

PHY 100S – THE MAGIC OF PHYSICS

Spring Term, 2012

HOMEWORK #2

DUE: By 11:00 AM, Thursday, February 16, 2012 in the Drop Boxes

Late penalty = 5% per day (which also applies to weekend days) for a maximum of 7 days, after which homework will not be accepted. The final late due date is thus 11:00 AM, Thursday, February 23 – this is during Reading Week – you are responsible for finding a way to get late submissions to your TAs (e.g., by email) if they are not here to check the Drop Boxes that week.

DROP BOXES: The completed homework assignment should be submitted in the *Drop Box for your tutorial section*. There are six Drop Boxes – one for each tutorial section, clearly labelled. The Drop Boxes are located in the basement of the Burton tower of the McLennan Physics building.

TEXTBOOK: All questions are taken from the textbook, *Physics: Concepts and Connections, Fifth Edition*, by Art Hobson, Pearson Education (2010).

INSTRUCTIONS: (1) Make sure your name and student number, and the name of your tutor are on your submitted homework, preferably on all pages in case a page comes loose. Staple all pages together.
(2) Show all your reasoning and work legibly, and draw a box around the final answer where applicable.

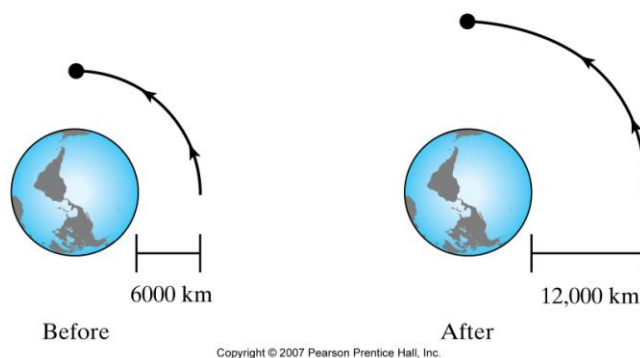
MARKING: Marks will be given for reasoning, as well as for final answers. Each question is worth 2 marks. Total marks = 20.

QUESTIONS:

Chapter 6, Conceptual Exercises 10, 18, 28, 32, 36

10. Name the type of energy possessed by each of the following: a raised book, gasoline, a stretched spring, sunlight, a speeding train, hot steam.

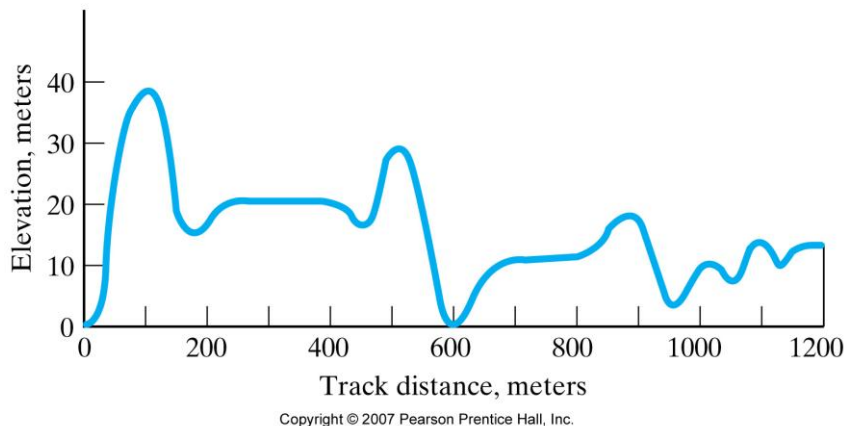
18. (a) Where would an apple have greater gravitational energy, at 100 km high or at 1000 km high? (b) Would the gravitational energy of an orbiting satellite be increased or decreased by moving it from an orbit that is 6000 km high up to an orbit that is 12,000 km high (see figure)? (c) At which point, 6000 km high or 12,000 km high, does a satellite have the larger gravitational force on it?



28. Including air resistance, does the energy of a falling rock increase, decrease, or remain the same? What happens to its kinetic energy? Its thermal energy?

32. You throw a baseball horizontally, and Jill catches it. Neglect air resistance. Describe the energy transformation that occurs (a) during the throw (while the ball is in your hand) and (b) during the catch.

36. The figure below is a graph of a roller coaster's height above the ground versus the length of track it covers. The coaster is powered up to its high point at 100 m from the starting point. From the high point, the coaster coasts freely all the way to the end. Assume that the coaster starts from rest at the high point and encounters no friction or air resistance. Between 200 m and the finish, where is it moving slowest? Fastest?

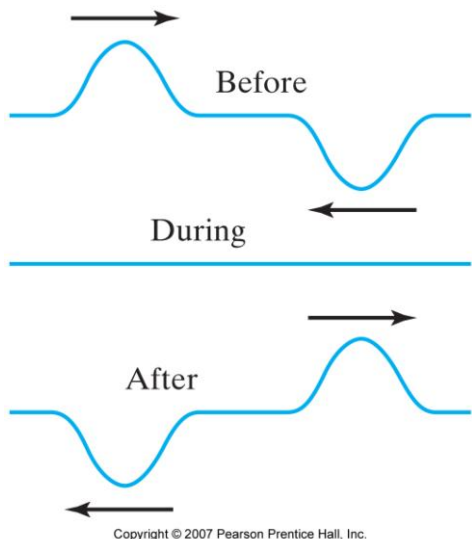
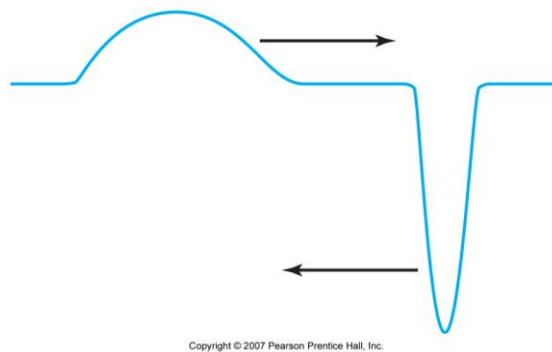


Chapter 8, Conceptual Exercises 6, 14, 32

6. When tiny scraps of paper are placed between two flat metal plates that have been oppositely charged (one plate charged positively and the other charged negatively), they bounce back and forth between the plates. Explain this phenomenon.
14. While brushing your hair, you find that the hairs tend to stand apart from one another and that they are attracted toward the brush. Explain this in microscopic terms.
32. A proton is placed, at rest, at some point A within a room that is otherwise devoid of all matter. At some other point B within the room is there an electric field? An electric force? A magnetic field? A magnetic force? Is there energy at point B?

Chapter 9, Conceptual Exercises 6, 8

6. The two waves shown in the figure to the right are moving toward each other along a string. Sketch the string during the interference of the two waves.



8. What happens to the energy of the two waves shown in the figure to the left when they interfere destructively, as shown in the second of the three sketches? Did the energy vanish? (*Hint:* What are the parts of the rope doing as the wave moves? Which type of energy is the wave carrying?)