Undergraduate physics at AUT

Explorations, Student Teachers, & Seminars

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Run 1

Time	Gate State	Distance	Velocity	Acceleration
T	G	D	V	A
s		m	m/s	m/s^2
0.00000	Blocked	0.000		
0.03856	Unblocked			
0.06486	Blocked	1.087		9.76
0.08566	Unblocked			
0.10398	Blocked	1.470		9.79
0.11995	Unblocked			
0.13483	Blocked	1.772		9.80
0.14830	Unblocked			
0.16113	Blocked	2.029		9.74
0.17299	Unblocked			
0.18447	Blocked	2.256		9.76
0.19519	Unblocked			
0.20566	Blocked	2.463		9.76
0.21548	Unblocked			
0.22520	Blocked			
0.23439	Unblocked			

LAB 1 — PICKET FENCE FREE FALL

31-07-2015

Collaborators: ?

PURPOSE: measure the acceleration of a freely falling body (g) to better than 0.5% precision using a Pikket Fence and a Photogate

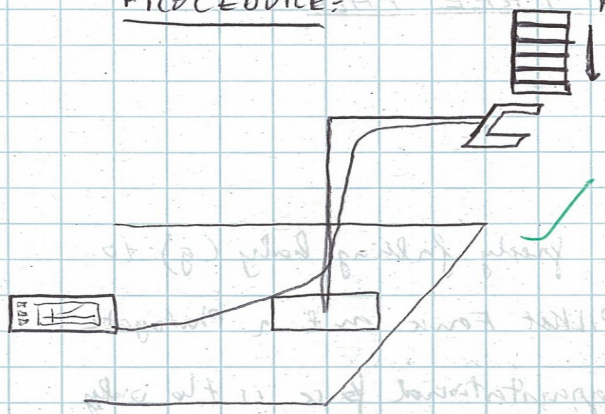
An object is in free fall when earth's gravitational force is the only one acting (we consider that air resistance is absent or so small to be ignored).

HYPOTHESIS: If an object is in free fall, then the object will accelerate at a constant rate

MATERIALS:

- Labquest 2
- Picket Fence
- Vernier photogate
- clamp or ring stand to secure Photogate
- Computer with labquest 2 software

PROCEDURE:



We will drop the picket fence through the photogate to collect the data into the DIG of Labquest 2

The data will show a graph of distance vs time and velocity vs time

We will analyse this data to determine the acceleration

RESULTS:

We dropped the picket fence 6 times and we got the acceleration from the DIG 1

Data Table

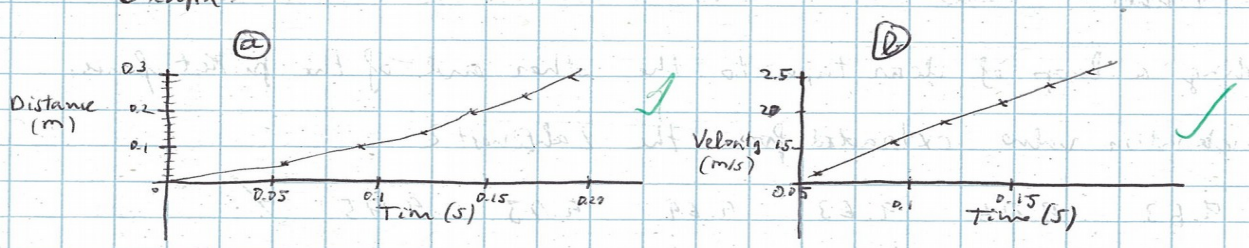
TRIAL	1	2	3	4	5	6
slope (m/s^2)	9.81	9.79	9.76	9.92	9.73	9.62
		Minimum	Maximum		Average	
Acceleration (m/s^2)		9.62	9.92		9.77 ± 0.15	

Acceleration due to gravity, g — 9.81 m/s^2

Precision — 1.94 %

The value obtained is within the accepted values

Graph:



(a) distance vs time graph: the shape of this graph is a gradual function with a ~~small~~ ~~slope~~ tangent of small slope ✓

(b) velocity vs time graph: the shape of this graph is a straight line, ✓

Deviation ~~of the~~ in the data: $\sigma = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}}$

$$\sigma = \sqrt{\frac{0.0016 + 0.0004 + 0.0001 + 0.0225 + 0.0016 + 0.0225}{5}} = \sqrt{0.00974} =$$

$\sigma = 0.09869$ — measure of the average deviation ✓

Printed graph of from one trial:

	Time (s)	Distance (m)	Run 1 Velocity (m/s)	Ac
1	0.00000	0.000		
2	0.03016			
3	0.05353	0.050	1.197	
4	0.07266			
5	0.08989	0.100	1.553	
6	0.10504			
7	0.11935	0.150	1.841	
8	0.13229			
9	0.14480	0.200	2.091	
10	0.15625			
11	0.16749	0.250	2.314	
12	0.17789			
13	0.18819	0.300	2.515	
14	0.19777			
15	0.20737	0.350		
16	0.21629			
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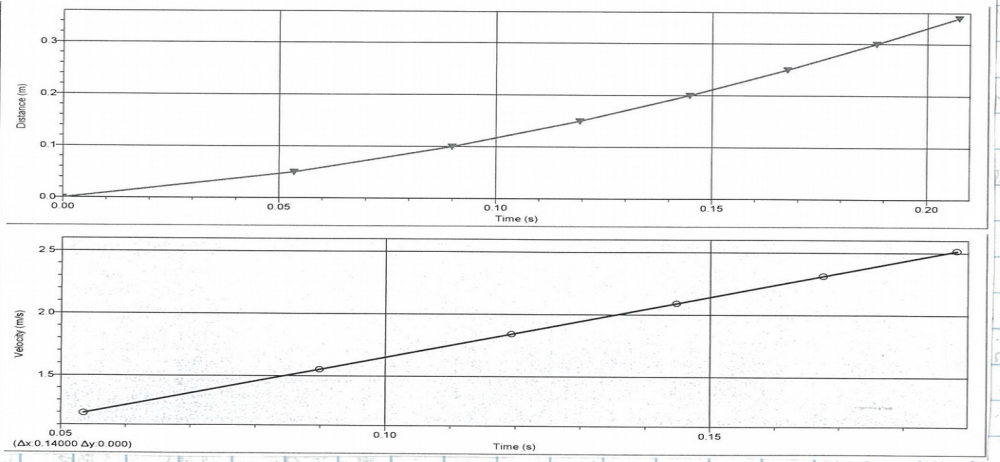
Gate State



GRAPH 1