



Kinetic Energy

• Kinetic energy is the energy due to motion.

• $KE = \frac{1}{2} mv^2$

• Units for energy = joule (J).

Work-kinetic energy theorem

• F x d = $\frac{1}{2}$ mv²_f - $\frac{1}{2}$ mv²_i



Potential Energy

- Potential energy is stored energy.
 Gravitational Potential energy is the energy due to the position of the object.
- PE = mgh
- Units are joules (J)

Elastic Potential Energy

 Elastic potential energy in a stretched or compressed elastic object.

- $PE_{elastic} = \frac{1}{2} kx^2$
- PE = Joules (J)

Spring Constant

- k = spring constant
- Spring constant expresses how resistant a spring is to being compressed or stretched.
- Flexible spring = small k
- Stiff Spring = large k
- Spring constant = N/m

Practice 5B

- #1. Calculate the speed of an 8000 kg airliner with KE of 1.1 x 10⁹ J.
- Knowns?
- Unknown?
- Equation?

Sample Problem 5C
A person kicks a 10kg sled, giving an initial speed of 2.2m/s. How far does it move if the µk = .1?

- Known?
- Unknown?
- Equation?

- A 70 kg man is on a bungee cord with an unstretched length of 15m. He jumps off a bridge that is 50 m high. When jumping, his cord stretches to 44m. The spring constant of the cord is 71.8 N/m. What is the total potential energy relative to the water?
- Knowns?
- Unkown?
- Equations?



5-3 Notes

Conservation of Energy

• When we say something is conserved, we mean it remains constant.

• If we have a certain amount of a conserved quantity, we will have the same amount at a later time.

 This does not mean the quantity can't change forms though.

Energy Classification



• $\frac{1}{2} \text{ mv}^2 \text{i} + \text{mgh}_i = \frac{1}{2} \text{ mv}^2_f + \text{mgh}_f$ • Where friction is involved, the principal of conservation of mechanical energy is not true because kinetic energy is not all converted potential energy but some is lost to heat and sound.



Practice 5E

- #1. A bird is flying with a speed of 18 m/s over water and drops a 2 kg fish. If the bird is 5.4 m high, what is the speed of the fish when it hits the water?
- Known?
- Unknown?
- Equation?



Power

• The rate at which work is done is called power. • P = Work / time• Work = force x distance P = (Fd)/t

 Power and Speed
 If speed is known, use alternative power formula.

• Power = Force x velocity

 $\bullet P = Fv$

Units • Units of power = watt (W) • Watt = 1 Joule / second Horsepower is another unit of power.

•1 Horsepower = 746 Watts



Power Ratings Machines with different power ratings do the same work in different times. The higher the rating, the more work done in a set

more work done in a s amount of time.

Practice 5F

- #1. A 1000 kg elevator carries a load of 800kg. A frictional force of 4000 N keeps the upward movement constant. What power is needed to lift the load at a speed of 3m/s?
- Known?
- Unknown?
- P = ?