

PYP 001
Quiz # 4 (A)

Name: _____

ID : _____

1. A 0.016 kg object (A) is moving horizontally at 30 m/s while a 0.004 kg object (B) is moving in the opposite direction at 50 m/s. They collide head on and stick together. What is their velocity after the collision?

Solution:

$$m_1v_1 + m_2v_2 = (m_1 + m_2)V$$

$$0.016 \times 30 + 0.004 \times (-50) = (0.016 + 0.004)V$$

$$V = 14 \text{ m/s}$$

2. A 0.500 kg ball is dropped from rest. It hits the floor after 4 seconds. The ball rebounds straight upward to reach a maximum height in 3 seconds. What are the magnitude and direction of the impulse of the net force applied to the ball during the collision with the floor?

Solution:

$$v_i = 40 \text{ m/s} \Rightarrow mv_i = 20 \text{ Kg.m/s}$$

$$v_f = 30 \text{ m/s} \Rightarrow mv_f = 15 \text{ Kg.m/s}$$

$$\text{impulse} = \text{change in momentum} = (20 - 15) = 5 \text{ Kg.m/s}$$

3. A black ball of mass 0.220 kg that is moving with a speed of 5.5 m/s collides head on and elastically with a 1.1 kg white ball initially at rest. Afterward it is found that the black ball has bounced backward with a speed of 3.7 m/s. Calculate the velocity of the white ball after the collision.

Solution:

$$m_1v_2 = m_1V_1 + m_2V_2$$

$$0.22 \times 5.5 = 0.22 \times (-3.7) + 1.1 \times V_2$$

$$V_2 = 1.84 \text{ m/s}$$

PYP 001
Quiz # 4 (B)

Name: _____

ID : _____

1. A 40,000 kg freight car is coasting at a velocity of 5.0 m/s along a straight track when it strikes a 30,000 kg freight car traveling in the same direction at 2.0 m/s and couples to it. What will be their combined velocity after impact?

Solution:

$$m_1v_1 + m_2v_2 = (m_1 + m_2)V$$

$$40,000 \times 5 + 30,000 \times 2 = 70,000 \times V$$

$$V = 3.7 \text{ m/s}$$

2. A black ball of mass 0.25 kg that is moving with a speed of 7.5 m/s collides head on and elastically with a 1.4 kg white ball initially at rest. Afterward it is found that the black ball has bounced backward with a speed of 3.5 m/s. Calculate the velocity of the white ball after the collision.

Solution:

$$m_1v_2 = m_1V_1 + m_2V_2$$

$$0.25 \times 7.5 = 0.25 \times (-3.5) + 1.4 \times V_2$$

$$V_2 = 1.96 \text{ m/s}$$

3. A 0.600 kg ball is dropped from rest. It hits the floor after 3 seconds. The ball rebounds straight upward to reach a maximum height in 2 seconds. What are the magnitude and direction of the impulse of the net force applied to the ball during the collision with the floor?

Solution:

$$v_i = 30 \text{ m/s} \Rightarrow mv_i = 18 \text{ Kg.m / s}$$

$$v_f = 20 \text{ m/s} \Rightarrow mv_f = 12 \text{ Kg.m/s}$$

$$\text{impulse} = \text{change in momentum} = (18 - 12) = 6 \text{ Kg.m/s}$$