1. A block of mass *m* slides without friction on a table with speed *v*. It hits and compresses a spring of force constant *k* by a distance *L*. The spring then expands again ejecting the block in the opposite direction as it was originally traveling. Neglecting the mass of the spring, what is the speed of the block after it is ejected by the spring?

   (A) *v*/2 (B) 2*v* (C) *v* (D) 4*v* (E) *v - L*sqrt(k/m)*

Conservation of energy, speed is unchanged → **Correct answer is C**

2. A 0.2-kg mass attached to the end of a vertical spring causes it to stretch 5.0 cm. If another 0.2-kg mass is added to the spring, the potential energy of the spring will be

   (A) the same (B) one-half as much (C) twice as much (D) 3 times as much (E) 4 times as much

F = -kx → the spring stretches twice as much. But $U = \frac{1}{2}kx^2$, so the potential energy is 4 times as much → **Correct answer is E**

3. A ball drops some distance and gains 30 J of kinetic energy. Do not ignore air resistance. How much gravitational potential energy did the ball lose?

(A) > 30 J (B) = 30 J (C) < 30 J (D) Need more info

Correct answer is A because some energy is lost to air resistance

4. Describe the energy of a car driving up a hill.

(A) only kinetic (B) only potential (C) both kinetic and potential

$K=\frac{1}{2}mv^2$ and $U=mgh$ → **Correct answer is C**

5. A simple pendulum, consisting of a mass m, is attached to the end of a 1.5 m length of string. If the mass is held out horizontally, and then released from rest, its speed at the bottom is

(A) 4.4 m/sec (B) 5.4 m/sec (C) 9.8 m/sec (D) 17 m/sec

$U_{init}=mgh$ $K_{init}=0$ $U_{fin}=0$ $K_{fin}=\frac{1}{2}mv^2$ → $mgh=\frac{1}{2}mv^2$ → $v=\sqrt{2gh}$

→ $v=\sqrt{2 * 9.8 * 1.5}\,m/s=5.4\,m/s$ → **Correct answer is B**