Name: _____

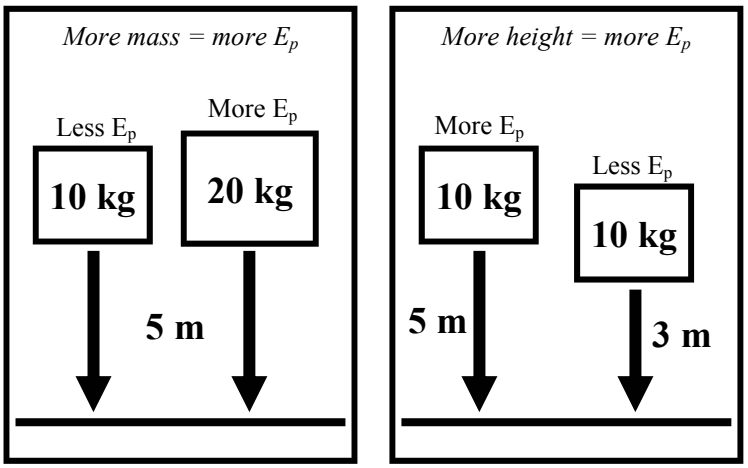
Period: _____

Potential and Kinetic Energy

Potential Energy

Potential Energy is energy of position.

An object gets potential energy from height, mass and gravity. An object with potential energy has the **potential to do work**. This potential is only released if the object falls. The energy is then transformed into energy of motion or transformed into work.



Potential Energy (in Joules) → $E_p = mgh$ ← mass (in kilograms), height (in meters), acceleration due to gravity (9.8 m/s^2)

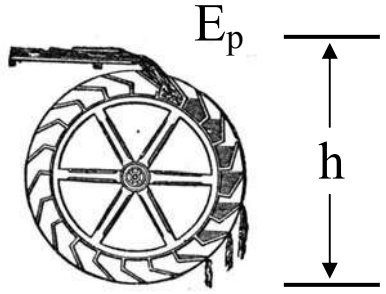
Potential energy equals mass times gravity times height.

And since $F_w = mg$, then $E_p = F_w h$

Ex: How much potential energy does a 4 kg object have that is 5 meters off the ground?

m = 4 kg h = 5 m g = 10 m/s^2 E_p = ?	$E_p = mgh$ E_p = (4 kg)(10 m/s^2)(5 m) = (40 kgm/s^2)(5 m) = 200 Joules

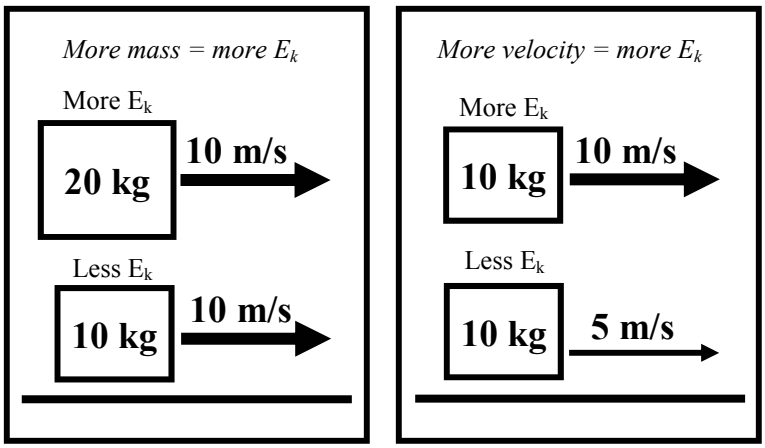
Potential energy helps us generate electricity in hydroelectric dams. When the water falls, gravity helps turn energy of height to electrical energy.



Kinetic Energy

Kinetic Energy is energy of motion.

An object gets kinetic energy from its mass and velocity. An object with kinetic energy has energy stored in motion. When the object slows down the energy is released into potential energy (if going up) or some other kind of energy (like heat [thermal energy] in the brakes of car).

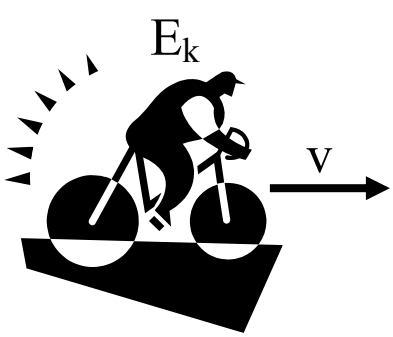


Kinetic Energy (in Joules) → $E_k = (½)mv^2$ ← mass (in kilograms), velocity (m/s)

Kinetic energy equals one-half times mass times velocity squared.

Ex: How much kinetic energy does a 10 kg object traveling 3 m/s?

m = 10 kg v = 3 m/s E_k = ?	$E_k = ½mv^2$ $E_k = ½(10\text{ kg})(3\text{ m/s})^2$ = (5 kg)(9 m^2/s^2) = 45 Joules



Kinetic energy helps you bike up a hill. The energy of motion helps you overcome gravity. The faster you are moving, the easier it is to get up a hill.

Name: _____

Period: _____

1. F or F_w = _____	8 w
2. v = _____	8 N
3. p = _____	8 m
4. h = _____	8 kgm/s
5. W or E= _____	8 J
6. P = _____	8 m/s

1. Kinetic Energy	A. Uses energy and can create energy; calculated by multiplying force times distance.
2. Potential Energy	B. How far above the ground an object is.
3. Work	C. Energy of motion.
4. Joules	D. Units for energy and work.
5. h	E. Energy of position.

Potential (E_p) or Kinetic (E_k) Energy

___ A car is traveling 45 mph.

___ A rock is on a ledge 5 meters high.

___ A car is resting at the top of a hill.

___ A ball is thrown into the air and is still moving.

___ A ball rolling on the ground.

Circle the one with more Kinetic Energy

A 25 kg mass or a 30 kg mass going 5 m/s.

Two 10 kg masses, one going 75 m/s, one going 45 m/s.

A car at rest or a car rolling down a hill.

A heavy bike or a light bike.

Calculate the potential energy of a 5 kg object sitting on a 3 meter ledge.

_____

A rock is at the top of a 20 meter tall hill. The rock has a mass of 10 kg. How much potential energy does it have?

_____

A 25 N object is 3 meters up. How much potential energy does it have. (Hint, notice the units of the object.)

_____

How high up is a 3 kg object that has 300 joules of energy?

Circle the one with more Potential Energy

A 25 kg mass or a 30 kg mass at the top of a hill?

A car at the top of the hill or the bottom of a hill?

A plane on the ground or a plane in the air?

A full plane or an empty plane (both are flying)?

A 4 kg rock is rolling 10 m/s. Find its kinetic energy.

_____

A 8 kg cat is running 4 m/s. How much kinetic energy does it have?

_____

A rolling ball has 18 joules of kinetic energy and is rolling 3 m/s. Find its mass.

_____

A 4 kg bird has 8 joules of kinetic energy. How fast is it flying?

_____

Find the work done by a 25 N force applied for 6 meters.