Energy & Power Test for Practice Name: Answers for Practice Test

Short Answer & Fill-In the Blank

1. Energy that results from the position of an object within a force field is called potential energy.

2. Energy that results from the movement of an object is called Kinetic energy.

3. If you lift a bottle of laundry detergent onto a shelf 3 times its original height. (Recall the formula for gravitational potential energy.) By what numerical factor does its gravitational potential energy change?

   $PE_g = mgh$ so $3 \times h \rightarrow$ 3 x Energy!

4. If you drop a bowling ball, as it falls it loses grav. potential energy, and it gains kinetic energy.

5. When the bowling ball strikes the ground and comes to rest, what happens to all of the kinetic and gravitational energy it once had?

   It transforms into thermal (& sound) energy.

6. If an object is at rest, what form of mechanical energy (if any) *must* it have? Carefully think and explain your answer.

   None. It may have grav. potential energy but it doesn't have to have grav. potential, if on ground.

7. A car's speed increases by a factor of 4 (i.e. it's going four times faster). (Recall the formula for kinetic energy.) By what numerical factor does its kinetic energy increase?

   $KE = \frac{1}{2}mv^2$ so if v goes from 1 to 4

   $\frac{1}{2}m(1)^2$ vs. $\frac{1}{2}m(4)^2$

   1 vs. 16

   16 x Energy!

8. What's the SI (International Standard Metric) Unit for each of the following?

   Speed m/s Mass kg Distance m

   Acceleration m/s^2 Energy J Power W

9. Name two (2) forms of energy that we discussed other than kinetic and gravitational energy.

   So many ... Thermal, Acoustic, Light, Nuclear, Electrical, Spring Potential, & more

   pick 2

10. Is mechanical energy *always* conserved? If not, give an example when it is not conserved.

    No.

    Friction slowing a moving bicycle converts kinetic (mechanical) into thermal (non-Mechanical) energy.

Puzzles (Let g=9.80 m/s^2. Please show all your steps and calculations--G.U.E.S.S.)

1. Barry throws a glob of applesauce straight up at 12.0 m/s. Using the conservation of energy, determine how high the applesauce rises above the point from which it was thrown.

$v_i = 12.0$ m/s
$v_f = 0$ m/s at top
$h_i = 0$ at bottom
$h_f = ?$ at top

$KE_i + PE_{g_i} = KE_f + PE_{g_f}$

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

$\frac{1}{2}(12)^2 + 9.8(0) = \frac{1}{2}(0)^2 + 9.8(h_f)$

$\frac{1}{2}(144) + 0 = 0 + 9.8h_f$

$72 = 9.8h_f$

$\frac{72}{9.8} = h_f$

$h_f = 7.3469$ (3 s.f.)

Height = 7.35 m

2. Michele drops a picture frame from a roof 6.0 meters above the ground. Using the conservation of energy, determine the speed of the frame as it strikes the ground below.

$v_i = 0$
$v_f = ?$
$h_i = 6.0$ m
$h_f = 0$

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

$\frac{1}{2}(0)^2 + (9.8)(6) = \frac{1}{2}v_f^2 + 9.8(0)$

$58.8 = \frac{1}{2}(v_f^2) + 0$

$117.6 = v_f^2$

$\sqrt{117.6} = v_f$ 10.844 m/s (2 s.f.)

Speed = 11 m/s

3. An enterprising bird swipes one of Hilary's cookies as they are cooling on a window sill. But because she used applesauce instead of eggs, the cookie crumbles and falls from the bird's talons. If the bird was travelling at 10.0 m/s at a height of 4.1 m, use the conservation of energy to determine the speed of the cookie crumbles as they hit the ground.

$v_i = 10.0$ m/s
$h_i = 4.1$ m
$h_f = 0$
$v_f = ?$

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

$\frac{1}{2}(10)^2 + (9.8)(4.1) = \frac{1}{2}(v_f)^2 + (9.8)(0)$

$50 + 40.18 = \frac{1}{2}(v_f)^2 + 0$

$90.18 = \frac{1}{2}v_f^2$

$180.36 = v_f^2$

$v_f = 13.4258$ (2 s.f.)

Speed = 13 m/s

4. Bill's reconstructed 225 kg motorcycle can go from 0 to 30.0 m/s in 9.0 s. Determine the final kinetic energy of the motorcycle and the power of the engine.

$KE_f = \frac{1}{2}mv_f^2$

$= \frac{1}{2}(225\text{ kg})(30.0\text{ m/s})^2$

$= 101{,}250$ J (3 s.f.)

$P = \frac{\Delta E}{t} = \frac{101{,}250\text{ J}}{9.0\text{ s}} = 11{,}250$ W (2 s.f.)

Kinetic Energy = 101,000 J (3 s.f.)

Power = 11,000 W (2 s.f.)