Answer on Question #42097-Physics-Mechanics-Kinematics-Dynamics
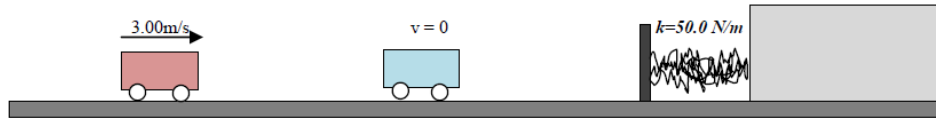
two cars of equal mass m = 0.250 kg are placed on a frictionless track that has a light spring of force constant k = 50.0n/m attached to one end of it as vo= 3.00m/s to the right and the blue cars is initially at rest if the cars collide elastically find a) the velocity of the cars just after the first collision and b) the maximum compression of the spring

Solution

a) When objects of the same mass collide elastically, they "exchange energies" because the forces are equal and opposite, and no overall energy or momentum is lost. So the red cart will stop and the blue cart will move off with the same velocity as the red cart had:

$$v_{red} = 0, v_{blue} = 3.00\frac{m}{s}.$$

b) Now when the blue cart hits the spring, it will compress until the kinetic energy of the cart has been converted into the elastic potential energy of the spring:

$$\frac{mv_{blue}^2}{2} = \frac{kx^2}{2},$$

where x is the compression. Thus

$$x = v\sqrt{\frac{m}{k}} = 3.00\frac{m}{s}\sqrt{\frac{0.250 \text{ kg}}{50.0 \text{ N/m}}} = 0.212 \ m.$$

Answer: a) $v_{red} = 0, v_{blue} = 3.00\frac{m}{s}$; b) $0.212 \ m$.

http://www.AssignmentExpert.com/