

Final Review

Unit 6 - Impulse & Momentum

- ① the bicycle, because it is moving and the car is not.
- ② bike: $p = 25(26) = 650 \text{ kg}\cdot\text{m/s}$
skateboarder: $p = 65(12) = 780 \text{ kg}\cdot\text{m/s}$ } skateboarder
- ③ a) $J = m\Delta v = (0.06)(33 - (-27)) = \boxed{3.6 \text{ N}\cdot\text{s}}$
b) $J = F\Delta t \rightarrow 3.6 = F(0.025) \rightarrow F = \boxed{144 \text{ N}}$
- ④ a) $J = F\Delta t = 600(0.03) = \boxed{18 \text{ N}\cdot\text{s}}$
b) $J = m\Delta v$
 $18 = (.15)\Delta v$
 $\Delta v = 120 \text{ m/s}$ $\nearrow v_f = -50 + 120 = \boxed{70 \text{ m/s}}$
- ⑤ a) same impulse (both have to take momentum to 0)
b) steering wheel (less time so more force)
- ⑥ the sheet slows the egg down over a longer period of time so exerts less force ($J = F\Delta t$)
- ⑦ momentum is 0 before the gun is fired. Conservation of momentum says that when the bullet is fired and gains forward momentum, the gun must have the same amount of momentum backwards.
- ⑧ Inelastic Collision: $m_1 v_{10} + m_2 v_{20} = m_{\text{TOTAL}} v_f$
 $75(14) + 25(0) = 100 v_f \rightarrow v_f = \boxed{10.5 \text{ m/s}}$
- ⑨ Elastic Collision: $m_1 v_{10} + m_2 v_{20} = m_1 v_{1f} + m_2 v_{2f}$
 $(.16)(2.3) + (.16)(-1.5) = (.16)(-1.8) + (.16) v_{f2} \rightarrow v_{f2} = \boxed{2.6 \text{ m/s}}$
- ⑩ a) Inelastic: $1300(-40) + 800(35) = 2100 v_f \rightarrow v_f = \boxed{11.4 \text{ m/s south}}$
b) Elastic: $1300(-40) + 800(35) = 1300 v_{f1} + 800(-8)$
 $v_{f1} = \boxed{13.5 \text{ m/s south}}$
- ⑪ Explosion: $m_{\text{TOTAL}} v_0 = m_1 v_{f1} + m_2 v_{f2}$
 $2.15(0) = 1.25 v_{f1} + (0.9)(5)$
 $v_{f1} = \boxed{3.6 \text{ m/s left}}$
- ⑫ Explosion: $4(60) = 3(-12) + 1 v_{f2}$
 $v_{f2} = \boxed{276 \text{ m/s upward}}$