

## Practice Worksheet

1. (momentum review) A 0.01 kg bullet moving horizontally at 200 m/s crashes into a stationary 2.99 kg block on a level, horizontal surface.
  - a. What is the speed of the bullet/block combination after the perfectly inelastic collision?
  - b. How much energy was lost in the collision?
  - c. How high would the bullet/block combination slide up a  $36.87^\circ$  hill after the collision?
  
2. (momentum review) A 4 kg block moving at 20 m/s collides elastically, head-on with an initially stationary 6 kg block. What are the speeds and directions of motion of the two blocks after the collision?
  
3. The frequency of an oscillator is 2 HZ. What is its period? What is its frequency in rpm? What is the average speed of the oscillator if its amplitude is 20 cm?
  
4. At what point in an oscillation cycle (middle, end, in between) are the following quantities at a maximum? Minimum?
  - a. Speed
  - b. Net Force
  - c. Potential Energy
  - d. Kinetic Energy
  - e. Acceleration
  
5. A 2 kg mass and a 50 N/m spring comprise a horizontal spring-mass oscillator on a frictionless surface. If the amplitude of the oscillator is 40 cm,
  - a. What is the maximum force on the mass?
  - b. What is the maximum potential energy of the spring?
  - c. What is the maximum acceleration of the mass?
  - d. What is the minimum acceleration of the mass?
  - e. Using conservation of energy, calculate the maximum speed of the mass.

Selected answers...

1.a. 0.667 m/s

1.c. 37 cm = .037 m

2.  $v(4) = -4$  m/s,  $v(6) = +16$  m/s

3.a.  $\frac{1}{2}$  second b. 120 rpm c. (this is tricky!!) 160 cm/sec (its average velocity = 0 m/s, though)

4. maximums: a. middle b. ends c. ends d. middle e. ends (why?)

5. a. 20 N b. 4 J c.  $10 \text{ m/s}^2$  d.  $0 \text{ m/s}^2$  e. 2 m/s