Physics 11 Unit 4 Momentum Year End Review Sheet

Key

Name: _____

Show all your work, even write yourself some notes on your work, little mental reminders of what you are doing.

1. Calculate the momentum of a 1800 kg car travelling at 28 m/s.

$p = mv = (1800)(28) = 50,400\ N \cdot s$

2. Calculate the momentum of a 2100 kg car travelling at 120 km/hr.

$120\ km/hr \rightarrow 33.3\ m/s$

$p = mv = (2100)(33.3) = 70,000\ N \cdot s$

3. A 2 kg ball is initially at rest, the ball is struck and has a final velocity of 28 m/s. Find the impulse impart to the ball. (impulse = change in momentum)

$\Delta p = p_f - p_i = (2)(28) - (2)(0) = 56\ N \cdot s$

4. A ball is travelling at 29 m/s east and comes to a complete stop. Calculate the change in velocity.

(+)

$\Delta v = v_f - v_i = 0 - 29 = -29\ m/s$.

5. A ball is travelling at 15 m/s east, the ball is struck and has a final velocity of 41 m/s east. Calculate the change in velocity.

(+) (+)

$\Delta v = v_f - v_i = 41 - 15 = 26\ m/s$

6. A ball is travelling at 18 m/s east, the ball is struck and has a final velocity of 38 m/s west. Find the change in velocity.

(+) (−)

$\Delta v = v_f - v_i = -38 - (18) = 56\ m/s$

7. A 1200 kg car traveling at 24 m/s hits a 2000 kg hippo traveling 20 m/s head on. Assuming the car and the hippo "stick", what is the final velocity of the carnage?

one of the velocities is ⊖

$P_i = P_f$

$mv + mv = mv$

$(1200)(24) + (2000)(-20) = (3200)v$

$V = -3.5$ direction of hippo

8. A 1800 kg car travelling 120 km/hr east hits a 2200 kg car travelling west at 130 km/hr. After the collision the car is travelling west at 15 km/hr. Find the final velocity of the truck. $36.\overline{1}$ m/s

east = ⊕ ⊖

$P_i = P_f$

$(1800)(33.\overline{3}) + (2200)(-36.\overline{1}) = (1800)(-4.1\overline{6}) + (2200)V$

$-19,444 = -7499.9 + 2200V$

$V = -5.43$ m/s (− means west)

9. A baseball player hits a stationary ball. The collision with the ball lasts 0.08 seconds. The 0.7 kg ball has a final velocity of 26 m/s. What was the average force during the collision?

$\Delta p = m\Delta v = F\Delta t$

$(.7)(26) = F(.08)$

$F = 227.5\ N = 228\ N$

10. A baseball player hits a 0.6 kg ball that was pitched at 90 km/hr. The collision lasts 0.07 of a second. The final velocity of the ball is 140 km/hr back at the pitcher. What is the average collision force?

$-38.888$ m/s

25 m/s away from pitcher

$\Delta v = -38.888 - 25 = 63.\overline{8}$ m/s

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$\Delta p = m\Delta v = F\Delta t$

$(.6)(63.\overline{8}) = (F)(.07)$

$F = 548\ N$