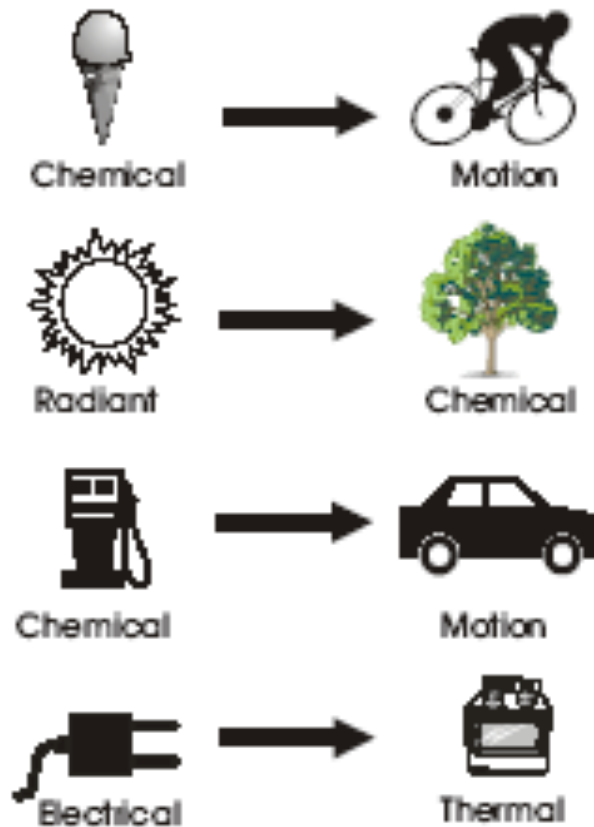


Conservation of Energy



[Law of Conservation of Energy]

Energy Transformations



- What you put in is what you get out
- Total energy is conserved

[Practical Applications



- Gasoline converts to energy which moves the car
- A battery converts stored chemical energy to electrical energy
- Dams convert the kinetic energy of falling water into electrical energy



Can You Think of Other
Examples?



Conservation of Mechanical Energy

$$\frac{1}{2}mv^2 + mgh = E$$

Kinetic Energy

Potential Energy

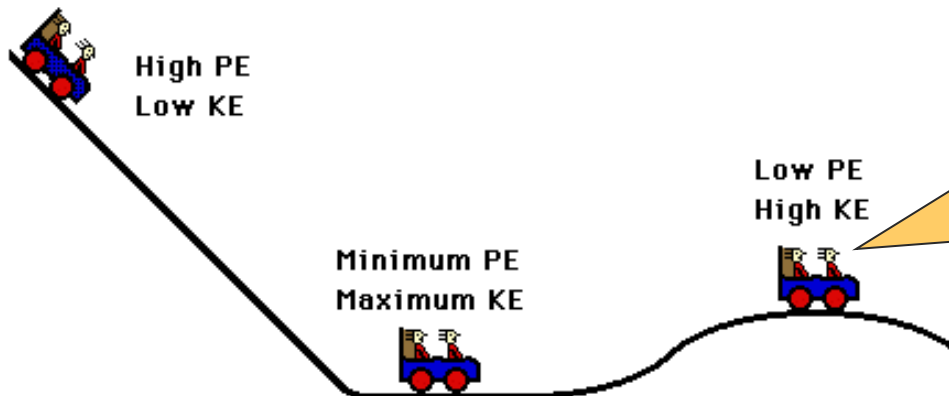
Total Energy

m = mass

v = velocity

g = gravitational acceleration

h = height



ILYA, did you know that even though it was a bumpy ride, our energy remained constant!

As a coaster car loses height, it gains speed; PE is transformed into KE. As a coaster car gains height it loses speed; KE is transformed into PE. The sum of the KE and PE is a constant.

Example of Conservation of Mechanical Energy

$$\frac{1}{2}mv^2 + mgh = E$$

Potential Energy



+

Kinetic Energy



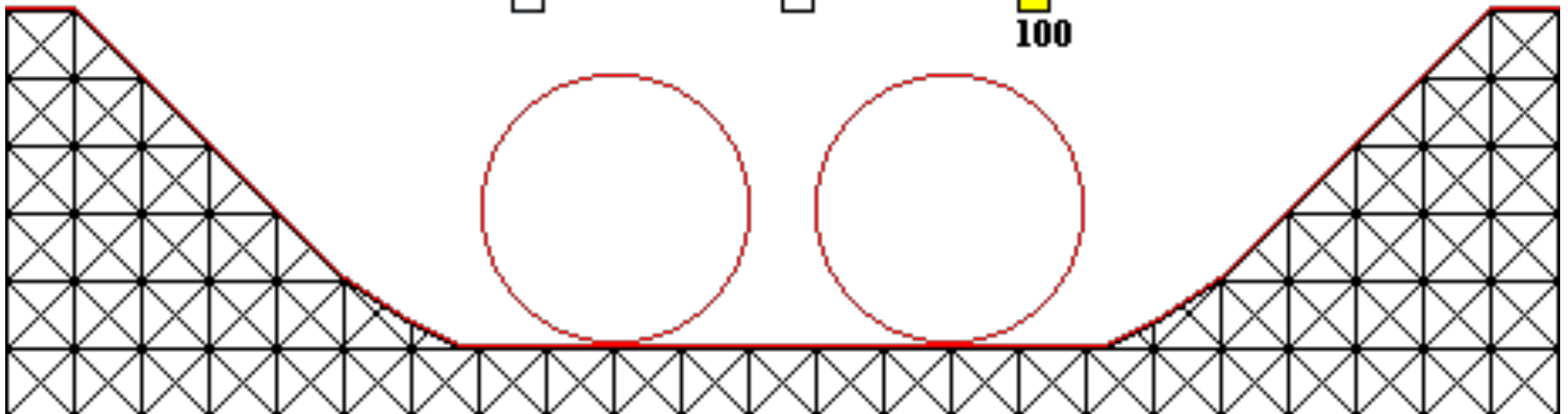
=

Total Energy

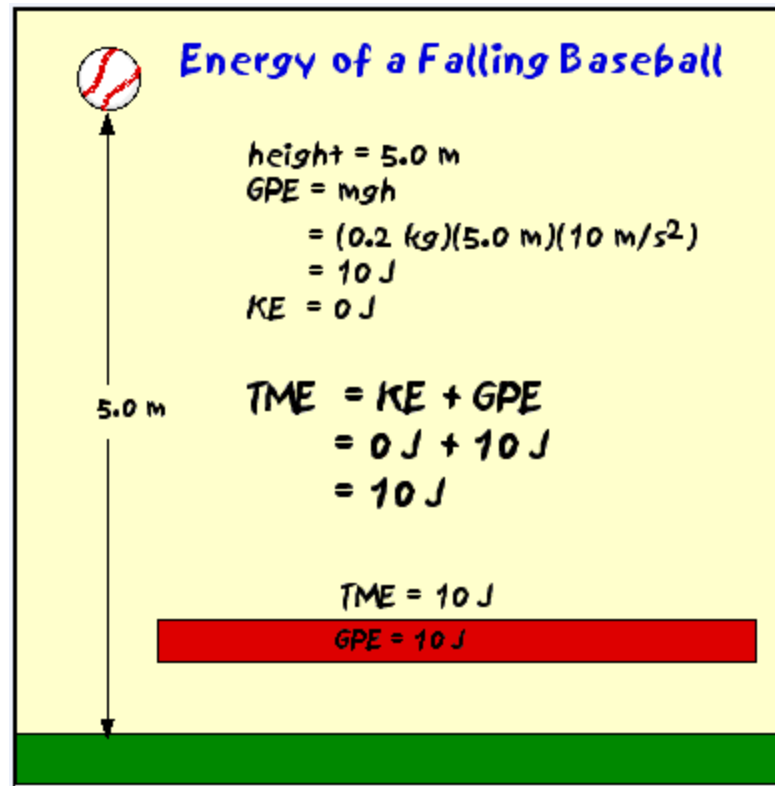


100

Constant

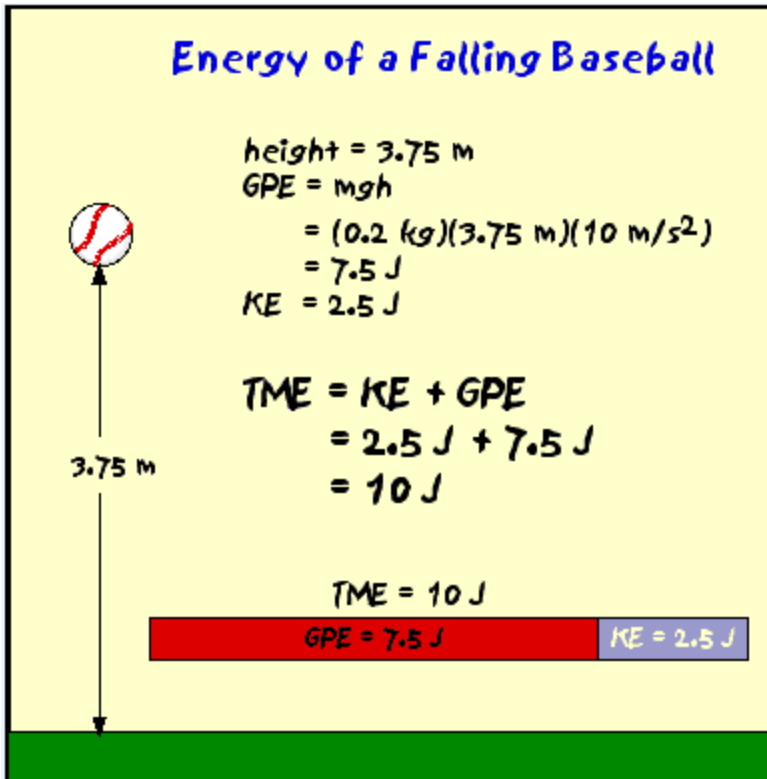


[An Example]



[Another Example]

Energy of a Falling Baseball



height = 3.75 m
GPE = mgh
 $= (0.2 \text{ kg})(3.75 \text{ m})(10 \text{ m/s}^2)$
 $= 7.5 \text{ J}$
KE = 2.5 J

TME = KE + GPE
 $= 2.5 \text{ J} + 7.5 \text{ J}$
 $= 10 \text{ J}$

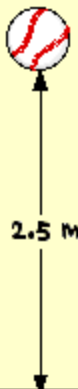
TME = 10 J

GPE = 7.5 J	KE = 2.5 J
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[Yet Another Example]


Energy of a Falling Baseball

height = 2.5 m
GPE = mgh
 $= (0.2 \text{ kg})(2.5 \text{ m})(10 \text{ m/s}^2)$
 $= 5.0 \text{ J}$
KE = 5.0 J



TME = KE + GPE
 $= 5.0 \text{ J} + 5.0 \text{ J}$
 $= 10 \text{ J}$

TME = 10 J



GPE = 5.0 J	KE = 5.0 J
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[Last Example]

Energy of a Falling Baseball

$$\begin{aligned} \text{height} &= 0 \text{ m} \\ \text{GPE} &= mgh \\ &= (0.2 \text{ kg})(0 \text{ m})(10 \text{ m/s}^2) \\ &= 0 \text{ J} \\ \text{KE} &= 10 \text{ J} \end{aligned}$$

$$\begin{aligned} \text{TME} &= \text{KE} + \text{GPE} \\ &= 10 \text{ J} + 0 \text{ J} \\ &= 10 \text{ J} \end{aligned}$$

$$\text{TME} = 10 \text{ J}$$

$$\text{KE} = 10 \text{ J}$$



Conservation of Mechanical Energy using a Basketball



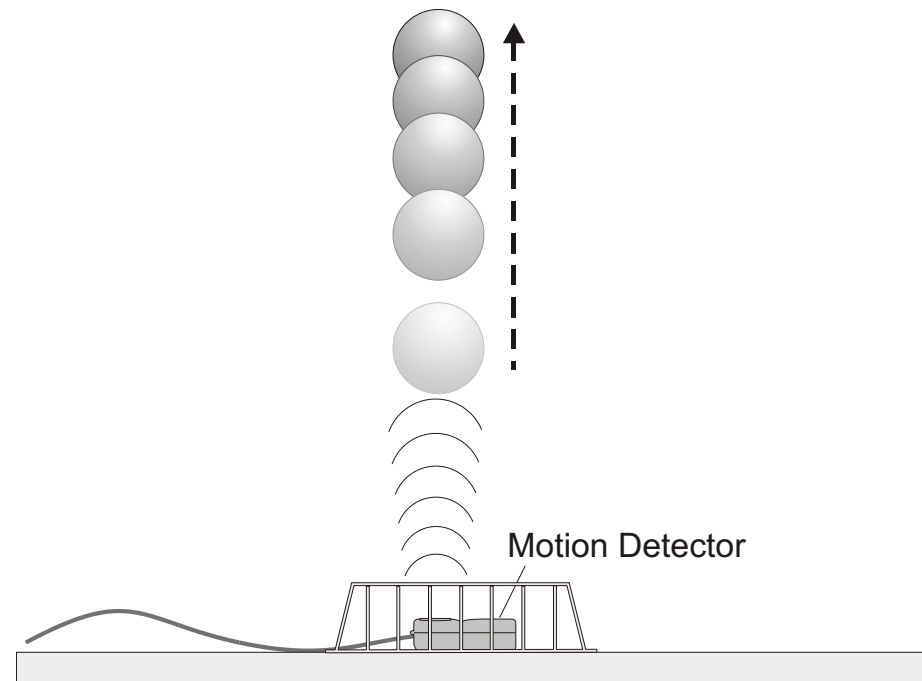
Hi I am
Sookram, lets
do the lab

[Instructional Objectives]

- State the law of conservation of energy
- Define the components of Mechanical Energy
- Demonstrate the ability to solve problems using the law of conservation of energy

[Lab Procedure]

1. Place the motion detector on a flat surface, like in the diagram to the right
2. Toss a basketball above the ultrasonic sensor
3. The sensor will detect the position, velocity, and acceleration of the ball's flight



[Lab Analysis]

- Determine which line represents:
 - Kinetic energy
 - Potential energy
 - Total energy

[References]

- http://en.wikipedia.org/wiki/Conservation_of_energy
- http://www.slcc.edu/schools/hum_sci/physics/tutor/2210/potential_energy/
- Vernier Software and Technology