Honors Physics Work & Energy HW, part 1 (Homework)

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Include file name: Physics_Worksheet_0051
Price: $3

1.
A weight lifter lifts a 370 N set of weights from ground level to a position over his head, a vertical distance of 2.00 m. How much work does the weight lifter do, assuming he moves the weights at constant speed?

2.
A tugboat exerts a constant force of 3.80×10^3 N on a ship moving at constant speed through a harbor. How much work does the tugboat do on the ship if each moves a distance of 5.00 km?

3.
Starting from rest, a 5.9 kg block slides 2.3 m down a rough 30.0° incline. The coefficent of kinetic friction between the block and the incline is $\mu_k = 0.436$. Determine
(a) the work done by the force of gravity,
(b) the work done by the friction force between block and incline, and
(c) the work done by the normal force.

4.
A mechanic pushes a 2990 kg car from rest to a speed of *v*, doing 5200 J of work in the process. During this time, the car moves 20.0 m. Neglecting friction between car and road, find
(a) *v* and
(b) the horizontal force exerted on the car.

5.
A 69.0 kg base runner begins his slide into second base when moving at a speed of 3.6 m/s. The coefficient of friction between his clothes and Earth is 0.70. He slides so that his speed is zero just as he reaches the base.
(a) How much mechanical energy is lost due to friction acting on the runner?
(b) How far does he slide?

6.
A person doing a chin-up weighs 655 N exclusive of her arms. During the first 23.0 cm of the lift, each arm exerts an upward force of 355 N on the torso. If the upward movement starts from rest, what is the person's speed at this point?

7.
A 2.0 g bullet leaves the barrel of a gun at a speed of 340 m/s.
(a) Find its kinetic energy.
(b) Find the average force exerted on the bullet by the expanding gases as the bullet moves the length of the 50 cm-long barrel.

8.
A 2150 kg car moves down a level highway under the actions of two forces. One is a 960 N forward force exerted on the drive wheels by the road; the other is a 910 N resistive force. Use the work-energy theorem to find the speed of the car after it has moved a distance of 34 m, assuming it starts from rest.

9.
A 1000 kg roller-coaster car is initially at the top of a rise, at point *A*. It then moves 47.0 m at an angle of 43.0° below the horizontal to a lower point, *B*.
(a) Choosing point *B* as the zero level for gravitational potential energy, find the potential energy of the car at *A* and *B*, and the difference in potential energy between these points.
(A)
(B)
Difference in potential energy:
(b) Repeat part (a), choosing point *A* as the zero reference level.
(A)
(B)
Difference in potential energy:

10.
A 1.7 m long pendulum is released from rest when the support string is at an angle of 21° with the vertical. What is the speed of the bob at the bottom of the swing?

11.
A 44 N child is in a swing that is attached to ropes 2.6 m long. Find the gravitational potential energy of the child relative to her lowest position
(a) when the ropes are horizontal,
(b) when the ropes make a 30° angle with the vertical, and
(c) at the bottom of the circular arc.
12.
A child and sled with a combined mass of 52.0 kg slide down a frictionless hill. If the sled starts from rest and has a speed of 4.00 m/s at the bottom, what is the height of the hill?

13.
A 183 g particle is released from rest at point *A* on the inside of a smooth hemispherical bowl of radius *R* = 29.0 cm (Fig. P5.25).

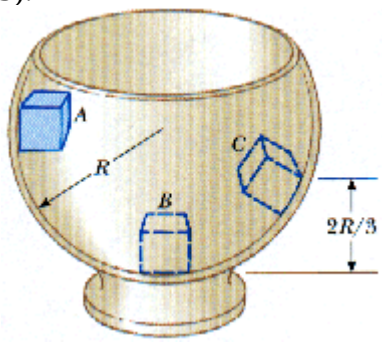

Fig. P5.25.

Calculate
(a) its gravitational potential energy at *A* relative to *B*,
(b) its kinetic energy at *B*,
(c) its speed at *B*,
(d) its potential energy at *C* relative to *B* and
its kinetic energy at *C*.

14.
Three masses, m_1 = 4.0 kg, m_2 = 10.0 kg, and m_3 = 18.0 kg, are attached by strings over frictionless pulleys as indicated in Figure P5.27. The horizontal surface is frictionless and the system is released from rest. Using energy concepts, find the speed of m_3 after it moves down 5.0 m.

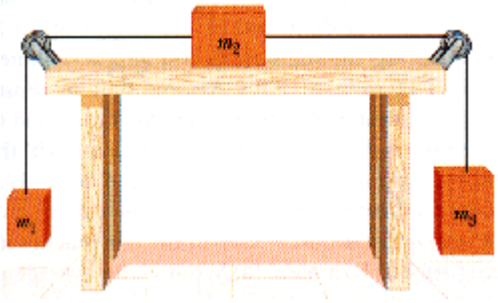

Figure P5.27.