

Inquiry Approaches

Initial Inquiry

What are the two types of mechanical energy?

Mechanical energy is described as kinetic energy (energy of motion) or potential energy (energy of position). The total mechanical energy of a system is the sum of the system's kinetic energy and the potential energy.

What is the difference between stable and unstable equilibrium?

A stable equilibrium is a position to which an object will return to when moved. The object does this as the position is a lower energy state. An unstable equilibrium is a position to which an object will not return to when moved. The object does this as the position is a higher energy state.

Experimental Procedure Inquiry

How many more dominoes would be needed to knock over a domino as tall as the school?

The largest domino is 1.3 metres tall. A domino can knock over another domino that is up to 1.5 times its own size. If the school is four storeys tall, then six or seven additional dominoes are needed.

Can you explain how kinetic and potential energy relate to these demonstrations?

At the start of this demonstration, there is gravitational potential energy stored in each of the dominoes, because their centre of mass is above the ground. Once the first domino is pushed, its potential energy is converted to kinetic energy as the centre of mass falls. This kinetic energy allows the smaller domino to knock over the next domino, converting more potential energy to kinetic.

In-Depth Inquiry

Can you explain how the little domino is able to knock over the larger ones?

The dominoes are in an unstable equilibrium. For any two dominoes, the force exerted by the smaller domino when it hits the next domino in line is enough to push the large domino's centre of mass past its base. This causes the larger domino to topple and push the next domino in line. The dominoes must be spaced so that when the smaller domino falls, it hits the larger domino on the same level as the larger domino's centre of mass. Placing the dominoes too far apart will cause the smaller domino to merely graze the larger domino; placing them too close together will prevent the smaller domino from acquiring enough kinetic energy to push the larger domino's centre of mass off its base.

Can you explain how the dominoes are able to fall upstairs? Why does this not defy gravity?

As the domino on the lower step falls, it is able to knock the domino on the next step out of its unstable equilibrium. The second domino does the same to the domino on the following step, triggering the reaction. None of them actually fall up, they just cause the one above them to fall. Since the final position of each domino's centre of mass is lower than its starting position, gravity is being obeyed.