

2012 dse suggested answer physics

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2012 DSE Suggested Answer: Physics

Question:

A body of mass 2.0 kg is moving with a velocity of 4.0 m/s in the positive x-direction. It collides with an identical body at rest. After the collision, the second body moves with a velocity of 2.0 m/s in the positive y-direction.

(a) Calculate the velocity of the first body after the collision. (b) Determine the coefficient of restitution of the collision.

Answer:

(a) Velocity of the first body after collision:

Using the conservation of momentum:

$$(2.0 \text{ kg})(4.0 \text{ m/s}) + (0 \text{ kg})(0 \text{ m/s}) = (2.0 \text{ kg})v_{1x} + (2.0 \text{ kg})(2.0 \text{ m/s})$$

Solving for v_{1x} :

$$v_{1x} = 2.0 \text{ m/s}$$

The first body moves with a velocity of 2.0 m/s in the positive x-direction after the collision.

(b) Coefficient of restitution:

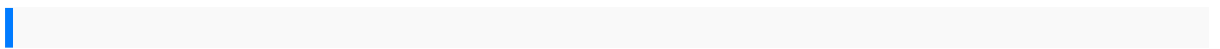
The coefficient of restitution is given by:

$$e = (\text{relative velocity after collision}) / (\text{relative velocity before collision})$$

The relative velocity before collision is $4.0 \text{ m/s} - 0 \text{ m/s} = 4.0 \text{ m/s}$. The relative velocity after collision is $v_{1x} - 2.0 \text{ m/s} = 2.0 \text{ m/s}$.

Therefore, the coefficient of restitution is:

$$e = 2.0 \text{ m/s} / 4.0 \text{ m/s} = 0.5$$



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