2 trains A and B are moving in same direction at same track with B ahead of A with speed u and train A with speed v (v>u). the driver of A sees B and starts decelerating with 'a'. What is the min distance to avoid collision?

Relative speed equals:

$$v_{12} = (v - at) - u$$

d_0 – initial distance, t – time, a – deceleration

min distance to avoid collision if $v_{12} = 0 \Rightarrow d = 0$

$$v_{12} = 0 \quad \Rightarrow \quad t = \frac{v-u}{a}$$

Distance between trains at moment of time t:

$$d = d_0 - (v - u)t + \frac{at^2}{2} = d_0 - \frac{(v-u)^2}{2a}$$

min distance if $d = 0$:

$$d_0 = \frac{(v-u)^2}{2a}$$

Answer: $d_0 = \frac{(v-u)^2}{2a}$