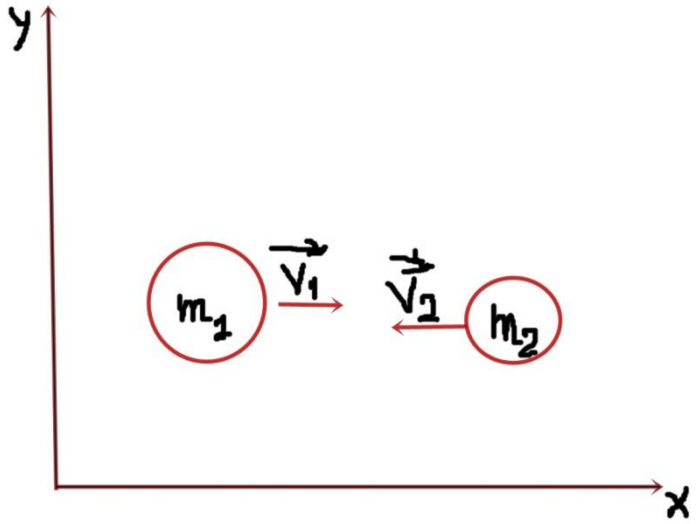
Answer on Question #44595, Physics, Other

Task: Consider the inelastic collision between two objects (A and B). Object A has a mass of 15 kg. and is moving at 12 m/s. Object B has a mass of 8 kg. and is moving at 20 m/s toward object A (i.e., objects A and B are moving towards each other).

What is the velocity and direction of the wreckage after the inelastic collision?

(b) How much energy is dissipated as heat ?

Solution:



a)according to the law of conservation of momentum we have

$$\vec{p}_1 + \vec{p}_2 = m_1\vec{V}_1 + m_2\vec{V}_2 = (m_1 + m_2)\vec{V}_3 \Rightarrow V_3 = \frac{m_1V_1 - m_2V_2}{m_1 + m_2} = \frac{15*12 - 20*8}{15+8} = \frac{20}{23} > 0,$$ direction of the velocity after the inelastic collision in the direction of positive x-axis.

$$let\ \ U = \frac{m_1V_1 - m_2V_2}{m_1 + m_2}.$$

$$E_k^{/} + E_k^{//} = A - \text{work of non - conservative forces}$$

b) $$\frac{m_1V_1^2}{2} + \frac{m_2V_2^2}{2} - \frac{(m_1 + m_2)}{2}U^2 = A$$

$$A = \frac{15*12^2}{2} + \frac{8*20^2}{2} - \frac{(15+8)}{2}(\frac{20}{23})^2 \approx 2671J$$