Name: ______________________

Period: ______________________

PreAP Energy Notes -

Ep — Due to height ONLY (path doesn't matter. Only the final position.)
conservative (path doesn't matter).
mg (weight) = Force, so F_w times h = E_p.
Must be relative to a point (Can be negative)
h is always vertical
Doubling m doubles Ep (since m is not squared); doubling h doubles Ep.
Graphing (E_p vs m is linear; E_p vs h is also linear).

W — Force times distance. Only the component of F parallel to the motion does work (use cos).
W = ΔE. Friction always removes energy so friction = −W.
F could = mg, when lifting an object. Either F = mg OR W = E_p
No work done if object doesn't move.
Units = joules. [in simplier units = Fd = mad = $kg(m/s^2)m = kgm^2/s^2$]
Graphed (area under F vs D graph = work done. Can be negative area.)

E_k — Energy of motion. Doesn't matter if it is above the ground or not.
Can have other kinds of energy at the same time.
Double m, E_k doubles; Double v, E_k quadruples.
Always positive (since v is squared).
Graphed (E_k vs m is linear; E_k vs v is quadratic [an upward parabola])

PEel — k is spring constant – k is bigger for stronger spring
Units are N/m or how many Newton's it takes to stretch it a meter.
X is distance from equilibrium position (rest position)
Always positive (since x is squared)
Double k, doubles PE; Doubling x, quadruples PE.
Graphed (PE_{el} el vs k is linear; PE_{el} vs x is quadratic [an upward parabola])

P — rate of doing work or giving energy (how FAST you do work or change energy)
Slope of W vs. time graph is power.
P = W/t OR P = Fd/t OR P = ΔE/t. You don't have to know the work to find P. You could know the amount of energy you gave the object.
Units = watts. (Like joules, it can be expressed as simpler units.)
Since P = Fd/t and v = d/t, P can also = Fv, if pushed at constant velocity.

Conservation of Energy – If no work is done, the total amount of mechanical E remains constant. If there is work then E_{total} increases (+W) or decreases (−W [lost, like friction]). Pendulums and roller coaster are good examples of systems where E_p turns to E_k and back. In the absence of friction, E_{total} doesn't change. If there is friction, then E_{total} decreases over time.

Mechanical Energy – any kind of E_p or E_k. Mechanical energy is organized energy (as opposed to thermal energy which is random) and easy to utilize – easy to transfer to another kind. Energy is always conserved, but mechanical energy can be lost to thermal energy.