PHY 100S – THE MAGIC OF PHYSICS
Spring Term, 2013

HOMEWORK #3

DUE: **By 11:00 AM, Thursday, March 7, 2013 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, March 14.

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 9, Conceptual Exercises 34/46, 38, 40, 48

34/46. (a) Which of the following worsens the ozone problem: coal-fired power plants, gasoline engines, CFC coolants, nuclear power plants, hydroelectric power plants, solar heating of homes, deforestation? (b) Which of the following contributes to global warming: coal-fired power plants, gasoline engines, CFC coolants, nuclear power plants, hydroelectric power plants, solar heating of homes, deforestation?

38. Which of the ozone-destroying chemicals has the longest atmospheric lifetime? Which one forms the largest share of the problem?

40. The total quantity of energy that reaches Earth in the infrared region is greater than that in the ultraviolet region. Why then are we more concerned about the direct health effects of UV than of IR radiation?

48. Assuming the CO_2 emissions in Figure 9.45 are due only to fossil fuel use, how many joules of fossil fuel energy are consumed by a typical American for each joule consumed by a typical Japanese? How many joules are consumed by a typical Japanese for each joule consumed by a typical Indian? (Note: tonnes per capita CO_2 emissions = tonnes emitted per person.)

Chapter 10, Conceptual Exercises 6, 8, 18, 24, 26, 30

6. Velma is in a train moving eastward at 70 m/s. Mort, standing beside the tracks, throws a ball at 20 m/s eastward. What is the ball's speed and direction relative to Velma?

8. Does the principle of relativity require that every observer observe the same laws of physics? Explain.

18. Velma's spaceship approaches Earth at 0.75c. She turns on a laser and beams it toward Earth. How fast does she see the beam move away from her? How fast does an Earth-based observer see the beam approach Earth?

24. A certain fast-moving particle is observed to have a lifetime of 2 seconds. If the same particle was at rest in the laboratory, would its lifetime still be 2 seconds, or would it be more, or less, than 2 seconds?

26. Does the special theory of relativity allow your father to go on a trip and return younger than you?

30. Velma passes Earth at 50% of lightspeed. On her video player, she watches a taped video program that runs 1 hour. How long does the program run as measured by an Earth-based observer?