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Energy Review
SPH4U6

Page 214-218

4. *Two identical marbles are dropped in a classroom. Marble A is dropped from 1.00 m, and marble B is dropped from 0.50 m. Compare the kinetic energies of the two marbles just before they strike the ground.*

5. *A 0.30 kg soccer ball is released from the top of a 10 m building. The ball strikes the ground with a speed of 12 m/s. Use the conservation of energy to determine the energy lost due to the work done by air resistance.*

8. *All moving objects have kinetic energy.*

10. *The gravitational potential energy of an object 5 m above the ground in Ontario is the same as an identical object 5 m above the ground on the Moon.*

11. *The joule (J) is the SI unit for three quantities: work, energy, and power.*

12. *A marble is shot from a slingshot on a planet with no atmosphere. At any given moment, before the marble hits the ground, the sum of the kinetic energy and the gravitational potential energy is constant.*

13. *The farther you pull a spring beyond its equilibrium point, the more work you do on it.*

14. *In an oscillating spring, the elastic potential energy when the spring is completely compressed is equal to the kinetic energy when the spring is fully extended*

18. *A car is parked on a hill. The gravitational force on the car is 9.31 3 103 N straight downward, and the angle of the hill is 4.00° from the horizontal (Figure 3). The car's brakes fail, and the car slides 30.0 m downhill.*

21. *A sprinter with a mass of 68 kg is running at a speed of 5.8 m/s. In a burst of speed to win the race, she increases her speed to 6.9 m/s. Determine the work that the sprinter does to increase her speed.*

22. *In a curling match, a 20.0 kg stone (Figure 4) with an initial speed of 2.0 m/s glides to a stop after 30.0 m. Determine the work done on the stone by friction*

54. *An amusement park uses large compressible springs to stop cars at the end of a ride. Assume the springs are ideal, with no weight, mass, or damping losses. The combined mass of the car and passengers averages 450 kg, and the cars make contact with the spring at a speed of 3.5 m/s. Determine the minimum spring constant to bring the car and its riders to a stop in 2.0 m.*

57. *Suppose you set a spring with spring constant 4.5 N/m into damped harmonic motion at noon, measuring its maximum displacement from equilibrium to be 0.75 m. When you return 15 min later, the spring is still oscillating, but its maximum displacement has decreased to 0.5 m.*

- ***A.*** *Determine how much energy the system has lost*
- ***B.*** *What is the power loss of the system?*

58. *A ball is attached to a vertical spring with a spring constant of 6.0 N/m. It is held at the equilibrium position of the spring and then released. It falls 0.40 m and then bounces back up again. Calculate the mass of the ball.*

59. *A ball of mass 0.50 kg is attached to a horizontal spring. The spring is compressed 0.25 m from its equilibrium and then released. The ball undergoes simple harmonic motion, achieving a maximum speed of 1.5 m/s.*

- ***A.*** *Determine the spring constant.*
- ***B.*** *Calculate the speed of the ball when the spring is halfway to its equilibrium point.*
- ***C.*** *When the ball is halfway to its equilibrium point, what fraction of its energy has been converted from elastic potential energy to kinetic energy?*

60. *Two objects of different masses are suspended from two springs that have the same spring constant. The heavier of the two objects will extend its spring farther beyond the equilibrium point. Why?*