Engineering Physics I Name _____
PHYS 1210 Spring 2015

Discussion 6 – Energy Conservation (Ch 7)

Energy Type	Situation	Formula
Kinetic Energy	Motion, speed	$K = \frac{1}{2}mv^2$
Potential Energy	Stored energy, not actually doing anything yet	
• Gravitational PE	At a height above some zero point (you define the zero, usually the ground or table top)	$U_g = mgh$
• Spring PE	Spring stretched or compressed away from equilibrium	$U_s = \frac{1}{2}kx^2$ $F = -kx$
Work	Friction Applied force Anything else that doesn't fit above	$W = \vec{F} \cdot \vec{d} = Fd\cos\theta$ $W = \int \vec{F} \cdot d\vec{l} = \int F\,dx$

Conservation of Energy

$$E_i = E_f$$

$$K_i + U_i + W_{in} = K_f + U_f + W_{out}$$

My Problem Solving Approach (for Energy)

1. 2 pictures: start and end separate
2. Identify forms of Energy
3. Do Math
4. Sanity Check

Problems (Giancoli, 4e)

Jackie throws a ball upwards with a speed of v_o and then catches it again when it comes back down to the same height.

1) Without air friction, how does $|v_o|$ compare to $|v_f|$? Bigger, smaller, the same, impossible to say.
2) If we turned on air friction, how does $|v_o|$ compare to $|v_f|$? Bigger, smaller, the same, impossible to say. (Hint: Think about energy.)

8. (II) If $U = 3x^2 + 2xy + 4y^2z$, what is the force, $\vec{\mathbf{F}}$?

9. (II) A particle is constrained to move in one dimension along the x axis and is acted upon by a force given by

$$\vec{\mathbf{F}}(x) = -\frac{k}{x^3}\hat{\mathbf{i}}$$

where k is a constant with units appropriate to the SI system. Find the potential energy function $U(x)$, if U is arbitrarily defined to be zero at $x = 2.0\,\text{m}$, so that $U(2.0\,\text{m}) = 0$.

16. (II) A 72-kg trampoline artist jumps vertically upward from the top of a platform with a speed of 4.5 m/s. (*a*) How fast is he going as he lands on the trampoline, 2.0 m below (Fig. 8–31)? (*b*) If the trampoline behaves like a spring of spring constant $5.8 \times 10^4\,\text{N/m}$, how far does he depress it?

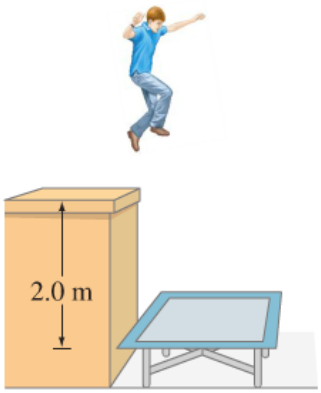
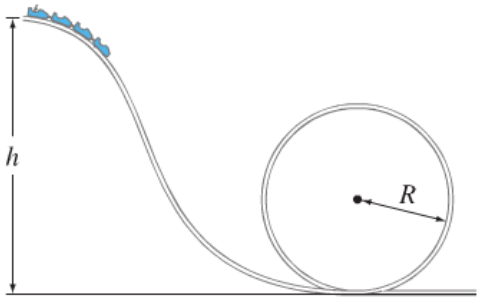


FIGURE 8–31
Problem 16.

(c) Part A can be solved using either kinematics (Ch 2) or energy (Ch 7). Check your answer by trying the other way.
(d) In Part B, the proper way to solve this problem is to account for the fact that depressing the trampoline by a distance *d* will affect the potential energy due to gravity as well. What is the ratio of distances you find if you do and do not account for that additional gravitational potential energy?

Based on 87



Find an algebraic expression for *h*, the minimum height required to barely make it around the loop.
Bonus: How many *g*'s will the riders experience at the bottom of the loop?