Conservation of Energy, Collisions, Power and everything else….

4/14/14

Rogue Volvo

A 2000 kg Volvo is driving in a parking lot and hits a 1500 kg parked car. The Volvo was traveling at 18 m/s before the collision.

What will the final speed be if the bumpers lock rather than bouncing apart? 10.3 m/s

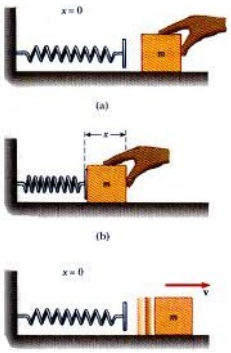
Determine how much mechanical energy was transferred to other forms.

When is Momentum and/or energy conserved?

- **Perfectly inelastic**
  - Momentum is conserved
- **Perfectly elastic**
  - Momentum is conserved
  - Energy is conserved
- **Inelastic**(most collisions)
  - Momentum is conserved

Elastic Potential Energy

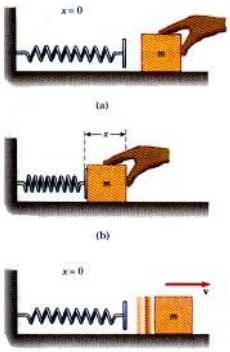
$U_s = ½\ kx^2$



Springs

What is the work done on a mass that is pushed against a spring over a distance x?

Remember $F_s = -kx$

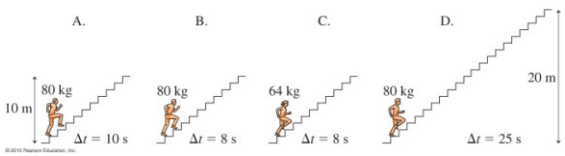


Power

Power is change in Energy per time

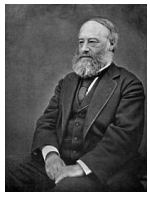
$P = \Delta W/\Delta t$

Which student has the higher power output?



Power

- Unit is a Watt = Joule/second
- Watt from James Watt 1700's improved Steam engines
- Joule from James Joule 1800's brewer who worked with Lord Kelvin
  - Major player in the *Law of Conservation of Energy*



Watts

- 100 Watt light bulb uses 100 Joules of energy per second.
  - Light and heat
- What is a kWh – kiloWatthour?

kWh

What is a kiloWatthour?

A. Force
B. Power
C. Energy
D. Velocity

Use dimensional Analysis

kWh

Work out how many Joules are in 1 kWh

1kWh = 1000 W * 3600s = 3.6×10^6 J

A car drives down the highway with a constant speed of 29 m/s while the engine is putting out 175 hp. Estimate the total frictional force (wheels and air) acting on the car.

$$P = W/\Delta t = F\,v$$

746 W = 1 hp

Incandescent vs. LED bulbs

Compare the cost of using two 100 Watt light bulbs 12 hours per day for a month to using two 10 Watt LED bulbs for the same amount of time. Assume 1kwh costs $0.22

kWh is just power times hours