

# Physics 117 HW#6 Problems

[Note that earlier posting of this page was ~~ERRONEOUS~~

Ch 7: Q: 22, 30, 33; E: 12, 15, 21

Ch 9: Q: 1, 5; E: 1, 5

Fig. 22

22. The Chandra X-ray satellite orbits the Earth in a highly elliptical orbit, as shown in the figure. The force that Earth exerts on the satellite is always directed toward Earth. Is the satellite's kinetic energy increasing, decreasing, or staying the same at each of the points indicated? Explain your reasoning. (Note: The velocity vectors on the figure are *not* drawn to scale.)



30. As the firefighter in the picture slides down the pole, he initially speeds up to some terminal velocity, which he maintains until reaching the bottom. Gravitational potential energy is constantly decreasing during this process. Where does it go?
33. At which point in the swing of an ideal pendulum (ignoring friction) is the gravitational potential energy at its maximum? At which point is the kinetic energy at its maximum?
12. How much work is performed by the gravitational force on a satellite in near-Earth orbit during one revolution?
15. A baseball (mass = 145 g) is thrown straight upward with kinetic energy 8.7 J. When the ball has risen 6 m, find (a) the work done by gravity, (b) the ball's kinetic energy, and (c) the ball's speed.
21. What average power does a weightlifter need to lift 300 lb a distance of 4 ft in 0.8 s?

Fig 30



1. Newton's first law states: "Every object remains at rest or in motion in a straight line at constant speed unless acted on by an unbalanced force." Is this "law" true in all reference frames? Explain.
5. You wake up in a windowless room on a train, which rides along particularly smooth tracks. Imagine that you have a collection of objects and measuring devices in your room. What experiment could you do to determine whether the train is stopped at the train station or moving horizontally at a constant velocity?
1. A spring gun fires a ball horizontally at 15 m/s. It is mounted on a flatcar moving in a straight line at 25 m/s. Relative to the ground, what is the horizontal speed of the ball when the gun is aimed (a) forward? (b) backward?
5. What would an observer measure for the magnitude and direction of the free-fall acceleration in an elevator near the surface of Earth if the elevator (a) accelerates downward at  $6 \text{ m/s}^2$ ? (b) accelerates downward at  $16 \text{ m/s}^2$ ?