24. For the elastic collision of the two balls, we use momentum conservation:
$m_1v_1 + m_2v_2 = m_1v_1' + m_2v_2'$;
$(0.060\ \text{kg})(2.50\ \text{m/s}) + (0.090\ \text{kg})(1.00\ \text{m/s}) = (0.060\ \text{kg})v_1' + (0.090\ \text{kg})v_2'$.
Because the collision is elastic, the relative speed does not change:
$v_1 - v_2 = -(v_1' - v_2')$, or $2.50\ \text{m/s} - 1.00\ \text{m/s} = v_2' - v_1'$.
Combining these two equations, we get
$v_1' = 0.70\ \text{m/s}$, and $v_2' = 2.20\ \text{m/s}$.

25. (*a*) For the elastic collision of the two balls, we use momentum conservation:
$m_1v_1 + m_2v_2 = m_1v_1' + m_2v_2'$;
$(0.220\ \text{kg})(5.5\ \text{m/s}) + m_2(0) = (0.220\ \text{kg})(-3.7\ \text{m/s}) + m_2v_2'$.
Because the collision is elastic, the relative speed does not change:
$v_1 - v_2 = -(v_1' - v_2')$, or $5.5\ \text{m/s} - 0 = v_2' - (-3.7\ \text{m/s})$, which gives $v_2' = 1.8\ \text{m/s}$.
(*b*) Using the result for v_2' in the momentum equation, we get $m_2 = 1.1\ \text{kg}$.

26. (*a*) For the elastic collision of the two bumper cars, we use momentum conservation:
$m_1v_1 + m_2v_2 = m_1v_1' + m_2v_2'$;
$(450\ \text{kg})(4.50\ \text{m/s}) + (550\ \text{kg})(3.70\ \text{m/s}) = (450\ \text{kg})v_1' + (550\ \text{kg})v_2'$.
Because the collision is elastic, the relative speed does not change:
$v_1 - v_2 = -(v_1' - v_2')$, or $4.5\ \text{m/s} - 3.7\ \text{m/s} = v_2' - v_1'$.
Combining these two equations, we get
$v_1' = 3.62\ \text{m/s}$, and $v_2' = 4.42\ \text{m/s}$.
(*b*) For the change in momentum of each we have
$\Delta p_1 = m_1(v_1' - v_1) = (450\ \text{kg})(3.62\ \text{m/s} - 4.50\ \text{m/s}) = -396\ \text{kg}\cdot\text{m/s}$;
$\Delta p_2 = m_2(v_2' - v_2) = (550\ \text{kg})(4.42\ \text{m/s} - 3.70\ \text{m/s}) = +396\ \text{kg}\cdot\text{m/s}$.
As expected, the changes are equal and opposite.

27. (*a*) For the elastic collision of the two balls, we use momentum conservation:
$m_1v_1 + m_2v_2 = m_1v_1' + m_2v_2'$;
$(0.280\ \text{kg})v_1 + m_2(0) = (0.280\ \text{kg})v_1' + m_2(\tfrac{1}{2}v_1)$.
Because the collision is elastic, the relative speed does not change:
$v_1 - v_2 = -(v_1' - v_2')$, or $v_1 - 0 = \tfrac{1}{2}v_1 - v_1'$, which gives $v_1' = -\tfrac{1}{2}v_1$.
Using this result in the momentum equation, we get $m_2 = 0.840\ \text{kg}$.
(*b*) The fraction transferred is
$\text{fraction} = \Delta KE_2/KE_1 = \tfrac{1}{2}m_2(v_2'^2 - v_2^2)/\tfrac{1}{2}m_1v_1^2$
$= \tfrac{1}{2}m_2[(\tfrac{1}{2}v_1)^2 - 0]/\tfrac{1}{2}m_1v_1^2 = \tfrac{1}{4}m_2/m_1 = \tfrac{1}{4}(0.840\ \text{kg})/(0.280\ \text{kg}) = 0.750.$