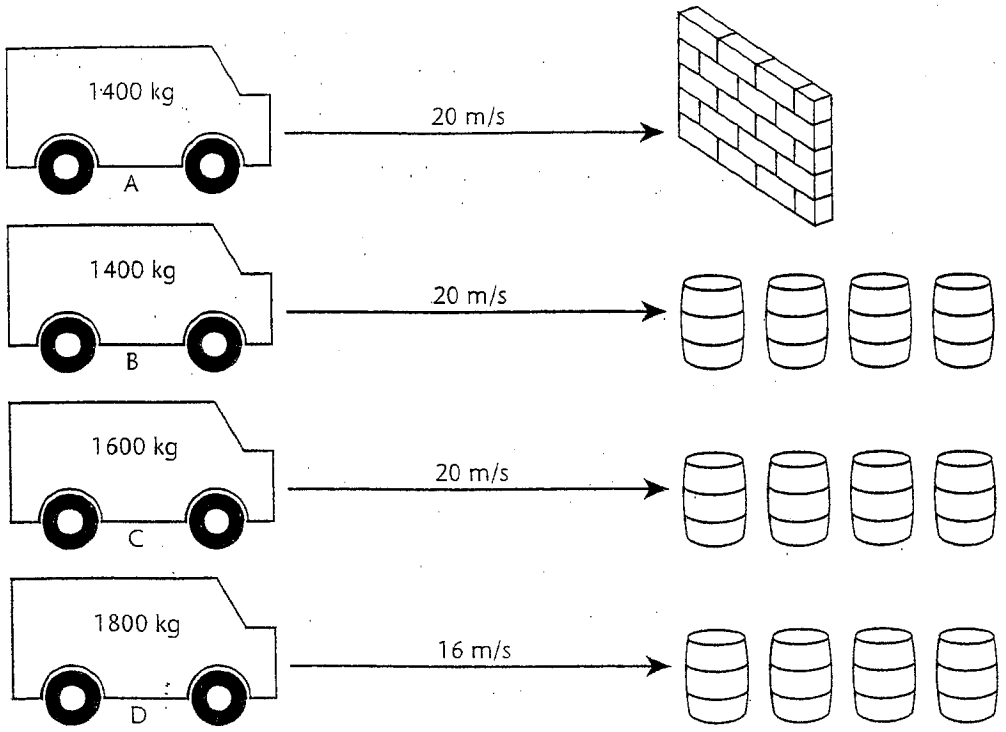
Life-Saving Barrier

On January 14, 1998 a former racing car driver by the name of John Fitch received an award for "his life-long contributions in the field of roadside safety." Back in the late 1960s, Fitch had invented a device that is now used in all 50 states of the United States. The device is believed to have saved thousands of lives.

You've probably seen it—or, really, them—near the exit ramps of bridges and highways or other places where roadways divide. They are plastic, sand-filled barrels called Fitch Barriers. And their purpose is to slowly absorb the momentum of a vehicle that might otherwise be stopped dead by a solid wall or highway divider.

Study the drawings below. They show the mass and velocity of four different cars on a collision course with a concrete wall or Fitch Barriers.



Answer the following questions on a separate sheet of paper.

1. Which car has the greatest momentum? What is its momentum?
2. Of the cars that strike the Fitch Barriers, which will penetrate the least distance? Explain your answer.
3. Compare the forces exerted by the wall and the Fitch Barriers on Cars A and B and describe differences, if any about how those forces are applied.
4. Write a comparison of the effects of a crash on people in cars A and B. Explain the causes of the differences of the effects.

1. The product of an object's mass and velocity is its _____.

2. What is the equation you use to determine the momentum of an object?

3. What is the momentum of a 20 kg dog running at a speed of 8 m/s?

4. Imagine a train car moving down a track at 10 m/s and it hits a train car that is not moving. Assuming the first train car stops, what speed does the second train car move away with?

5. Could an elephant have the same momentum as a golf ball? Explain.

6. Calculate the impulse when an average force of 10 N acts on a cart for 5.0 s.

7. A 2 kg blob of putty traveling at 3 m/s slams into a 2 kg blob of putty at rest. Calculate the speed of the two stuck together blobs of putty immediately after colliding.

8. A 1 kg block with velcro on its side is traveling at 2m/s. It collides with a stationary block that has a mass of 2 kg. Assuming both blocks stick together, what speed do they move away at?

9. A 12,000 kg railroad car is traveling at 2 m/s when it strikes another 10,000 kg railroad car that is at rest. If the cars lock together, what is the final speed of the two railroad cars?