106. (Second problem of **Cluster 1**)
The two parts of this problem are as follows. Part 1 (motion from A to B) consists of constant acceleration (so Table 2-1 applies) and involves the data $v_0 = 20.0$ m/s, $v = 30.0$ m/s, $x_0 = 0$ and $t_1 = 10.0$ s (taking point A as the coordinate origin, orienting the positive x axis towards B and C, and starting the clock when it passes point A). Part 2 (from B to C) also involves uniformly accelerated motion but now with the data $v_0 = 30.0$ m/s, $v = 15.0$ m/s, and $\Delta x = x - x_0 = 150$ m.

(a) The distance for part 1 is given by

$$x - x_0 = \frac{1}{2}(v_0 + v)\, t_1 = \frac{1}{2}(20.0 + 30.0)(10.0)$$

which yields $x = 250$ m.

(b) The time t_2 for part 2 is found from the same formula as in part (a).

$$x - x_0 = \frac{1}{2}(v_0 + v)\, t_2 \quad \Longrightarrow \quad 150 = \frac{1}{2}(30.0 + 15.0)t_2 \ .$$

This results in $t_2 = 6.67$ s.

(c) The definition of average velocity is given by Eq. 2-2:

$$v_{\text{avg}} = \frac{x_C - x_A}{t_C - t_A} = \frac{400 - 0}{16.7} = 24.0 \text{ m/s} \ .$$

(d) The definition of average acceleration is given by Eq. 2-7:

$$a_{\text{avg}} = \frac{v_C - v_A}{t_C - t_A} = \frac{15.0 - 20.0}{16.7} = -0.30 \text{ m/s}^2 \ .$$