Note-Taking Guide – Episode 605 Momentum and Energy Notes

kinetic energy equation – $KE = \frac{1}{2} m \cdot v^2$

ex: A shot-putter heaves a 7.2 kg shot with a velocity of 6.9 m/s.

a. What is the K.E. of the shot?

$m = 7.2 kg$, $v = 6.9 m/s$ | $KE = \frac{1}{2} m \cdot v^2$ | $KE = \frac{1}{2} \cdot 7.2 kg \cdot (6.9 m/s)^2 = 172 J$

b. How much work did the shot-putter do on the shot? $W = \Delta E = 172 J$

Problem Set #1: (1-3) *on back*

potential energy equation – $PE = m \cdot g \cdot h$

Can you measure an object's potential energy? No

Can you measure an object's change in PE? Yes

ex: A 2.0 kg book is lifted from a table to a shelf 1.8 m above the floor. What is the gravitational potential energy of the book...

a. relative to the floor?

$m = 2 kg$, $h = 1.8 m$ | $PE = m \cdot g \cdot h = 2 kg \cdot 9.8 m/s^2 \cdot 1.8 m = 35.28 J$ | $PE = 35 J$

b. relative to the table 0.6 m above the floor?

$PE = m \cdot g \cdot h = 2 kg \cdot 9.8 m/s^2 \cdot 1.2 m$ | $PE = 11.76 J \simeq 12 J$

Problem Set #2 (1-2) *on back*

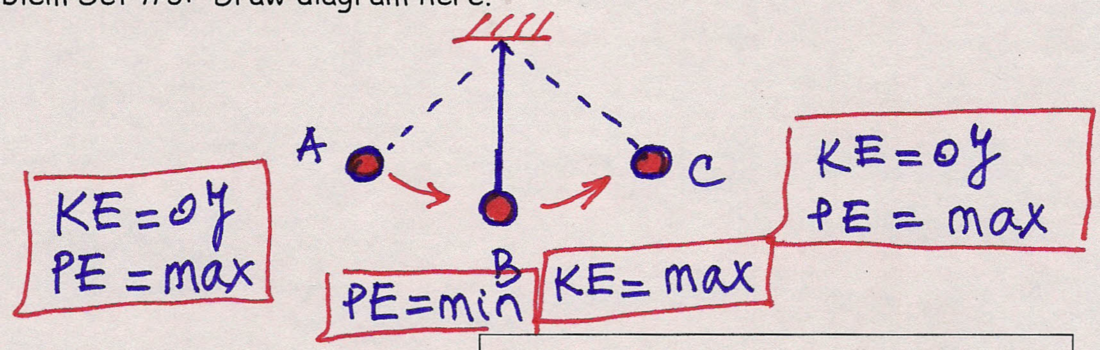
Energy can be transformed from potential to kinetic and vice versa.

Law of Conservation of Energy:

- Energy can change form but cannot be created or destroyed
- In a closed, isolated system, the ~~total~~ mechanical energy (KE + PE) remains constant

Note-Taking Guide – Episode 605 Momentum and Energy (continued)

Problem Set #3: Draw diagram here.



<u>Conservation of Energy equation:</u> $KE_i + PE_i = KE_f + PE_f$

Conservation Ex. Problem:

A 12 kg rock is at the edge of a 95 m cliff.

a. What is the rock's initial PE and KE?

$PE = 12\,kg \cdot 9.8\,m/s^2 \cdot 95\,m = 11000\,J$

$KE = 0\,J$

b. If the rock falls to the ground, what is its final PE and KE just before it hits?

$PE_i + KE_i = PE_f + KE_f$ $KE_f = 11000\,J$

c. What is the rock's velocity just before it hits the ground?

$KE = \frac{1}{2} m v^2$ $v = \sqrt{\frac{2KE}{m}} = 43\,m/s$

Problem Set #4 (1-2) *on back*

During **elastic** collisions, KE is - conserved by the system of objects.

During **inelastic** collisions KE is - not conserved by the system
because some energy is - lost to the surroundings as heat.

How are momentum ($p = m \cdot v$) and kinetic energy ($KE = \frac{1}{2} m \cdot v^2$):

- similar? mass "m"
velocity "v"
- different?
momentum - p - is a vector Unit: kg·m/s
Kinetic energy - KE - is a scalar Unit: J (Joule)

A change in momentum is creating an impulse $\Delta m \cdot v = F \cdot \Delta t$

A change of the energy of the system is equal with the amount of work done by or on the system.

$\Delta E = W$