

Energy - the ability to do work.

page 141

Kinetic energy - energy due to motion.

$$KE = \frac{1}{2}mv^2$$

p 143 ex 6-4

$$KE = \frac{1}{2} m v^2$$

$$KE = \frac{1}{2} (.145) 25^2$$

$$= 45.3 \text{ J}$$

$$W = Fd$$

$$\text{N} \cdot \text{m} = \text{J}$$

$$KE = \frac{1}{2} m v^2$$

$$= (\text{kg}) \left(\frac{\text{m}}{\text{s}} \right)^2$$

$$= \frac{\text{kg} \cdot \text{m} \cdot \text{m}}{\text{s}^2}$$

$$\text{N} \cdot \text{m}$$

Why W and KE are both joules:

$$F = ma$$

$$= (\text{kg}) (\text{m/s}^2)$$

ex 6-5

$$KE = \frac{1}{2} (1000) 20^2$$
$$= 200,000 \text{ J}$$

$$KE = \frac{1}{2} (1000) 30^2$$
$$= 450,000 \text{ J}$$

$$W = 450,000 - 200,000$$
$$= 250,000 \text{ J}$$

How much work does it take to stop a 1800 kg car going 30.0 m/s?

$$W = \frac{1}{2} (1800) 30^2$$
$$= -810,000 \text{ J}$$

or

$$W = 0 - 810,000$$
$$= -810,000 \text{ J}$$

A bat hits a .300 kg T-ball with a force of 10.0 N for a distance of 1.50 m. How fast does the ball leave the bat?

$$W = KE$$

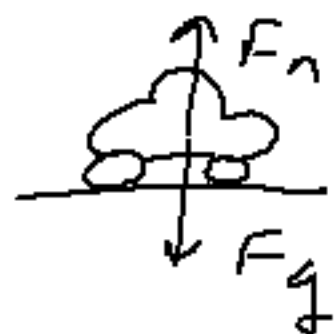
$$Fd = \frac{1}{2}mv^2$$

$$10(1.5) = \frac{1}{2}(.3)v^2$$

$$v = 10.0 \text{ m/s}$$

p 163 # 22

$$F_f = \mu F_n$$



$$W = KE$$

$$F d = \frac{1}{2} m v^2$$

$$\mu m g d = \frac{1}{2} m v^2$$

$$.42 (9.8) (88) = \frac{1}{2} v^2$$

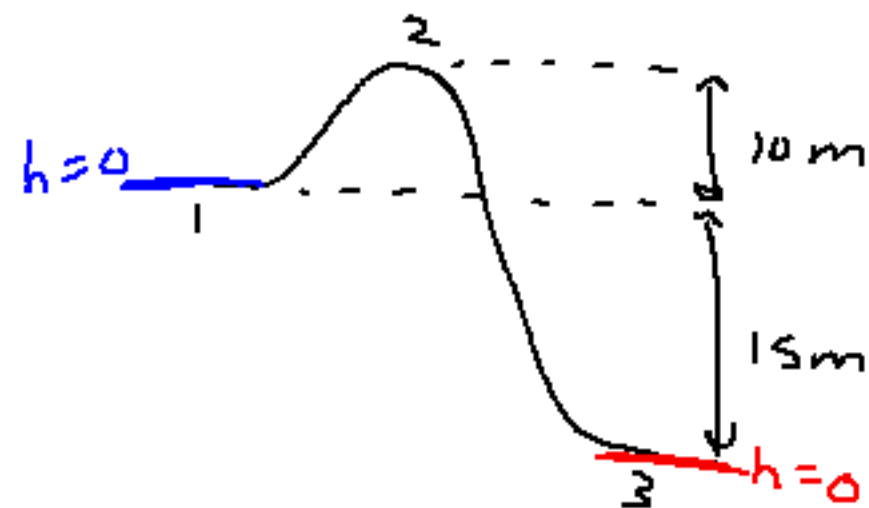
$$v = 26.9 \text{ m/s}$$

Potential energy - energy due to position.

2 types - gravitational
elastic

$$PE_g = mgh$$

p 146 ex 6-7



$$\begin{aligned} * a) PE_2 &= (1000)(9.8)(10) \\ &= 98,000 \text{ J} \end{aligned}$$

$$\begin{aligned} PE_3 &= 1000(9.8)(-15) \\ &= -147,000 \text{ J} \end{aligned}$$

$$* b) PE = -147,000 - 98,000 = -245,000 \text{ J}$$

$$* c) PE_2 = (1000)(9.8)(25) = 245,000$$

$$PE_3 = 1000(9.8)(0) = 0$$

$$PE = 0 - 245,000 = -245,000 \text{ J}$$

p 163 # 30

$$\begin{aligned} a) PE &= 2.1(9.8)(2.2) \\ &= 45.3 \text{ J} \end{aligned}$$

$$\begin{aligned} b) PE &= 2.1(9.8)(.6) \\ &= 12.3 \text{ J} \end{aligned}$$

c) $W = \text{answer to (a)}$



#24

$$W = PE$$

$$80 = (1.85)(9.81)h$$

$$h = 4.41 \text{ m}$$

no KE

since $v = 0$

at top:



Elastic Potential Energy

$$PE = \frac{1}{2} k x^2$$

k = spring constant.



equilibrium
(not stretched
or compressed)



If $k = 275 \text{ N/m}$ and the spring is compressed $.200 \text{ m}$, how much energy is stored?

$$\begin{aligned} PE &= \frac{1}{2} k x^2 \\ &= \frac{1}{2} (275) (.2)^2 \\ &= 5.5 \text{ J} \end{aligned}$$

If 28.0 J of work done on a spring causes it to stretch .150 m, what is the spring constant?

$$W = PE = \frac{1}{2} k x^2$$

$$28 = \frac{1}{2} k (.15)^2$$

$$k = 2489 \text{ N/m}$$

Homework:
page 162 # 15, 17, 19, 26, 27, 31