ANSWERS TO EVEN NUMBERED CONCEPTUAL QUESTIONS

2. Each half-spring will have twice the spring constant of the full spring, as shown by the following argument. The force exerted by a spring is proportional to the separation of the coils as the spring is extended. Imagine that we extend a spring by a given distance and measure the distance between coils. We then cut the spring in half. If one of the half-springs is now extended by the same distance, the coils will be twice as far apart as they were for the complete spring. Thus, it takes twice as much force to stretch the half-spring, from which we conclude that the half-spring has a spring constant which is twice that of the complete spring.

4. Friction. This includes both air-resistance and damping within the spring.

6. No. The period of vibration is $T = 2\pi\sqrt{L/g}$ and g is smaller at high altitude. Therefore, the period is longer on the mountain top and the clock will run slower.

8. Shorten the pendulum to decrease the period between ticks.

10. The speed of the pulse is $v = \sqrt{F/\mu}$, so increasing the tension F in the hose increases the speed of the pulse. Filling the hose with water increases the mass per unit length μ, and will decrease the speed of the pulse.

12. The speed of a wave on a string is given by $v = \sqrt{F/\mu}$. This says the speed is independent of the frequency of the wave. Thus, doubling the frequency leaves the speed unaffected.