PHYSICS 191 **CLASS 17** **Fall 2009**

14 October 09

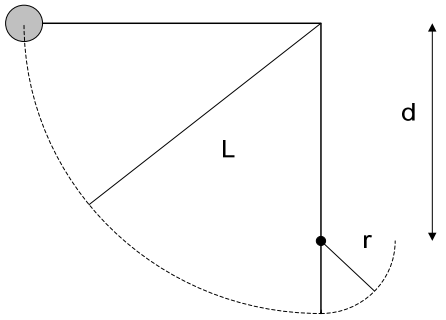
ASSIGNMENT: Text, Chapter 7.

CONCEPTS:

1. **Conservative force:** The work done depends only on the initial and final "positions," and not on the path taken.
2. Conservation of mechanical energy: Make sure you understand the alternate forms given in Equations 7.11, 7.14, and 7.15.
3. Potential energy function: depends only on starting and ending points (see item 1 above). Note that the zero of potential energy is **arbitrary**.
4. Relation between force and work/potential energy: If you knows the force, you can find the work or potential energy function by taking the antiderivative (and putting in the appropriate limits). Similarly, if you know the potential energy of a system, you can find the force by taking the derivative of the potential energy function. Thus we have
   - work is the anti-derivative of the force function, evaluated between appropriate limits
   - force is the *negative* of the derivative of the potential energy function. If the force is conservative, work is also the negative of the change in potential energy. See Section 8-6. In symbols,

	Example: mass/spring
$W = -\Delta U = \int F\,dx$	$U = \frac{1}{2}kx^2$
$F = -\frac{dU}{dx}$	$F = -\frac{dU}{dx} = -kx$

TURN IN: Chapter 7, Question Q7.4; Exercise 7.19, Problems 7.43, 7.53, 7.59 (with an extra part c given below, *as a separate problem*); Extra Credit, 7.70. **For credit, use work-energy methods, not the methods of Chapters 4–5**.



7.59(c) Suppose the string is of length *L*. The mass (potato) descends to its lowest point, and then swings around a horizontal peg located a distance *d* below the point of support. Show that the mass swings completely around the peg, in circular motion with the string taut, only if

$$d \geq \frac{3}{5}L$$

Hint: See if you can combine energy concepts with what you know about circular motion. It may help to review Problem 7.46.

DO BUT DO NOT TURN IN: Chapter 7, Problems 7.42, 7.55, 7.65, 7.66, 7.75

OVER

NOTES AND ANNOUNCEMENTS

1. The next exam will come at the end of Chapter 8. A likely date is Wednesday, 28 October.
2. The laboratory will meet this Thursday, Friday, and Monday, 15–16 and 19 October, Days 4, 5, and 6. We will do Experiment 6, Kinetic Friction. Note that you will need to do the derivation described in the lab manual *before* you come to lab. It should be a good review of HRW Chapter 6.
3. We will begin Chapter 8 on Friday.