

Energy Skate Park: Basics

Grade: 9th - 10th

https://phet.colorado.edu/sims/html/energy-skate-park-basics/latest/energy-skate-park-basics_en.html

Brief Notes:

Kinetic energy and gravitational potential energy are two common forms of energy. Kinetic energy is associated with motion of objects, whereas gravitational potential energy is associated with configuration of objects.

Mathematically, it is given as:

$$\text{Kinetic Energy (K)} = \frac{1}{2} mV^2$$

$$\text{Gravitational Potential Energy (U)} = mgh$$

Sum of kinetic and potential energy is called as mechanical energy. In absence of any resistance (like: friction), mechanical energy of a system is always conserved (or constant). Though, energy can change its form from one to another.

Explore:

Intro:

Click on Grid. Keep Skater at any height (for ex- 4 m). Does skater come back at same height? If yes, what can be the reason?

Which energy does the skater possess when he is at highest position? How does this energy change when skater comes towards ground? Click on Bar Graph to verify your answer.

How does the total energy of skater change? From energy graph, how can you conclude whether track has friction or not?

What are the points of maximum and minimum kinetic energies of skater? Explain the reason.

Now, change (increase/decrease) the mass of skater. Notice, carefully, how does it affect energy and speed? Explain reason to support your observation.

Change (increase/decrease) the height of skater. Notice how does it affect energy and speed? Explain reason to support your observation.

Similarly, select second and third tracks one by one. Change the mass and height of skater. Notice the speed and energies as skater changes his position.

Friction:

Click on Bar Graph, Grid and Speed. Place skater at some height (for ex- 4 m). Notice initial total energy, kinetic energy, potential energy, thermal energy and speed.

How does the total energy, kinetic energy, potential energy, thermal energy and speed change with time? Explain the reason.

Note the approximate time that skater takes to come to rest.

Change (increase/decrease) mass of skater and place him at same height. Notice again the time taken by skater to come to rest. Do you observe any difference in time?

What change do you observe in the amount of total energy and thermal energy?

Change (increase/decrease) the value of friction. How does it affect stopping time of skater?

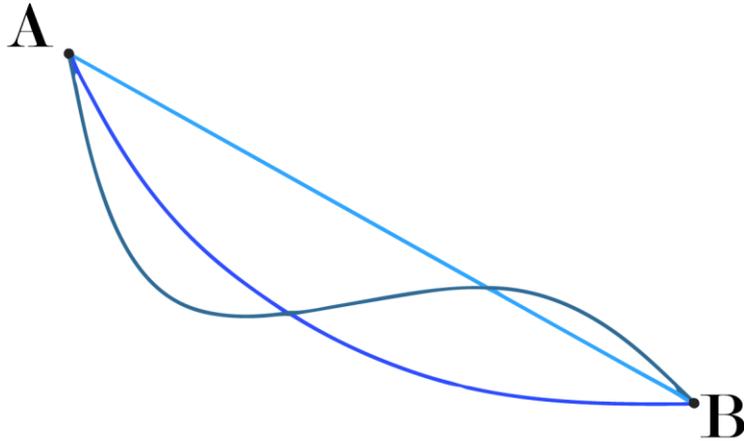
Similarly select second and third tracks one by one. And check the effect of friction on energies and speed.

Playground:

Make your own track. And observe change in energy and speed for different tracks. As slope of track changes, how does the speed change?

Think:

In which of the following cases, speed of ball will be maximum when ball leaves frictionless tracks.



A ball is released from a height on a friction track with initial kinetic energy 10 joule, and potential energy 5 joule. Find out total thermal energy generated when ball comes to rest on ground.

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