SPH3U0 5.2 - Energy Activities Lesson

Energy - provides the ability to do **work**. Objects possess energy when they are moving or at rest, and energy is constantly changing forms. There are several different types of energy …
Kinetic Energy (E_k) - can be calculated using the formula;

$$E_k = \frac{1}{2}mv^2$$

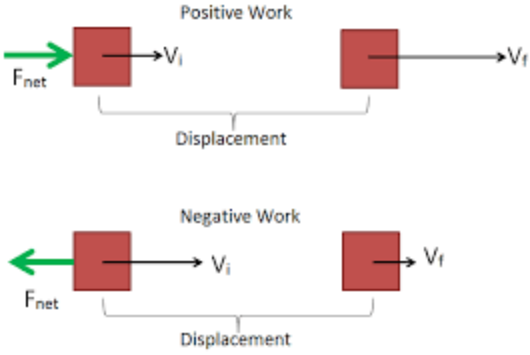
… find energy in Joules by multiplying 0.5, mass (in kg), and velocity (in m/s) squared.

Eg: hammering a nail into a wall;
-the hammer has kinetic energy as it swings toward the nail
-work is done on the nail as the hammer uses a force on the nail over a distance (pushing the nail into the wood

Easy example: a 100m sprinter weighs 65kg, and runs at 11m/s. What is the value of the sprinter's kinetic energy?

Rearranging the kinetic energy equation: A 0.25kg baseball has 25.0J of kinetic energy as it is falling to the ground. Calculate its velocity.

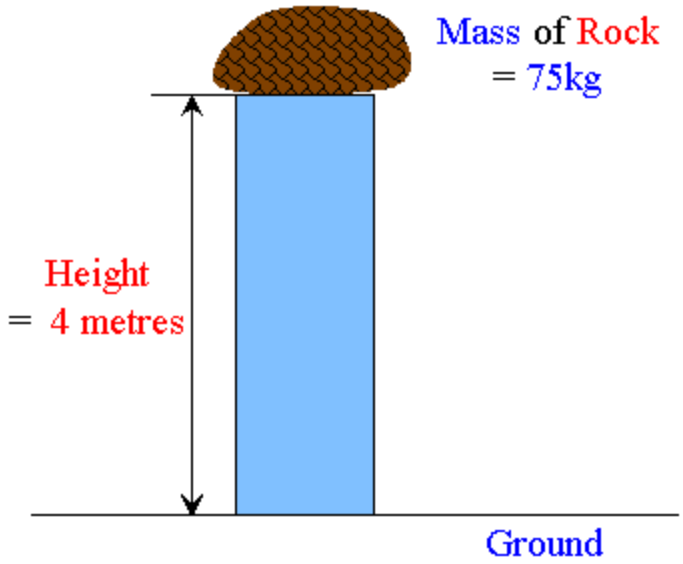
The work-energy principle: the net amount of mechanical work done on an object equals the object's change in kinetic energy.



Easy example: A shot putter practices throwing horizontally with his 8kg shot put. He accelerates the shot put from rest, with a force of 90N [right] through a distance of 0.35m. Calculate the velocity of the shot put at the time he lets go of it.

A 55kg hockey player moving at 11m/s slows to a stop over 2.5m. Calculate the net force that acted on the skater over this distance.

Potential energy: energy that is stored, and is available to do work in the future.
Gravitational potential energy: energy possessed by an object due to its position relative to the surface on the earth. Eg: objects that are located at a height from which they will likely descend.



An object at an elevated position will have the same force pushing it toward earth the entire way down.
We combine the force and distance in the work equation;
W= Force x change in height
Ep= mg x h
↳mass in kg

In the diagram, what is the gravitational force on the 75kg rock?

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In the diagram, what is the distance the rock will fall before it hits the ground?

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What work will be done on the rock by the force of gravity if the rock falls off the pillar?

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Simple gravitational energy calculation: calculate the potential energy of a 58kg person at the top of a 6.0m flight of stairs.

How much energy is gained by a 0.450kg soccer ball, when it is kicked to a height of 12.0m?

Mechanical energy: the sum of the kinetic energy and gravitational energy possessed by a given object.

Determine the mechanical energy possessed by a 0.45kg soccer ball travelling at 8.5m/s, and positioned 13.1m above the ground.

Find the mechanical energy in a **1750kg** roller coaster travelling at 6.5m/s, and located 18.0m above the ground.

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