

Unit VII: Worksheet 4

Start each solution with a force diagram.

1. A baseball ($m = 140 \text{ g}$) traveling at $30. \text{ m/s}$ moves a fielder's glove backward 35 cm when the ball is caught.
 - a. Construct an energy bar graph of the situation, with the ball as the system.
 - b. What was the average force exerted by the ball on the glove?
2. A $60. \text{ kg}$ student jumps from the $10. \text{ meter}$ platform at ASU's swimming complex into the pool below.
 - a. Determine her E_g at the top of the platform.
 - b. How much E_k does she possess at impact? What is her velocity at impact?
 - c. Repeat steps a and b for a 75 kg diver.
 - d. If she jumped from a platform that was twice as high, how many times greater would be her velocity at impact?
 - e. How much higher would the platform have to be in order for her velocity to be twice as great?

3. A spring whose spring constant is 850 N/m is compressed 0.40 m. What is the maximum speed it can give to a 500. g ball?
4. If the spring in #3 were compressed twice as much, how many times greater would the velocity of the ball be?
5. A bullet with a mass of 10. g is fired from a rifle with a barrel that is 85 cm long.
 - a. Assuming that the force exerted by the expanding gas to be a constant 5500 N, what speed would the bullet reach?
 - b. Do an energy pie chart analysis of the situation, with the entire gun and bullet as the system.
6. A 24 kg child descends a 5.0 m high slide and reaches the ground with a speed of 2.8 m/s.
 - a. How much energy was dissipated due to friction in the process?
 - b. Do a pie chart analysis of this situation, using an accurate % of the pie to represent the amount of E_{diss} in the process.
7. Remember the Wyle Coyote shot from cannon problems? Suppose a scrawny 20. kg Wyle was shot straight up with an initial velocity of +50 m/s.
 - a. Assuming that all his initial E_k was transformed into E_g , what is the maximum height he could reach?
 - b. Suppose that 20% of his initial E_k were lost due to friction with the air (air resistance). What is the maximum height he could reach?