

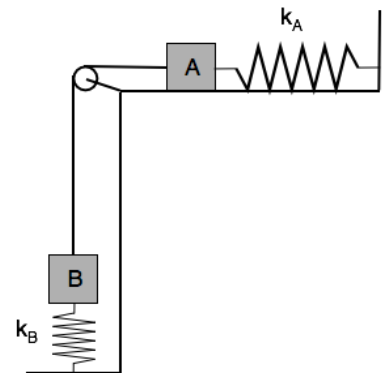
PHYS-114 Test #3 Chapters 9,10,11 Winter 2008
(Conservation of Momentum and Energy)

Name (please print): _____

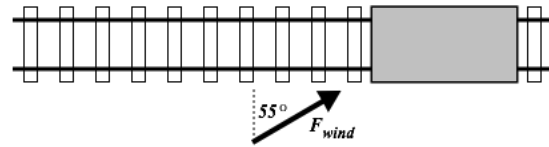
Raw Score: _____ Test Grade: _____

[1] (8 pts) In an episode of *Futurama* Professor Farnsworth uses his Smell-O-Scope to detect a gigantic ball of garbage, with a mass of 7.4×10^5 kg, that is hurtling towards the earth at a speed of 2400 m/s. Fry saves the day by suggesting that the New New Yorkers create a second huge ball of garbage and launch it towards the first one. If the second garbage ball has a mass of 5.3×10^5 what would its velocity have to be in order for it to stick to the first ball and stop, making it come to rest? (*Draw before and after pictures*)

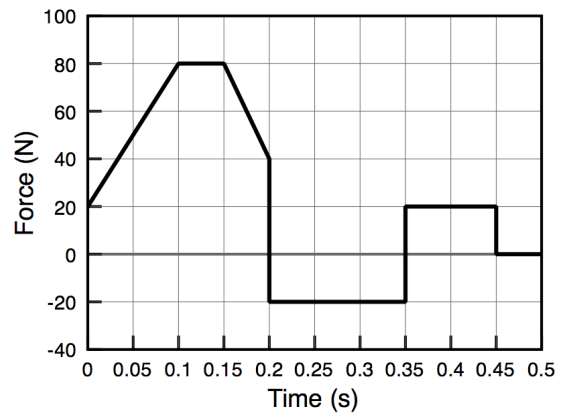
[3] (10 pts) Two blocks ($m_A = 0.6$ kg and $m_B = 0.25$ kg) are connected by a string passing over a massless, frictionless pulley. Both blocks are attached to springs, with $k_A = 44$ N/m and $k_B = 18$ N/m. Spring A is initially stretched to the left a distance of 0.87 m from its equilibrium point, while spring B is at its equilibrium point. The system is released from rest, and block B begins to move upwards. Find the speed of block B when block A is passing through its equilibrium point. (*include an end picture*)



[3] (8 pts) A 6500kg railroad boxcar is rolling to the left with a velocity of 4.0 m/s. Rolling friction is negligible. A strong constant wind blows on the boxcar exerting a force of $F_{\text{wind}} = 1050\text{N}$ in the direction shown in the figure. What is the boxcar's speed after it has traveled 45m to the left?



[4] (10 pts) A 170g hockey puck is sliding across the ice with an initial velocity of 20.0 m/s in the negative direction. A hockey player hits the puck with his stick, and the time history of the force that the stick exerts on the puck is shown in the graph at right. What is the final velocity of the puck?



[5] (24 pts) A block ($m_1 = 2.3 \text{ kg}$) is attached to a spring ($k = 140 \text{ N/m}$) that is initially compressed 1.84m . When released from rest at point A, block m_1 slides up a hill ($h = 3.5 \text{ m}$), and over a 4.8 m long rough patch ($\mu_k = 0.57$). After passing point B, block m_1 collides and sticks with a second block ($m_2 = 3 \text{ kg}$) that is moving to the left with a speed of 5.7 m/s . After colliding and sticking together, the two blocks pass point C and encounter a force directed to the left and which varies with time as $F(t) = -4t - 5$. After passing point C how much time passes before the two blocks stop? (This is a three-part problem. Your solution must clearly indicate the three major parts, along with appropriate pictures for each part.)

