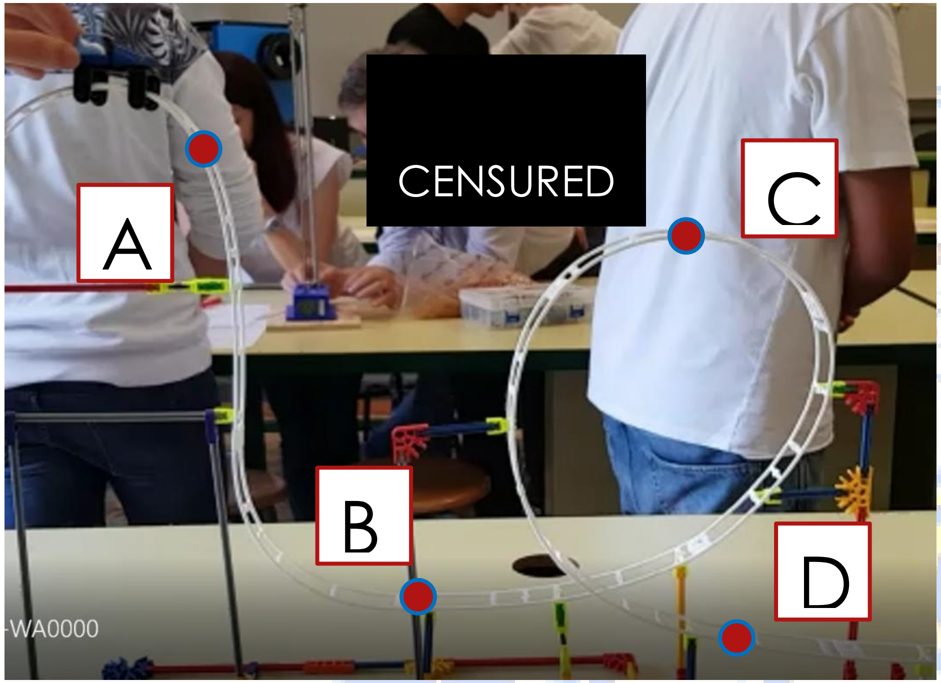
KATUN Model 3asa



This is the model that we have built in class with components of other rollcoasters.

THYPHOON Belgium

Given:

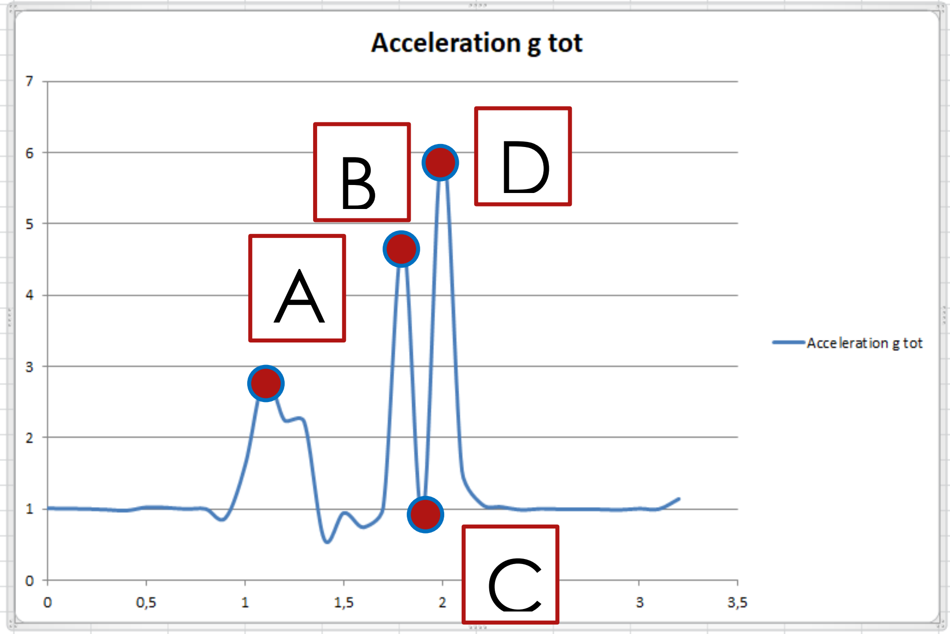
m = 24,02 g

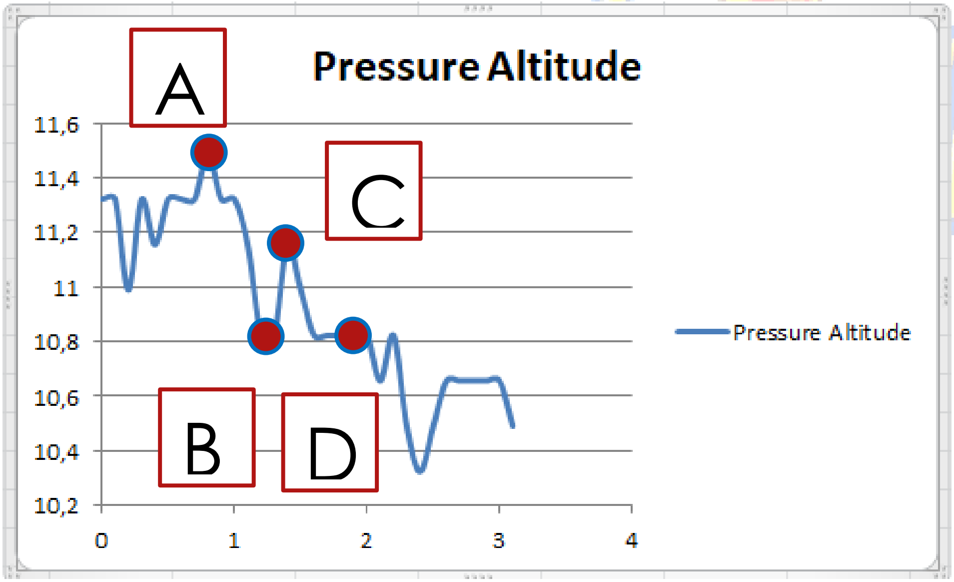
Ybeginning = 1,02 m

Ytop looping = 0,55 m

Ybottom looping = 0,20 m

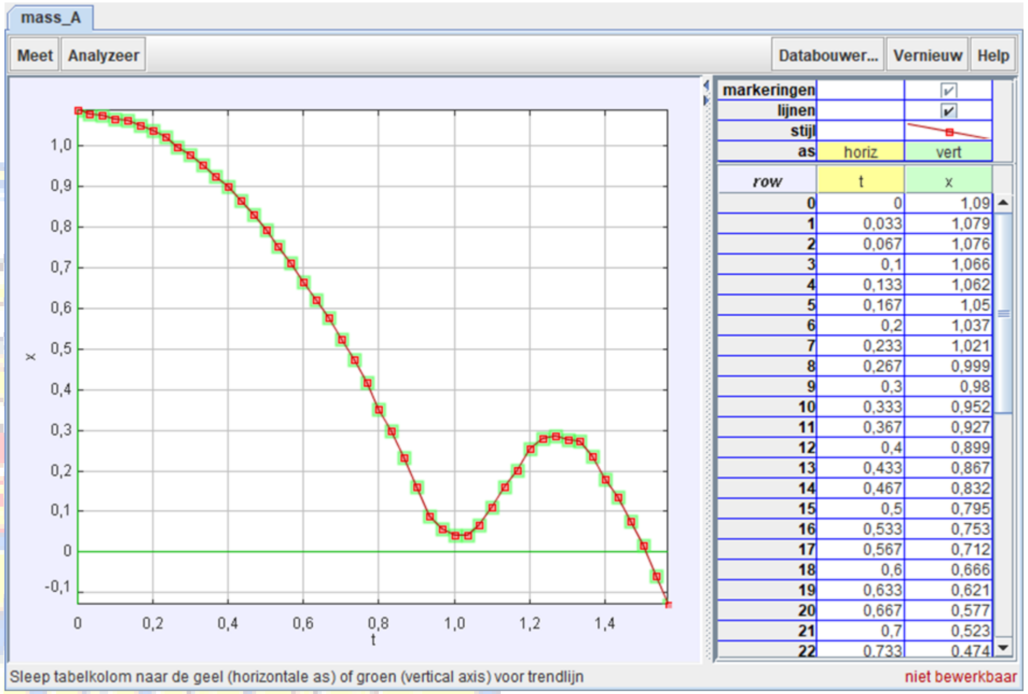
Rlooping = 0,35 m


Acceleration g tot
7
6
5
4
3
2
1
0
0
0,5
1
1,5
2
3
3,5
A
B
C
D
Acceleration g tot


Pressure Altitude
11,6
11,4
11,2
11
10,8
10,6
10,4
10,2
0
1
2
3
4
A
B
C
D
Pressure Altitude

Ghraps

y(x)


mass_A
Meet
Analyzeer
Databouwer...
Vernieuw
Help
markeringen
lijnen
stijl
as
horiz
vert
row
t
x
0 0 1,09
1 0,033 1,079
2 0,067 1,076
3 0,1 1,066
4 0,133 1,062
5 0,167 1,05
6 0,2 1,037
7 0,233 1,021
8 0,267 0,999
9 0,3 0,98
10 0,333 0,952
11 0,367 0,927
12 0,4 0,899
13 0,433 0,867
14 0,467 0,832
15 0,5 0,795
16 0,533 0,753
17 0,567 0,712
18 0,6 0,666
19 0,633 0,621
20 0,667 0,577
21 0,7 0,523
22 0,733 0,474
1,0
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
-0,1
x
0
0,2
0,4
0,6
0,8
1,0
1,2
1,4
t
Sleep tabelkolom naar de geel (horizontale as) of groen (vertical axis) voor trendlijn
niet bewerkbaar

(x(t))

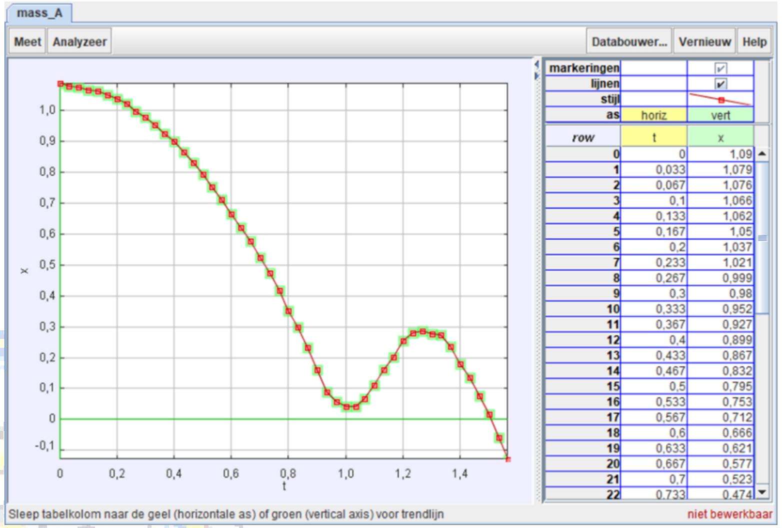
In order to make these recordings we used a detector given to us by the school.

POINT A:

The carrel gains an acceleration from our hand.

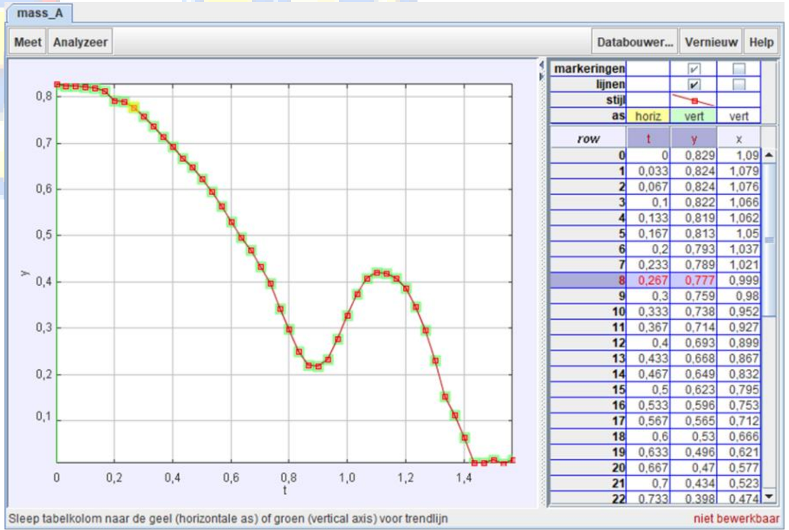
POINT B:

The carrel has a high acceleration thanks to the slope.



row	t	x
0	0	1,09
1	0,033	1,079
2	0,067	1,076
3	0,1	1,066
4	0,133	1,062
5	0,167	1,05
6	0,2	1,037
7	0,233	1,021
8	0,267	0,999
9	0,3	0,98
10	0,333	0,952
11	0,367	0,927
12	0,4	0,899
13	0,433	0,867
14	0,467	0,832
15	0,5	0,795
16	0,533	0,753
17	0,567	0,712
18	0,6	0,666
19	0,633	0,621
20	0,667	0,577
21	0,7	0,523
22	0,733	0,474

y(t) → Epot (J/kg) (at the beginning, in the middle and at the end)



row	t	y	x
0	0	0,829	1,09
1	0,033	0,824	1,079
2	0,067	0,824	1,076
3	0,1	0,822	1,066
4	0,133	0,819	1,062
5	0,167	0,813	1,05
6	0,2	0,793	1,037
7	0,233	0,789	1,021
8	0,267	0,777	0,999
9	0,3	0,759	0,98
10	0,333	0,738	0,952
11	0,367	0,714	0,927
12	0,4	0,693	0,899
13	0,433	0,668	0,867
14	0,467	0,649	0,832
15	0,5	0,623	0,795
16	0,533	0,596	0,753
17	0,567	0,565	0,712
18	0,6	0,53	0,666
19	0,633	0,496	0,621
20	0,667	0,47	0,577
21	0,7	0,434	0,523
22	0,733	0,398	0,474

POINT C:

The carrel is at the summit of the loop and has the lowest acceleration.

POINT D:

The carrel has the highest acceleration thanks to the slope of the loop.

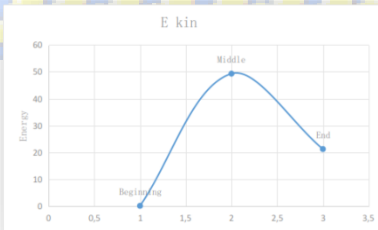
Calculations:

$V_{beginning}$ (t = 0.033)= = 0.1140842233 m/s
V_{middle} (t = 0.733)= = 2.026457007 m/s
V_{end}(t = 1.533)= = 1.331 m/s

The velocity increases until the looping, during the looping it decreases.

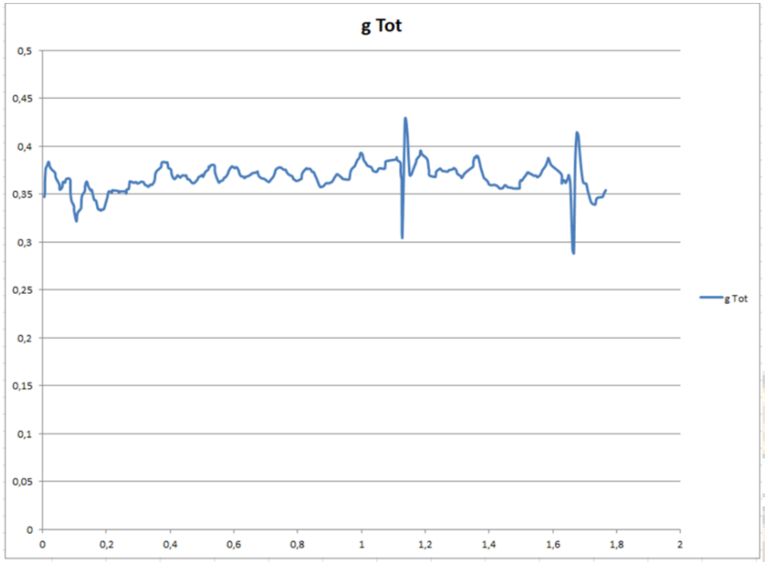
$ax_{beginning}$ (t = 0.067)= = 4.031922866 m/s^2
ax_{middle} (t = 0.733)= = 2.33157672 m/s^2

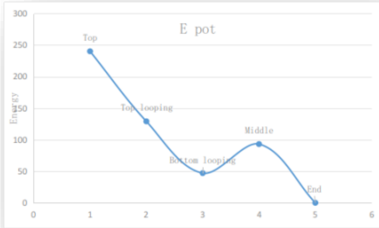
ax_{end}(t = 1.500)= = 11.07687343 m/s^2



E_{kin}= (m*v²) /2

$E_{kin\ beginning}$ = (24.02 * (0.1140842233)^2) /2 = 0,1563126722 J
$E_{kin\ middle}$ = (24.02 * (2.026457007)^2) /2 = 49,3194013 J
$E_{kin\ end}$ = (24.02 * (1.331)^2) /2 = 21,27644761 J





This is the graph of the real rollercoaster. We had some troubles understanding where it starts the loop or it finishes so we will post all the graph hoping you will understand the same.

<u>Epot= m*g*h</u>

$E_{pot\ beginning}$ (0.067) = 24.02 * 9.81 * 1.02 = 240,348924 J

$E_{pot\ top\ looping}$ = 24.02 *9.81 * 0.55 = 129,59991 J

$E_{pot\ bottom\ looping}$ = 24.02 * 9.81 * 0.20 = 47,12724 J

$E_{pot\ middle}$ (0.733) =24.02 * 9.81 * 0.398 = 93,7832076 J

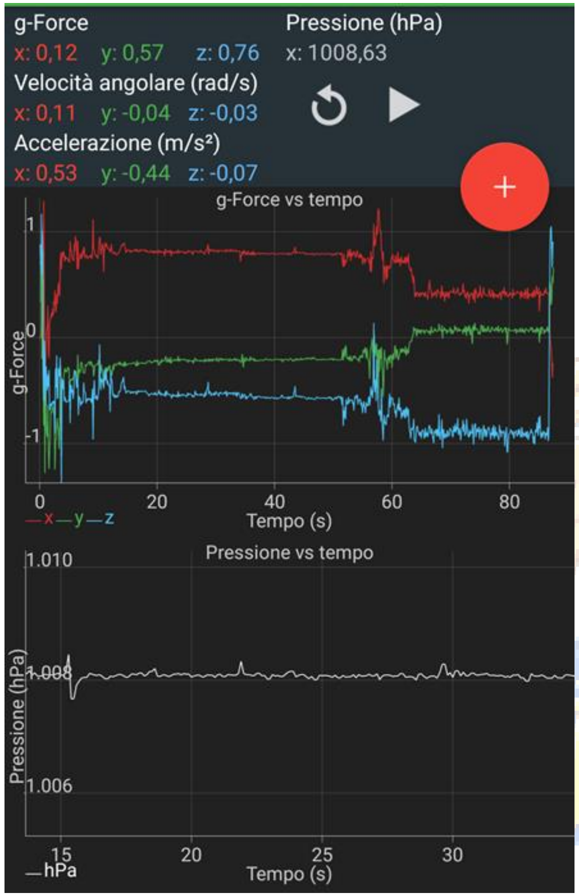
$E_{pot\ end}$ (1.500) = 24.02 * 9.81 * 0 = 0

<u>Emech= Ekin + Epot</u>

$E_{mech\ beginning}$ = 0.1563126722 + 240,348924 = 240,5052367 J

$E_{mech\ middle}$ = 49.3194013 + 93.7832076 = 143,1026089 J

$E_{mech\ end}$ = 21,28+0 = 21,28 J



Problems scalemodel:

We needed a heavier ball because it needed to make a looping and our looping was big. With a heavier ball, the potential gravitation energy was bigger and that results in a higher velocity. At first it just fell, but with the heavier ball the problem was solved.

Table with energy

	E_{kin}	E_{pot}	E_{mech}
Beginning	0,16 J	240,35 J	240,51 J
Middle	49,32 J	93,78 J	143,10 J
End	21,28 J	0 J	21,28 J
Average	23,58 J	111,38 J	134,96 J

Mechanic energy change

The mechanic energy decreases because the ball loses energy because there's friction.