Answers and comments for the review activities and problems in Chapter 6.

GR:

2. a: wk done on box = gain in KE of box. b: 3.46m/s
c: final KE = 21J, final velocity is 4.58m/s.

4. a,b: 22.05J, c: 9.39m/s.

6. KE = 4 \times 10^{-18} J, v = 6.94 \times 10^4 m/s.

8. 0.588J has become internal energy.

10. a: 680m/s, b: 0.028s, c: collisions with other molecules

12. 9.87C

14. Zero - no change in KE or PE, the force remains perpendicular to the motion.

15-16. a: Zero (the tension remains perpendicular to the motion). b: 1.084m/s.

19-21. a: same height, b: 18.7m, c: 900J has dissipated, i.e. changed to thermal energy.

P&RSB:

Note the following, listed under "misprints and corrections": page 128, problem 4: change "height of the ball from the ground" to "time". Eliminate parts c and d.
page 129, problem 16: this one is really hard! In part b, ignore the advice on the reference level. In part d, leave out finding the value of y at the highest point.

3. The alpha-particle slows down, stops, and moves back.

It loses KE until all of the KE has been transformed into electrical PE at the distance of closest approach to the nucleus. It then moves back, losing PE and gradually regaining the original KE.

6. a: The ball leaves the bat with some KE, loses some to become internal energy of the air and the ball as it flies. It gains PE and loses KE as it rises, loses PE and regains KE as it comes back down. Finally it loses all of its KE when it is caught, transforming it to internal energy of the glove, the air, and the ball.

b: The player eats breakfast, storing internal energy. Some of it is used up for breathing and other metabolic uses, some in getting to the ballpark and changing, then going out to the field. Finally some of the player's internal energy is transformed to KE of the bat as it swings. When the bat collides with the ball some of this KE is transformed to internal energy of the bat, the ball, and the air, and some to KE of the ball as it leaves the bat.

12. $KE + PE = E_M = constant$. Let $PE = 0$ at ground level. Let the maximum height be $H$ and the maximum velocity be $V$.

At the top, $PE = E_M = MgH$ and $v = 0$. At the bottom, $PE = 0$ and $KE = E_M$.

a: At the half-way point $PE = 1/2 E_M$, and $v = 1/\sqrt{V}$.

b: $3/4$ of the way down $PE = 1/4 E_M$, $KE = 3/4 E_M$, and $v = (\sqrt{3})/2$ V.

16. See above.

34. 9 x 10^4J, 0.5c.

40. K = 3 x 10^{-12}J, v = 6.01 x 10^7J; 1.67cm.

42. a: The gravitational force is still there and equal to Mg.
b: The force between the person and the floor of the satellite is zero.

46. v = 2 \sqrt{gL}.

**MCQ**

2. (b)