Mechanical Energy and Work (*Use g = 9.81 m/s^2 = 32.2 ft/s^2*)

1. Fill in the blank with the most appropriate term/word from the italicized list below.

a) An object's _____ is a measure of that object's ability to do work.

b) Work is a transfer energy to a body by _____.

c) The text equation for Work is $\boldsymbol{W = \int_{s1}^{s2} F_t * ds}$. In many cases the magnitude of work associated with a force may be calculated by multiplying the object _____ by the component of the force _____ to that displacement.

d) Work is positive if it serves to _____ energy.

e) Work is positive if the direction of motion and the component of force parallel are _____.

f) Work is _____if the direction of motion and the component of force parallel to the motion are opposite.

g) The formula for kinetic energy is KE = (1/2)*m*v^2. If car's speed increases from 20 to 40 mph, it's KE _____.

h) If an object has gravitational potential energy, that means the force of gravity can work on that object by virtue of that object's _____ position.

i) An elevated object starts with gravitational potential energy 100 J; that means gravity could do 100 Joules of work on the object. The object descends and gravity does 40 Joules of work on the object during the descent. The object's gravitational potential energy is now _____ Joules.

j) When an object is pushed against a spring and compresses that spring, we say the object has _____elastic potential energy. (Recall that object PE is positive if work can be done due to its position).

k) When an object is attached to a spring and stretches that spring, we say the object has _____elastic potential energy.

l) Kinetic energy is a _____ quantity.

m) Even though Atlas exerts a force holding up the world, he does no work because there is no _____ .

n) You carry a heavy box while moving horizontally at constant speed. The work you do is _____ because _____ of your force is _____ to the direction of your motion.

0%	*force*	*parallel*	*sixty*
100%	*halves*	*perpendicular*	*increase*
50%	*horizontal*	*positive*	*the same*
displacement	*negative*	*quadruples*	*vector*
doubles	*one hundred forty*	*remains the same*	*vertical*
energy	*opposite*	*scalar*	*zero*

In problems 2 and 3 below

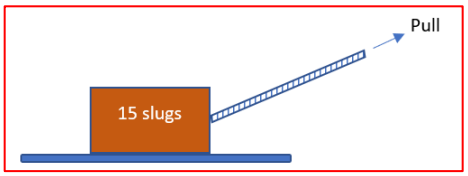
a) calculate i. the rope work ii. the friction work iii. the net work

b) calculate i. the initial KE ii. the acceleration using a FBD iii. the final velocity using $\boldsymbol{v^2 = v_0^2 + 2*a*\Delta s}$ iv. the final KE v. the ΔKE

c) compare net work and ΔKE. They should be the same!

2. The rope pulls at 150 N over a distance of 10 meters. The coefficient of static friction is 0.25 while that of kinetic friction is 0.15

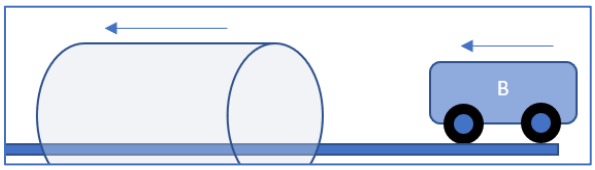
ENGR 110 PAL Worksheet #6

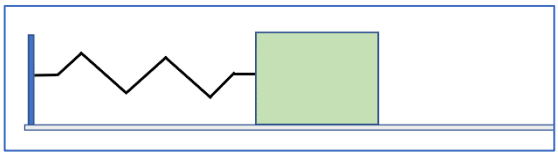


3. The rope's pull on the box is 200 lbs at 30 degrees above the horizontal; the pull acts as the box moves 15 feet horizontally. . The coefficient of static friction is 0.25 while that of kinetic friction is 0.15.

4. A 40 kg block hangs at a height of 10 meters. a) Determine in newton-meters and joules the work gravity could do if the rope holding the block were cut.
b) Determine the block's potential energy in joules.

5. The 50 slug car ("B") passes through a variable force wind tunnel. The force of the wind at the tunnel entrance is 400 lbs while that at the exit is 240 lbs. The tunnel is 100 feet long. Determine a) the work of the wind on the car in ft-lbs b) the car's change in kinetic energy in ft-lbs c) the speed with which the car exits the wind tunnel. It enters the tunnel at 40 mph and the wind is the only unbalanced force.

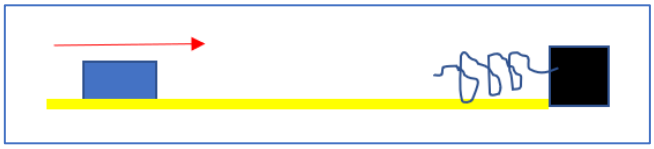


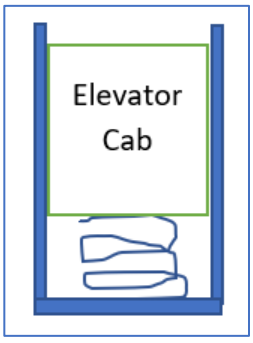


6. The mass has compressed the spring 20 cm. The spring has stiffness constant 1000 N/m. The mass is initially held at rest.

a) Determine the force of the spring on the mass the instant the mass is released.
b) Determine the total work the spring could do on the mass were the mass released. Answer in joules. The mass is not connected to the spring.
c) Determine the mass's elastic potential energy when the spring is compressed 20 cm.

7. The 322 pound crate is moving to the right with speed 10 feet second over a frictionless surface. It is stopped by the spring with stiffness constant 12 pounds/inch. Determine the compression of the spring in inches when the crate's speed reaches 0.





8. The 2000 kg elevator cab fell from a height of 15 meters above the top of the elevator shaft spring. The spring has stiffness constant 10,0000 N/m. Determine the spring compression when the elevator cab's vertical speed reaches 0 meters/sec.