

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Department of Physics

Physics 8.01

Spring 2005

PROBLEM SET 6

Saturday, March 5, 2005

Due Date: Thursday, March 10, 2005, 3:00 p.m.

Reading Assignment: Young and Freedman, Chapter 7; Busza, Cartwright, and Guth: pp. 116-122 of Chapter 4, through the paragraph that begins with “From $F = -dU/dx$...”.

Topics for the week: Conservative forces and potential energy: gravitational potential energy, elastic potential energy, force and potential energy, and energy diagrams.

Instructions:

If a problem is marked **DO**, you should write a solution to hand in to be graded. The graders will read your answers to one or two questions on each problem set, and they will check whether the other problems have at least been handed in.

The quiz on this material, to be given at 10:05 am on Friday, March 11, will include at least one problem that is at most a slight modification of one of the problems (**DO** or **STUDY**) on this problem set.

Your written solutions are due by 3:00 pm in room 4-339B on Thursday, March 10. Please indicate the number, instructor, and time of your recitation section, and be sure to submit your paper to the correct bin. Solutions will be made available on the 8.01 website shortly afterward, so that you will be able to use them in studying for the quiz.

Energy Conservation Basics:

- 1) **STUDY:** SG:4D.1 (S) Energy conservation riddles
- 2) **DO:** SG:4B.3 Potential energy of a spring
- 3) **STUDY:** SG:4B.2 (S) Energy considerations in lifting a box
- 4) **DO:** Y&F:7.43 Spring, block, and table top with friction
- 5) **STUDY:** SG:4D.5 (S) Firing a spring gun into the air
- 6) **DO:** Y&F:7.74 Inclined plane with a spring
- 7) **DO:** SG:4B.5 (H) Potential energy of gravitation and electrostatics

Energy Conservation and Circular Motion:

- 8) **DO:** SG:4D.4 (H) The pin and the pendulum
- 9) **DO:** SG:7.3 (H) Sliding down an igloo

— Problem Set continues on next page —

Energy Diagrams:

- 10) **DO:** Y&F:7.38 Equilibrium points in an energy diagram

More Advanced Energy Conservation Problems:

- 11) **DO:** Y&F:7.28 Nonconservative force acting on an electron
- 12) **DO:** Y&F:7.78 Determining potential energy from observed motions
- 13) **STUDY:** SG:4B.4 (S) Deriving mgh from the general formula for spheres

Other Applications of Energy Conservation:

- 14) **DO:** Y&F:7.80 Hydroelectric power