

P4.3e Calculate the changes in kinetic and potential energy in simple mechanical systems (e.g., pendulums, roller coasters, ski lifts) using the formulas for kinetic energy and potential energy

A 1Kg pendulum with a length of 3m from the pivot to the center of mass is raised up until the string is horizontal. How much PE has it gained?

$$\text{PE} = mgh$$

When dropped, how much KE does it gain at the bottom of its fall?

As much PE as it had!

With passengers, a certain roller coaster car has a mass of 800Kg. The height of the first big hill is 70 meters, and then it falls down to a height of 5 meters above the ground. The height of the second hill is 30 meters. What is the PE at the top of the first hill? (the car is at rest for a moment before it begins the fall down the first hill)

$$\text{PE} = mgh$$

The PE at the top of the second hill?

$$\text{PE} = mgh$$

How much PE was "lost" in between the two hills?

The difference between the previous two answers

Where did the PE go?

Into the KE of the car & passengers

What is the KE of the car at the top of the second hill?

This is the same answer as 3 answers previous!

What is the speed of the car at the top of the second hill?

$$\begin{aligned}\text{PE} &= \text{KE} \\ mgh &= mv^2/2 \\ v &= \text{sqrt}(2gh)\end{aligned}$$