Post-Video Questions

Directions
After viewing the video, answer the following questions in the space provided. Be prepared to discuss your responses while in small groups or as an entire class.

1. Historically crash research, like many scientific investigations, has required the cooperation and combined knowledge, skills, creativity, and passion of individuals from many different fields. Discuss how Col. John Stapp’s research combined several different fields to save human lives.

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2. Crash test dummies are tough, complicated and expensive, some costing over $130,000.
   a) List the three types of measurements most dummies record.

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   b) Describe how these measurements are used to help predict crash injuries.

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3. Explain how the term biofidelity is used to describe the effectiveness of crash test dummies in injury biomechanics research.

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4. During a collision someone may experience a blunt force trauma to his/her chest. Summarize how the appropriate body cavity and major bones protect the person’s heart and lungs.

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5. Describe the how three collisions can occur during a single crash between a truck and a wall.

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6. a) In the two images below, draw arrows to indicate the direction the brain and the cerebral spinal fluid are moving before and during a frontal collision resulting in a coup-contrecoup brain injury.

b) Write captions for each image that summarizes what is happening to the brain and the cerebral spinal fluid.

Before the collision

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During the collision

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7. The strength of any tissue or organ depends on many factors, such as its elasticity or the type of stress it experiences. Distinguish between stress and strain. Explain their effects on human tissue.

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8. Describe how shockwaves create stress and strain that injure tissue.

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9. Interpret this statement: Trauma to human tissue is like failure to a structure. In your answer, describe how critical stress limit relates to tissue trauma and structural failure.

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10. Analyze the photos below of Tony Kanaan’s race car from the Andretti Green Racing Team. Circle and label three safety features of the car that help reduce forces on drivers thereby preventing injuries during a crash.

Tony Kanaan’s race car

Dr. Jones buckling up

11. Describe how new technologies, such as crash recorders, help engineers build safer race cars.

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12. In the video, a 223 pound crash test dummy was lowered onto Dr. Jones’ chest while he was sandwiched between two beds of nails. Similarly, the diagram below shows a man lying between two beds of nails while having a concrete block shattered on his chest.

![Diagram of a man lying between two beds of nails](image)

a) How are forces from his weight, the block, and the impact reduced to allow him to survive the experience?

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b) How are the same physics concepts applied in the bed of nails demonstration utilized to improve a vehicle’s crashworthiness?

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13. One of the key principles to keeping people safe in crashes is extending impact time. If the change of momentum occurs over a long time, the force of impact is small. Examine the pictures below of the driver’s area of a stock car. Circle and label safety features that reduce impact forces by extending the impact time.

![Driver’s seat inside a stock car](image) ![Steering wheel and dashboard of a stock car](image)