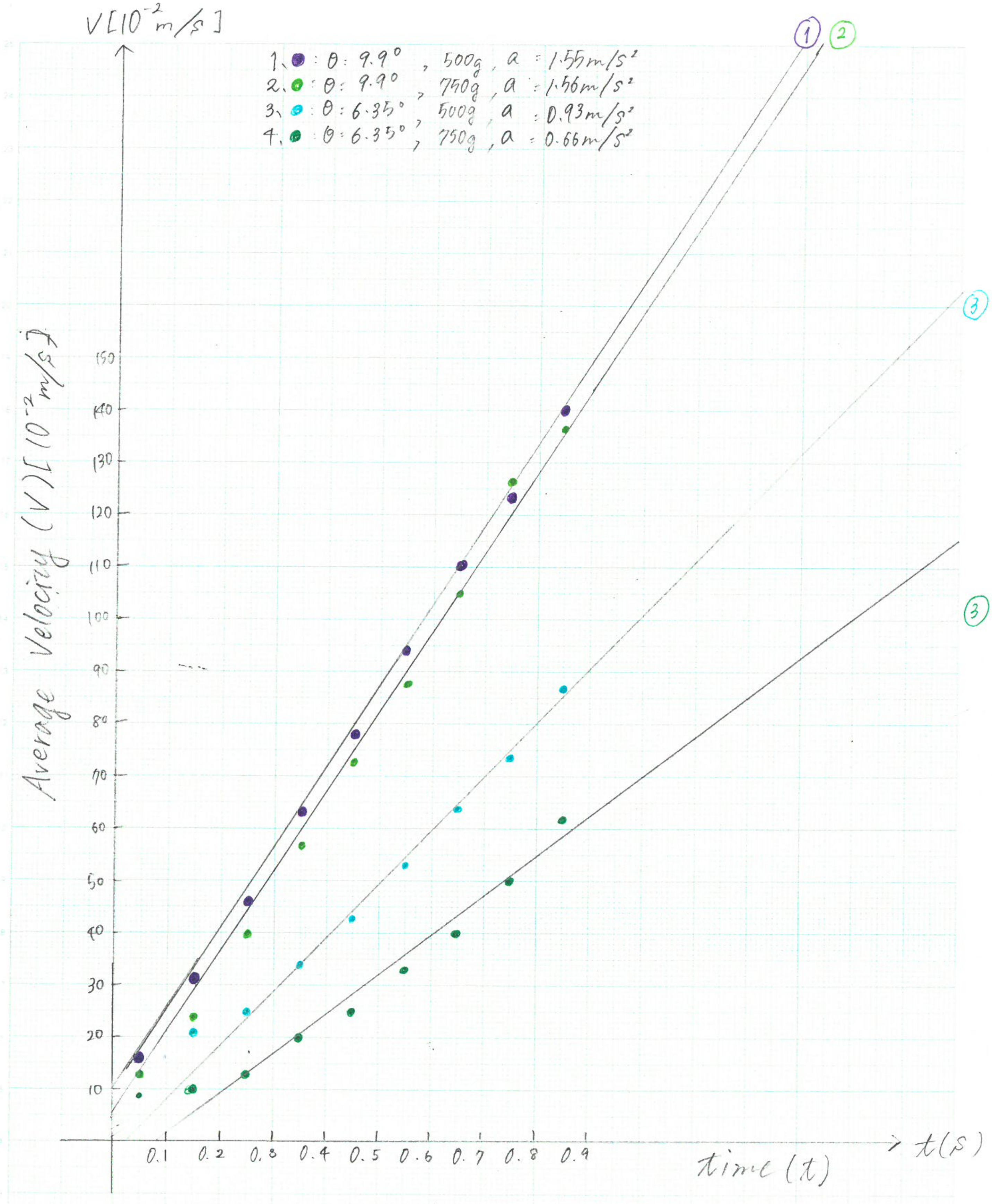

Figure 1. V-t graph

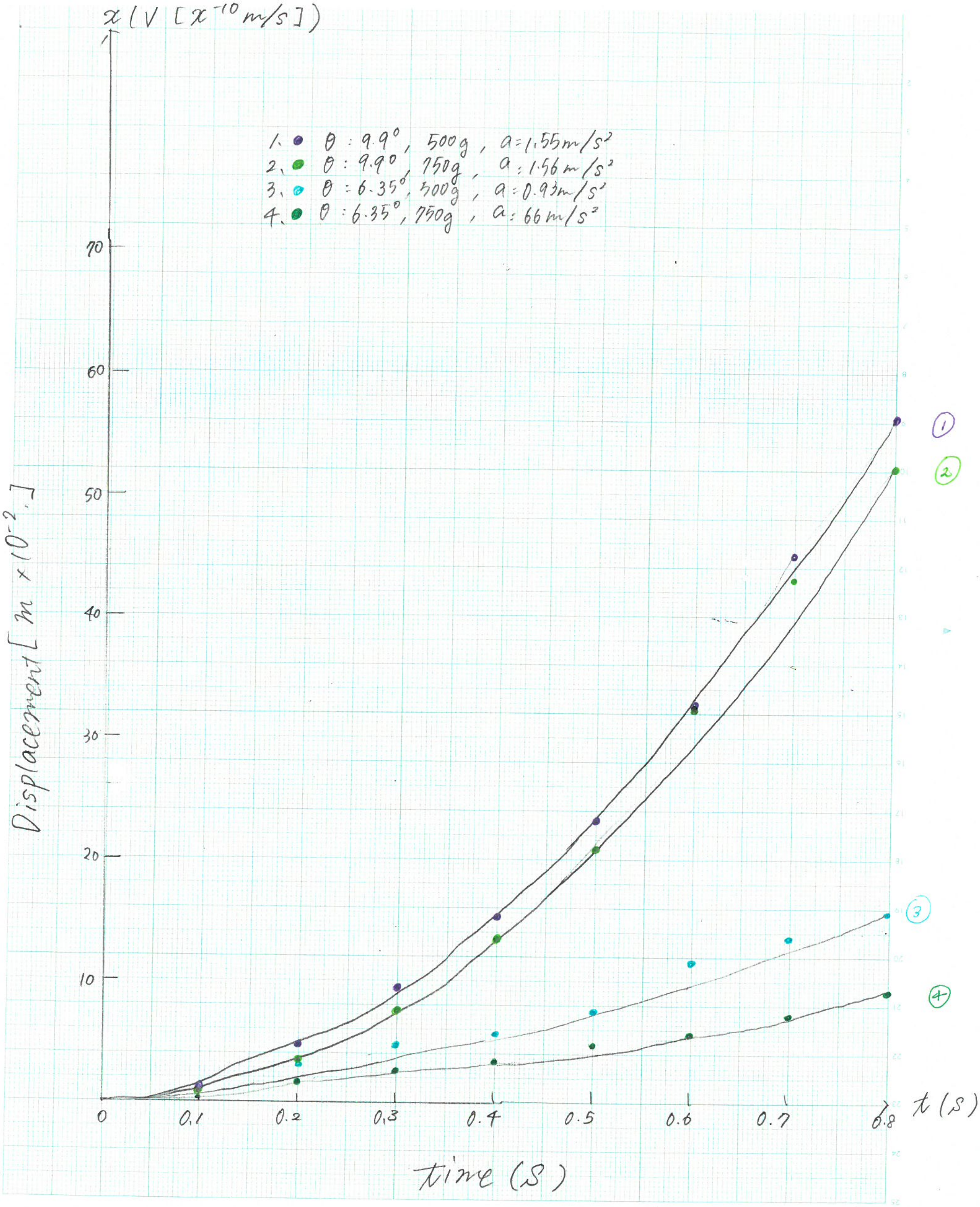

Fig. 2 x-t graph

Result

<u>Acceleration</u>

Condition1; the slope of v-t straight graph① through(0,10)and (0.8,136) from Figure1

Acceleration①=Slope of v-t graph① = $\Delta Y/\Delta X$

(14.0-1.6)/(0.85-0.05)=1.55m/s^2

Condition2; Acceleration②=Slope of v-t graph②(From Figure 1)

=(13.7-1.2)/(0.85-0,.05)=0.56m/s^2

Condition 3; Acceleration③=Slope of v-t graph③(From Figure 1)

=(8.7-1.2)/(0.85-0.05)=0.93m/s^2

Condition 4; Acceleration④=Slope of v-t graph④(From Figure 1)

=(6.2-0.9)/(0.85-0.05)=0.66m/s^2

	Angle(°)	Weight(g)	Acceleration Rate(m/s^2)
Condition 1	9.9°	500g	1.55
Condition 2	9.9°	750g	1.56
Condition 3	6.3°	500g	0.93
Condition 4	6.3°	750g	0.66

Discussion

When we pay attention to the v-t graph, the line of all conditions look like straight. It proved the acceleration of them is constant acceleration motion.

When we watch the condition1 and condition2, it did not change these acceleration almost all, even though the mass of the cart is not same. Also, the graph-lines are parallel. It means the angle of slope are same, so these acceleration are same. The difference of these condition is only the mass of the cart. Therefore, the mass of the cart does not connect the change of the acceleration.

Thus , when we watch the condition 3 and condition 4 it should prove same things. However, my result was wrong. The acceleration of conditions 3 is 0.93m/s^2, but the acceleration of the condition is 0.66m/s^2. The slope of these V-T graph is not parallel, so it is not same acceleration. When we make the graph which we used the tapes, all condition except for the condition 3 are straight line, but only condition 3 was little cabe. I think the reason why we make a this mistake was the timing which wereleace the cart moved over a little, so the displacement between 0 and 0.2 is wrong. Anyway, the acceleration must not change even though the mass of the cart become heavier.

When we compare condition 1 and condition 3,the acceleration of the cart of condition 1 moves faster than condition 2's. Also, when we make a comparison between condition 2 and 3, the movement of the condition 2 is faster than another one. The difference of them is only the slope of the trak. Therefore, when the slope of the track become bigger and bigger, the acceleration became faster. larger

Conclusion

- All tracks moves as constant acceleration motion
- The mass of the cart does not affect the acceleration of the carts
- The angle of the track affect the acceleration of the cart

  → Including the angle of the track, the acceleration of the cart become faster and faster

  ※Comparing condition 3 and 4, the acceleration were not same because I mistaked during the experience.

Opinion

I was very shocked my result was wrong because the acceleration of the condition 3 and 4 were too different. I noticed the small miss change the result very much. Therefore, it is very difficult to find the function at physics, so I respect the Newton more! Also, I was surprised at the result which the mass of the carts does not affect to change acceleration. However, I noticed even though 10 people ride the shinkansen, the acceleration of the shinkansen does not change. Therefore, the experimental of the physics connect to our life, so it is a bit interesting for me.

Tohei

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	

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]										

Condition: 1 $\theta = 9.943 = 9.9°$, 500g, $a = \frac{140-16}{0.85-0.05} = 1.55 m/s^2$

Time t [s]	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Displacement x [x 10^{-2} m]	0	1.6	4.7	9.3	15.6	23.4	32.8	43.8	56.1	70.1
Displacement per 0.100 s Δx [x 10^{-2} m]	1.6	3.1	4.6	6.3	7.8	9.4	11.0	12.3	14.0	
Average velocity v [x 10^{-2} m/s]	16	31	46	63	78	94	110	123	140	
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: 2 $\theta = 9.9°$, 750g, $a = \frac{137-12}{0.85-0.05} = 1.56 m/s^2$

Time t [s]	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Displacement x [x 10^{-2} m]	0	1.2	3.6	7.6	13.3	20.6	29.4	39.9	52.0	65.7
Displacement per 0.100 s Δx [x 10^{-2} m]	1.2	2.4	4.0	5.7	7.3	8.8	10.5	12.7	13.7	
Average velocity v [x 10^{-2} m/s]	12	24	40	57	73	88	105	127	137	
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: 3 $\theta = 6.35$, 500g, $a = \frac{87-12}{0.85-0.05} = \frac{0.75 m/s}{0.80 s} = 0.93 m/s^2$

Time t [s]	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Displacement x [x 10^{-2} m]	0	1.2	3.3	4.6	5.9	7.7	9.6	11.7	13.8	15.9
Displacement per 0.100 s Δx [x 10^{-2} m]	1.2	2.1	2.5	3.4	4.3	5.3	6.4	7.4	8.7	
Average velocity v [x 10^{-2} m/s]	12	21	25	34	43	53	64	74	87	
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: 4 $\theta = 6.35°$, 750g, $a = \frac{62-9}{0.85-0.05} = \frac{0.53 m/s}{0.80 s} = 0.6625 m/s^2$

Time t [s]	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Displacement x [x 10^{-2} m]	0	0.9	1.9	2.3	3.3	4.5	5.8	7.3	9.0	11.2
Displacement per 0.100 s Δx [x 10^{-2} m]	0.9	1.0	1.3	2.0	2.5	3.3	4.0	5.0	6.2	
Average velocity v [x 10^{-2} m/s]	9	10	13	20	25	33	40	50	62	
Time at central point t [s]	0.05	0.15	0.25	0.35	0.45	0.55	0.65	0.75	0.85	