Physics 160
Spring 2013
Homework Assignments

- HW #11 - Due May 3.

  Mastering Physics: 7 questions from chapters 13 and 14.

  Written Question:13.77 Consider a spacecraft in elliptical orbit around the earth. At the low point, or perigee, of its orbit, it is 400 km above the earth's surface; at the high point, or apogee, it is 4000 km above the earth's surface. (a) What is the period of the spacecraft's orbit? (b) Using conservation of angular momentum, find the ratio of the spacecraft's speed at perigee to its speed at apogee. (c) Using conservation of energy, find the speed at perigee and the speed at apogee. (d) It is necessary to have the spacecraft escape from the earth completely. If the spacecraft's rockets are fired at perigee, by how much would the speed have to be increased to achieve this? What is the rockets were fired at apogee? Which point in the orbit is more efficient to use?

- HW #10 - Due April 19.

  Mastering Physics: 7 problems from chapter 10.

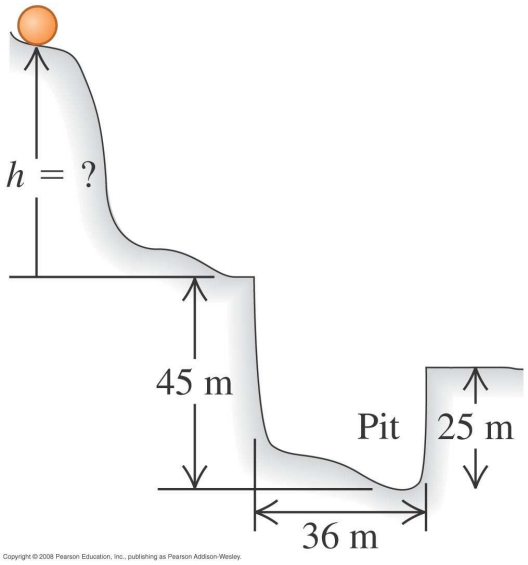
  Written Question, 10.86: A uniform drawbridge 8.00 m long is attached to the roadway by a frictionless hinge at one end, and it can be raised by a cable attached to the other end. The bridge is at rest, suspended at 60.0° above the horizontal, when the cable suddenly breaks. (a) Find the angular acceleration of the drawbridge just after the cable breaks. (Gravity behaves as though it

all acts at the center of mass.) (b) Could you use the equation $\omega = \omega_0 + \alpha t$ to calculate the angular speed of the drawbridge at a later time? Explain why. (c) What is the angular speed of the drawbridge as it becomes horizontal?

- HW #9 - April 12.

  Mastering Physics: 7 problems from chapter 9.

  Written Question, 10.80: A uniform marble rolls without slipping down the path shown in Fig. P10.80, starting from rest. (a) Find the minimum height h required for the marble not to fall into the pit. (b) The moment of inertia of the marble depends on its radius. Explain why the answer to part (a) does not depend on the radius of the marble. (c) Solve part (a) for a block that slides without friction instead of the rolling marble. How does the minimum h in this case compare to the answer in part (a)?



- HW #8 - Due April 8.

  Mastering Physics: 8 problems from chapter 8.

  Written Question, 8.101: Neutron Decay. A neutron at rest decays (breaks up) to a proton and an electron. Energy is released in the decay and appears as kinetic energy of the proton and electron. The mass of a proton is 1836 times the mass of an electron. What fraction of the total energy released goes into the kinetic energy of the proton?

- HW #7 - Due March 29.

  Mastering Physics: 6 problems from chapter 7.

  Written Question, 7.60: These data are from a computer simulation for a batted baseball with mass $0.145\,kg$, including air resistance:

t	x	y	v_x	v_y
0	0	0	$30.0\,m/s$	$40.0\,m/s$
$3.05\,s$	$70.2\,m$	$53.6\,m$	$18.6\,m/s$	0
$6.59\,s$	$124.4\,m$	0	$11.9\,m/s$	$-28.7\,m/s$

  (a) How much work was done by the air on the baseball as it moved from its initial position to its maximum height? (b) How much work was done by the air on the baseball as it moved from its maximum height back to the starting elevation? (c) Explain why the magnitude of the answer in part (b) is smaller than the magnitude of the answer in part (a).

- HW #6 - Due March 22.

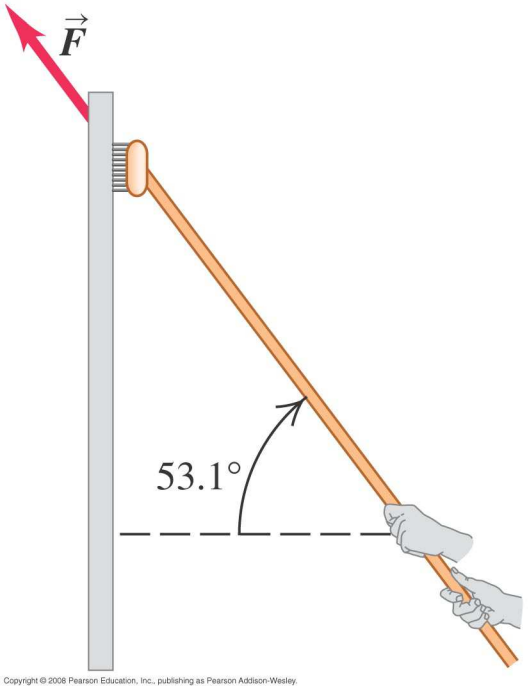
  Mastering Physics: 9 problems from chapters 5 and 6.

Written Question: 6.73 Varying Coefficient of Friction. A box is sliding with a speed of $4.50\,m/s$ on a horizontal surface when, at point P, it encounters a rough section. On the rough section, the coefficient of friction is not constant, but starts at 0.100 at P and increases linearly with distance past P, reaching a value of 0.600 at $12.5\,m$ past point P. (a) Use the work-energy theorem to find how far this box slides before stopping? (b) What is the coefficient of friction at the stopping point? (c) How far would the box have slid if the friction coefficient didn't increase but instead had the constant value of 0.100?

- HW #5 - Due March 1.

  Mastering Physics: 10 problems from chapters 4 and 5.

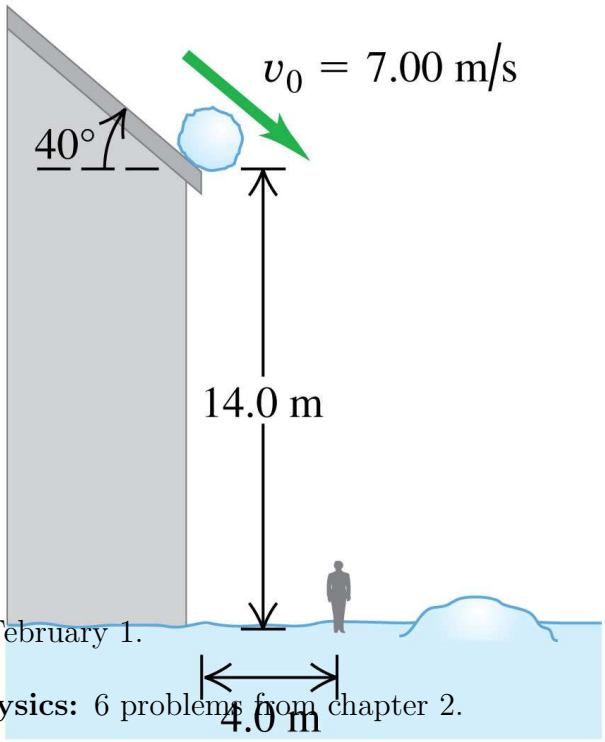
  Written Question, 5.74: A window washer pushes his scrub brush up a vertical window at constant speed by applying a force $\overrightarrow{\mathbf{F}}$ as shown in Fig. P5.74. The brush weighs $15.0\,N$ and the coefficient of kinetic friction is $\mu_k = 0.150$. Calculate (a) the magnitude of the force $\overrightarrow{\mathbf{F}}$ and (b) the normal force exerted by the window on the brush.



- HW #4 - Due February 8.

  Mastering Physics: 8 problems from chapters 1 and 3.

  Written Question, 3.65: Look Out! A snowball rolls off a roof that slopes downward at an angle of 40°. The edge of the roof if 14.0 m above the ground, and the snowball has a speed of 7.00 m/s as it rolls of the roof. Ignore air resistance. (a) How far from the edge of the barn does the snowball strike the ground if it doesn't strike anything else while falling? (b) Draw $x-t$, $y-t$, v_x-t, v_y-t graphs for the motion in part (a). (c) A man 1.9 m tall is standing 4.0 m from the edge of the barn. Will he be hit by the snowball?



- HW #3 - Due February 1.

  Mastering Physics: 6 problems from chapter 2.

  Written Question, 2.88: A physics teacher performing an outdoor demonstration suddenly falls from rest off a high cliff and simultaneously shouts "Help." When she has fallen for 3.0 s, she hears the echo of her shout from the valley floor below. The speed of sound is 340 m/s. (a) How tall is the cliff? (b) If air resistance is neglected, how fast will she be moving just before she hits the ground? (Her actual speed will be less than this, due to air resistance.)

- HW #2 - Due January 25.

  Mastering Physics: 6 problems from chapter 1 and 2.

  Written Question, 2.75: A marble is released from one rim of a hemispherical bowl of diameter 50 cm and rolls down and up to

the opposite rim in 10.0 s. Find (a) the average speed and (b) the average velocity of the marble.

- HW #1 - Due January 18.

  Mastering Physics: 9 introductory questions about Mastering Physics.

  Written Questions: None.