|  |  |  |
| --- | --- | --- |
|  | https://encrypted-tbn2.gstatic.com/images?q=tbn:ANd9GcQJWZebUasDm_zuaWp6qpGhWONfKunlhE7huLZ0oUcLa71Gde9VHz_xi9o | DeBron-Q.jpg  VRIJE ASO.SCHOOL |
| Let’s go for a ride! The physics of roller-coasters | | |
| **Creating a scale model and performing measurements on the model** | | |

In this file we are going to discuss the results of our scale model. We got the data from the analyses of the program *tracker*. We calculated three kinds of energy. Kinetic, potential and mechanical energy. We made our conclusions based on the difference of these energy. We could not calculate Vx  because there's no horizontal movement.

|  |
| --- |
| Ekin = m . v2 |

**The kinetic energy at the beginning:**

Data: m = 60 g = 60 . 103 kg

Vb = - 88, 097 m/s

Wanted: Ekin, b

Solution: Ekin, b = 60 . 103 kg . (- 88,97) m/s = - 5,3 . 106 J

**The kinetic energy in the middle**

Data: m = 60 g = 60 . 103 kg

vm = -115 m/s

Wanted: Ekin, m

Solution: Ekin, m = 60 . 103 kg . (-115) m/s = - 6,9 . 106 J

**The kinetic energy at the end**

Data: m = 60 g = 60 . 103 kg

ve = - 250 m/s

Wanted: Ekin, e

Solution: E kin, e = 60 . 103 kg . (-250) m/s = - 1,5 . 107J

**The difference in kinetic energy**

Δ Ekin = Ekin, e – Ekin,b

= - 1,5 . 107 - (- 5,3 . 106) = - 1,4 . 107J

|  |
| --- |
| Epot = m . g . h |

**The potential energy at the beginning**

Data: m = 60 g = 60 . 103 kg

g = 9,81 m/s2

h = 38 m

Wanted: Epot, b

Solution: Epot, b = 60 . 103 kg . 9,81 m/s2 . 38 m = 2,2 . 107 J

**The potential energy in the middle**

Data: m = 60 g = 60 . 103 kg

g = 9,81 m/s2

h = 18 m

Wanted: Epot, b

Solution: Epot, b = 60 . 103 kg . 9,81 m/s2 . 18 m = 1,1 . 107 J

**The potential energy at the end**

Data: m = 60 g = 60 . 103 kg

g = 9,81 m/s2

h = 2 m

Wanted: Epot, b

Solution: Epot, b = 60 . 103 kg . 9,81 m/s2 . 2 m = 1,2 . 106 J

**The difference in potential energy**

Δ E pot= Epot, e – Epot,b

= 1,2 . 106 J - 2,2 . 107 J = - 2,0 . 107J

|  |
| --- |
| Emech = Ekin + Epot |

**The mechanical energy at the beginning**

Data: Ekin, b = - 5,3 . 106 J

Epot, b = 2,2 . 107 J

Wanted: Emech, b

Solution: Emech, b = Ekin,b + Epot,b = - 5,3 . 106 + 2,2 . 107 J = 2,7 . 10 7J

**The mechanical energy in the middle**

Data: Ekin, m = - 6,9 . 106J

Epot, m = 1,1 . 107J

Wanted: Emech, m

Solution: Emech, m = Ekin,m + Epot,m = - 6,9 . 106 + 1,1 . 107J = 5,1 . 106 J

**The mechanical energy at the end**

Data: Ekin, e = - 1,5 . 107J

Epot, e = 1,2 . 106 J

Wanted: Emech, e

Solution: Emech, e = Ekin,e + Epot,e = - 6,9 . 106 J + 1,1 . 107J = 4,1 . 106J

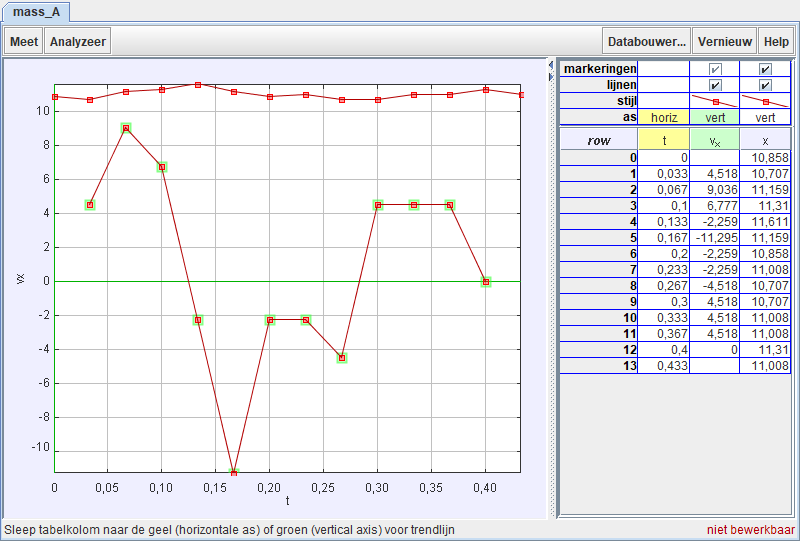
**The difference in mechanical energy**

Δ E mech= Emech, e – Emech,b

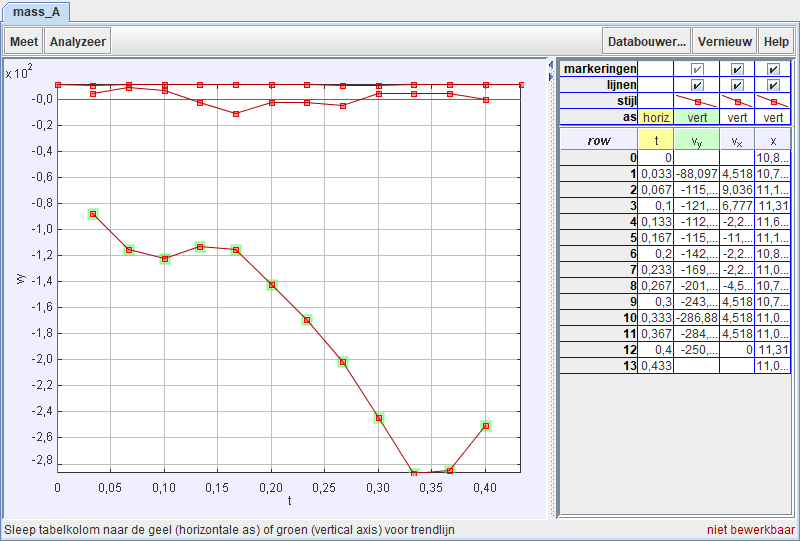
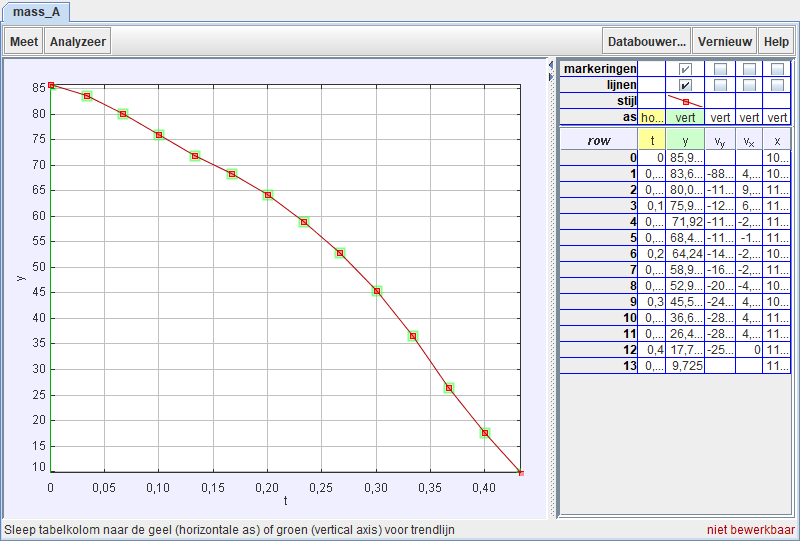
= 4,1 . 106J - 2,7 . 10 7J = - 2,2 . 107J

**Conclusion**

We can conclude that our results are not completely correct, because we used a scale model. We realized that our vx-graphic is not important, because we have a drop tower and the graphic is based on the left and right movements in its drop. The speed increases when it drops, that’s also what we thought, because it only falls because of the gravity. It’s not a smooth line because it slipped at the end.

This graph is not useable because there’s no horizontal movement.

This is the Vx(T) graph and shows the speed of the falling cage. It’s not a smooth graph because it slipped at the end.



This is the Y(T) - graph and shows the height of our cage in function of the time