

NAME: \_\_\_\_\_

DATE: \_\_\_\_\_ Period: \_\_\_\_\_

### Understanding Car Crashes: It's Basic Physics

#### Test Track Laws

1. Why did the dummy get left behind? It's called \_\_\_\_\_, the property of matter that causes it to \_\_\_\_\_.
2. Isaac Newton's \_\_\_\_\_ Law of Motion states: A body at rest remains at \_\_\_\_\_ unless acted upon by an external \_\_\_\_\_, and a body in \_\_\_\_\_ continues to move at a constant \_\_\_\_\_ in a straight line unless it is acted upon by an external force.

#### Crashing Dummies

3. Now watch what happens when the car crashes into a barrier. The front end of the car is crushing and absorbing \_\_\_\_\_, which slows down the rest of the car.
4. In this case, it is the steering wheel and windshield that applies the \_\_\_\_\_ that overcomes the dummy's \_\_\_\_\_.

#### Crash-Barrier Chalkboard

5. Newton explained the relationship between crash forces and inertia in his \_\_\_\_\_ Law of Motion.

(Fill in the blanks to explain what each letter in the formula represents.)

6.  $F = m a$      $F =$  \_\_\_\_\_  $m =$  \_\_\_\_\_  $a =$  \_\_\_\_\_

7.  $F = m \Delta v / \Delta t$      $\Delta v =$  \_\_\_\_\_  $\Delta t =$  \_\_\_\_\_

8.  $Ft = m \Delta v$      $Ft =$  \_\_\_\_\_  $m \Delta v =$  \_\_\_\_\_

#### Surfers, Cheetahs, and Elephants ...oh my!

9. Momentum is \_\_\_\_\_ in motion. It is the product of an object's \_\_\_\_\_ and its \_\_\_\_\_.
10. Which has more momentum? An 80,000-pound big rig traveling 2 mph or a 4,000 pound SUV traveling 40 mph? \_\_\_\_\_

#### Soccer Kicks, Slap Shots, and Egg Toss

11. What is it that changes an object's momentum? \_\_\_\_\_. It is the product of \_\_\_\_\_ and the \_\_\_\_\_ for which it acts.
12. If the eggs are of equal mass and are thrown at the same velocity they will have the same \_\_\_\_\_. The wall and the sheet both apply equal \_\_\_\_\_.
13. The wall applies a \_\_\_\_\_ force over a \_\_\_\_\_ time, while the sheet applies a \_\_\_\_\_ force over a \_\_\_\_\_ time.

**Understanding Car Crashes:**  
When Physics Meets Biology

*Answer the following questions after viewing the clips*

14. Show mathematically why an 80,000 pound (36,000 kg) big rig traveling 2 mph (0.89 m/s) has the SAME MOMENTUM as a 4,000 pound (1,800 kg) sport utility vehicle traveling 40 mph (18 m/s).
15. During the Egg-Throwing Demonstration, which egg experienced the greater impulse, the egg that hit the wall or the bed sheet? (Be careful here!) Which egg experienced the greater force of impact? Which egg experienced the greater time of impact?
16. Explain how the fortunate race car drivers survived their high speed crashes.