Key

Assessment

Work and Energy - 5.1

Teacher Notes and Answers

5 Work and Energy

WORK

1. d
2. c
3. b
4. c
5. a
6. b
7. b
8. d
9. While lifting the block, the worker does positive work on the block while gravity does negative work on the block. The net work while lifting the block is positive. When the worker is holding the block, no forces do work on the block and no net work is done on the block. While lowering the block, the worker does positive work while gravity does negative work on the block. The net work on the block while it is lowered is negative. The total net work on the block is zero because the net displacement is zero.
10. 99 J

Given

$d = 3.0\ \text{m}$

$F_{child} = 55\ \text{N}$

$\theta = 35°$

$F_k = -12\ \text{N}$

Solution

$W_{net} = F_{net}d = (F_{child}\cos\theta + F_k)d =$
$[(55\ \text{N})(\cos 35°) + (-12\ \text{N})](3.0\ \text{m})$
$= 99\ \text{J}$

Assessment

Work and Energy -5.2

Teacher Notes and Answers

5 Work and Energy

ENERGY

1. a
2. c
3. d
4. c
5. b
6. b
7. d
8. c
9. The bocce ball has more kinetic energy. Kinetic energy depends on both mass and velocity. However, kinetic energy is more strongly dependent on velocity because the velocity term is squared in the equation for kinetic energy: $KE = (1/2)mv^2$.
10. $KE_i = 1.1 \times 10^5$ J; $KE_f = 8.5 \times 10^4$ J

    Given

    $m = 1.0 \times 10^3$ kg

    $v_i = 15$ m/s

    $W_{net} = -25$ kJ $= -2.5 \times 10^4$ J

    Solution

    $$KE_i = \frac{1}{2} mv_i^2 = \frac{1}{2} (1.0 \times 10^3 \text{ kg})$$

    $$(15 \text{ m/s})^2 = 1.1 \times 10^5 \text{ J}$$

    $$W_{net} = \Delta KE = KE_f - KE_i$$

    $$KE_f = KE_i + W_{net} = (1.1 \times 10^5 \text{ J}) +$$

    $$(-2.5 \times 10^4 \text{ J}) = 8.5 \times 10^4 \text{ J}$$

Assessment

Work and Energy – 5.3

Teacher Notes and Answers

5 Work and Energy

CONSERVATION OF ENERGY

1. d
2. c
3. d
4. a
5. d
6. b
7. d
8. c
9. When the ball is first thrown, the ball has some kinetic energy and some gravitational potential energy. As the ball rises, the kinetic energy is transferred to gravitational potential energy. At the peak, all the energy is potential energy. As the ball falls, the potential energy is transferred to kinetic energy. When the ball hits the ground, all the energy is kinetic energy. Mechanical energy is conserved throughout the flight of the ball.
10. 5.8 m/s

Given

$m = 5.7 \times 10^{-2}$ kg

$v_i = 2.0$ m/s

$h_i = 1.5$ m

$h_f = 0$ m

$g = 9.81$ m/s^2

Solution

$ME_i = ME_f$

$\frac{1}{2}mv_i^2 + mgh_i = \frac{1}{2}mv_f^2 + mgh_f$

$v_f^2 = \frac{2\left(\frac{1}{2}mv_i^2 + mgh_i - mgh_f\right)}{m}$

$v_f = \sqrt{2\left(\frac{1}{2}v_i^2 + gh_i - gh_f\right)}$

$v_f = \sqrt{2\left[\left(\frac{1}{2}\right)(2.0 \text{ m/s})^2 + (9.81 \text{ m/s}^2)(1.5 \text{ m}) - (9.81 \text{ m/s}^2)(0 \text{ m})\right]}$

$v_f = 5.8$ m/s

Assessment

Work and Energy - 5.4

Teacher Notes and Answers

5 Work and Energy

POWER

1. d
2. d
3. c
4. c
5. c
6. a
7. b
8. d
9. Power measures the amount of energy that is transferred from one object to another or transformed to other forms of energy in a given time interval.
10. 220 kW
    Given
    $F = 29\ \text{kN} = 2.9 \times 10^4\ \text{N}$
    $v = 7.5\ \text{m/s}$
    Solution
    $P = Fv = (2.9 \times 10^4\ \text{N})(7.5\ \text{m/s}) = 2.2 \times 10^5\ \text{W} = 220\ \text{kW}$