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PHY 115—Spring 2014

Assignment 7

1. a. A meteor is moving horizontally in vacuum at a constant speed v. Its kinetic energy is 4.5 x 107 J. At what speed, in terms of v, would it be moving if it had 9.0 x 107 J of kinetic energy while following a horizontal path?

1.b. What would be the meteor’s kinetic energy if it moved horizontally at a constant speed of v/2?

2. Digipen Cee is a 50-kg ninja. She is able to jump from a 10-m high roof, and walk away without a limp. As Cee falls, she thinks about conservation of energy. To answer the following questions, neglect air resistance and treat Cee as a particle.

2. a. How long is Cee’s flight? Assume that her initial speed is zero.

2. b. What is Cee’s kinetic energy immediately before she hits the ground? Please use conservation of energy to solve this question. Of course, you can check your result by using a kinematic equation.

2. c. What is Cee’s speed immediately before she hits the ground?

2. d. What is the total work done by the gravitational force during the flight? Is it positive or negative?

3. After landing, Cee throws a scimitar straight upwards, from a height of 3.0 m above the ground. The mass of the scimitar is 1.0 kg. The scimitar moves vertically upwards, and lands on the ground (but Cee is not hit by the scimitar, as she has teleported somewhere far away as the scimitar fell). To answer parts a through c, neglect air resistance and treat the scimitar as a particle.

3. a. How fast must Cee throw the scimitar so that it will hit the ground at a speed of 15 m/s? Please use conservation of energy to solve this question. Again, you can check your result by using a kinematic equation.

3. b. What is the maximum height (relative to the ground) of the scimitar?

3. c. What is the speed of the scimitar at 4.0 m from the ground?

3. d. Extra-credit: if the drag force did -15 J of work (the drag force does negative work) on the scimitar during the entire flight, what would be the speed of the scimitar immediately before it hit the ground?