Question #51365, Physics, Mechanics | Kinematics | Dynamics

A car traveling 54.3 km/h is 24.3 m from a barrier when the driver slams on the brakes. The car hits the barrier 2.14 s later. (a) What is the car's constant deceleration magnitude before impact? (b) How fast is the car traveling at impact?

Answer.

$$S = V_0 t - \frac{at^2}{2}, \quad V = V_0 - at.$$

In our case:

$$S = 24.3 \, m, \quad V_0 = 54.3 \frac{km}{h} = 54.3 * \frac{1000}{60 * 60} = 15.08 \frac{m}{s}, \qquad t = 2.14 \, s.$$

(a) $\quad a = \frac{2(Vt - S)}{t^2} = \frac{2(15.08 * 2.14 - 24.3)}{2.14^2} = 3.48 \frac{m}{s^2}$

(b) $\quad V = 15.08 - 3.48 * 2.14 = 7.63 \frac{m}{s}$