p188 1 – 7 odd, 11, 15, 19

(1) $p = mv$

$= (0.028\ kg)(8.4\ ms^{-1}) = \underline{0.24\ kg\,ms^{-1}}$

(3) $F\Delta t = m\Delta v$

$F = \frac{m\Delta v}{\Delta t} = \frac{(0.145\ kg)(-52\ ms^{-1} - 39\ ms^{-1})}{3.0 \times 10^{-3}\ s} = -4400\ N$

4400 N towards the pitcher

(5) $F = \frac{m\Delta v}{\Delta t} = \frac{(1500\ kg\,s^{-1})(4.0 \times 10^{4}\ ms^{-1})}{} = \underline{6.0 \times 10^{8}\ N}$ (upward)

(7) $p_{before} = p_{after}$

$mv = m'v'$

$v' = \frac{mv}{m'} = \frac{(12\,600\ kg)(18.0\ ms^{-1})}{(12\,600\ kg + 5350\ kg)} = \underline{12.6\ ms^{-1}}$

(11) $p_{before} = p_{after}$

$m_n v_n = m_\alpha v_\alpha + m_n' v_n'$ $\qquad m_n' = 222 - 4u = 218u$

$(222u)(420\ ms^{-1}) = (4u)v_\alpha + (218u)(350\ ms^{-1})$

$\underline{v_\alpha = 4200\ ms^{-1}}$

(15) (a) $Impulse = m\Delta v = (0.045\ kg)(45\ ms^{-1} - 0) = \underline{2.0\ kg\,ms^{-1}}$

(b) $Impulse = F\Delta t$

$F = \frac{Impulse}{\Delta t} = \frac{2.0\ kg\,ms^{-1}}{3.5 \times 10^{-3}\ s} = \underline{570\ N}$

(19) (a) $p = mv = (95kg)(4\ ms^{-1}) = \underline{380\ kg\ ms^{-1}\ east}$

(b) $Impulse = m\Delta v = 95kg(0 - 4\ ms^{-1}) = \underline{380\ kg\ ms^{-1}\ west}$

(c) $\underline{380\ kg\ ms^{-1}\ east}$

(d) $Impulse = F\Delta t$

$$F = \frac{Impulse}{\Delta t} = \frac{380\ kg\ ms^{-1}}{0.75s} = \underline{510\ N}$$