7 Energy

Solutions to Chapter 7 Exercises

2. For the same momentum, the lighter truck must have a greater speed. It also has a greater KE and thus requires more work to stop. Whenever two bodies of different masses have the same momentum, the lighter one not only is the faster of the two, it also has the greater KE. That's because in the formula KE = $^1/_2\ mv^2$, the mass m enters once but the speed v enters twice (that is, it is squared). That means that the effect of higher speed for the lighter truck more than offsets the effect of smaller mass.

34. Both will have the same speed. This is easier to see here because both balls convert the same PE to KE.

42. Einstein's $E = mc^2$.

49. The question can be restated; Is $(30^2 - 20^2)$ greater or less than $(20^2 - 10^2)$? We see that $(30^2 - 20^2) = (900 - 400) = 500$, which is considerably greater than $(20^2 - 10^2) = (400 - 100) = 300$. So KE changes more for a given Δv at the higher speed.

53. Both have the same momentum, but the 1-kg one, the faster one, has the greater KE.

57. Not at all. A low-mass object moving at high speed can have the same KE as a high-mass object moving at low speed.

Chapter 7 Problem Solutions

3. The work done by 10 N over a distance of 5 m = 50 J. That by 20 N over 2 m = 40 J. So the **10-N force over 5 m** does more work and could produce a greater change in KE.

4. At three times the speed, it has 9 times (3^2) the KE and will skid 9 times as far—**135 m**. Since the frictional force is about the same in both cases, the distance has to be 9 times as great for 9 times as much work done by the pavement on the car.