Part I: Before the Video

Directions: Before viewing the video, answer the question below. Be prepared to discuss your answer.

Why do some spectacular racecar crashes produce only minor injuries?

Part II: During the Video

Directions: While viewing the video, complete the fill-in-the blank statements with the correct terms OR circle the correct answers if provided. (Times in left margin indicate when each item is discussed.)

IIHS’s Vehicle Research Center

1. It is a fascinating place where research engineers assess the crash performance of vehicles by running tests and where they evaluate new _____________ to prevent injuries.

Test Track Laws

2. Why did the dummy get left behind? It’s called ______________, the property of matter that causes it to resist any change in its motion.

3. Isaac Newton’s First Law of Motion states: A body at rest remains at ______________ unless acted upon by an external force; and a body in motion continues to move at a constant ______________ in a straight line unless it is acted upon by an external force.

Crashing Dummies

4. 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.

5. In this case, it is the steering wheel and windshield that apply the ______________ that overcomes the dummy’s inertia.

Crash-Barrier Chalkboard

6. Newton explained the relationship between crash forces and inertia in his (Circle one): 1st 2nd 3rd Law of Motion.

7. Fill in the blanks to complete the formula.

\[ F_t = m \Delta v \]

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\[ m \Delta v = \] _____________

*These times are for the full-length video. Disregard times if watching individual video chapters.
**“UNDERSTANDING CAR CRASHES: IT’S BASIC PHYSICS”**

Concept Organizer

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

8. Momentum is inertia in motion. It’s the product of an object's mass and its ______________.

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

9. Impulse is the product of ______________ and the time interval during which the force acts.

10. The wall applies a ______________ force over a shorter time.

11. The sheet applies a smaller force over a ______________ time.

**Fighter pilots, astronauts, and crash occupants**

12. People often refer to g’s as forces but they are not. A g is a standard unit of ______________.

13. People in serious car crashes experience high g’s and this can cause ______________.

14. Three things that extend the time of impact in a collision are: crumple zones, ______________, and ______________.

**Conserving momentum and energy - it's the law!**

15. Momentum has a directional property, so it is called a ______________ quantity.

16. Weight vs. Size in car crashes:

    ______________ helps you in all kinds of crashes.

    ______________ is primarily an advantage in a crash with another vehicle.

**Newton and energy**

17. Energy is the ability to do ______________.

18. Motion related energy is called ______________ energy.

    Energy due to an object’s position or condition is called ______________ energy.

19. At what point in the pendulum's swing is its potential energy equal to its kinetic energy? ______________

**Engineering safer vehicles**

20. We use the term ______________ to describe the protection a car offers its occupants during a crash.

21. If we can ______________ the front end of the car without allowing any damage to the occupant compartment then the people inside can be protected against serious injury.

22. When the ______________ collapses, you are going to have injuries to the occupants.

23. The rear seats of most cars lack seat belt systems with crash tensioners and ______________.

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