could use QUIZLET: Physics: Energy, Power & Work for definitions

NAME_______________ TEST #10 WORK & ENERGY REVIEW SHEET

You need to be able to do the following before taking the test.

Define each of the following in a sentence:

WORK- The product of FORCE and DISPLACEMENT.

ENERGY- The ability to do WORK.

POWER- The rate of doing work.

KINETIC ENERGY- energy of motion.

POTENTIAL ENERGY- energy of position

MECHANICAL ENERGY- sum of PE and KE.

LAW OF CONSERVATION OF ENERGY- The total mech. energy remains constant.

HOOKE'S LAW- The elongation of a spring is directly proportional to the force applied.

SPRING CONSTANT- a measure of the "stiffness" of the spring.

WORK-ENERGY THEOREM- The work done on an object = The Δ kinetic energy of the object.

What is the equation for work? What is it measured in? Is it a vector or scalar? Can it be negative?

$W = \vec{F} \cdot \vec{d}$

(Joules)

Scalar

F_{fr} does neg. work.

$F = k \cdot x$

Ex. Use Hooke's Law to determine the spring constant (k) of a spring that stretches 5.0 cm (0.050 m) when a mass of 200. grams (0.200 kg) is hung from it. Recall, the units of k will be N/m.

$$F = k \cdot x$$
$$k = \frac{F}{x} = \frac{0.200\,kg\,(9.8\,m/s^2)}{(0.050\,m)} = \underline{39\,N/m}$$

Ex. Find the change in gravitational PE of a person (70. kg) that runs to the top of a 2.0 meter hill.

$$PE = mgh = 70\,kg\,(9.8\,m/s^2)(2.0\,m) = 1373 \approx \underline{1400\ Joules}$$

Ex. Use the Work-energy theorem to solve the following.
What is the average force used to stop a car (m = 800. kg) moving at 20. m/s if it comes to a halt in 10. meters?

$$W = \Delta KE = KE_f - KE_i = 0 - KE_i$$
$$W = 0 - \tfrac{1}{2}(800\,kg)(20\,m/s)^2 = \underline{-160{,}000\,J}$$

gotta have negative sign!

Ex. How much elastic PE is stored in a toy having a spring constant of 75 N/m that is stretched 2.0 cm (0.020 m)?

$$PE_{spring} = \tfrac{1}{2}kx^2 = \tfrac{1}{2}(75\,N/m)(0.020\,m)^2 = \underline{0.015\,J}$$

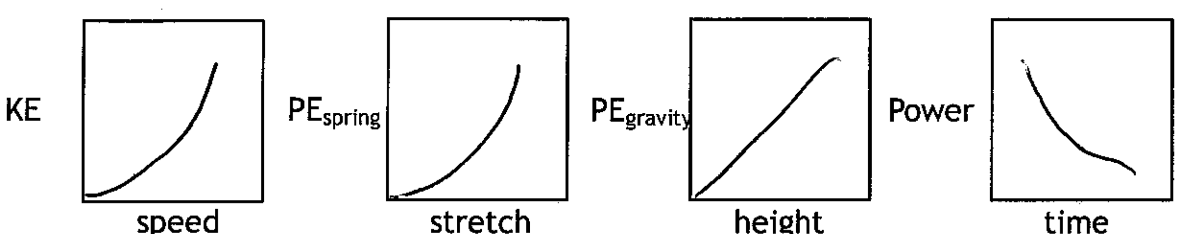
Ex. A bicyclist starts from rest and coasts down a steep 25 meters high hill. Use conservation of energy to determine their speed at the bottom.

$$PE_1 + KE_1^{\,0} = PE_2^{\,0} + KE_2$$
$$mgh_1 = \tfrac{1}{2}mv_2^2$$
$$v^2 = 2 \cdot g \cdot h_1$$
$$v = \sqrt{2 \cdot g \cdot h_1} = \sqrt{2(9.8\,m/s^2)(25\,m)} = \underline{22\,m/s}$$

Ex. How fast will this same person be traveling at the top of a 1.0 meter high ramp at the bottom of the hill?

$$PE_1 + KE_1^{\,0} = PE_2 + KE_2$$
$$mgh_1 = mgh_2 + \tfrac{1}{2}mv_2^2$$
$$9.8(25\,m) = 9.8(1.0\,m) + \tfrac{1}{2}v^2$$
$$\underline{v = 21.7\,m/s}$$

Sketch the graph shape with the relationship that exists between the two variables.



$KE = \tfrac{1}{2}mv^2$ $PE = \tfrac{1}{2}kx^2$ $PE = mgh$ $P = \frac{W}{t}$