

PHYSICS 117 – HOMEWORK SET 5

- Q 7** Since the mass and speed are the same in both cases, so too is the change in momentum; thus, the impulses are the same.
- Q 13** Both balls have the same initial momentum, but one comes to a stop while the other gets knocked backwards. The backwards-moving ball experiences the greater change in momentum and thus a greater impulse.
- Q 23** The momentum given to the air by the fan blades is taken away from the fan blades, pushing it backwards. Then, when the air hits the board and pushes it forwards, it merely cancels the backwards momentum of the fan.
- Q 25** Somehow, the magical Newtonian gravitational force allows momentum to be transferred between the falling object and the earth towards which it falls. This implies that the earth actually moves a little ‘up’ as you fall ‘down’; however, since the earth has such a large mass, the change in velocity corresponding to the change in momentum is tiny. Furthermore, at any moment, there are objects pulling on the earth from so many different directions that the total momentum averages out to something extremely tiny.
- Q 29** Before, the objects have a total momentum that points to the right. Then, after, they will still have that same total momentum.
- Q 39** The eastbound object has greater momentum, so the total must point more eastward than northward. That corresponds to path D.
- E 3** $v = \frac{m_{18}v_{18}}{m} = 400 \text{ mph.}$
- E 9** $Impulse = F\Delta t = m\Delta v = -42,000 \text{ N} \cdot \text{s}; F = \frac{I}{\Delta t} = -6000 \text{ N.}$
- E 12** $\Delta p = m\Delta v = 5 \text{ m/s}, F = \frac{\Delta p}{\Delta t} = -250 \text{ N.}$
- E 17** Momentum before should equal momentum after. In any case, $p_i = p_{car} + p_{truck} = 66,400 \text{ kg} \cdot \text{m/s, northwards.}$
- E 21** $L = rmv = 225 \text{ kg m}^2 / \text{s.}$
- E 23** Angular momentum should be the same in both spots. Thus, $v_2 = v_1 \frac{m_1 r_1}{m_2 r_2} = 57.8 \text{ km/s.}$