**Concept Questions with Answers**

8.01
W05D1

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**Momentum and Impulse**

8.01
W05D1

Today’s Reading Assignment (W05D1): MIT 8.01 Course Notes

*Chapter 10 Momentum, System of Particles, and Conservation of Momentum*

Sections 10.1-10.9

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**Concept Question: Pushing Identical Objects**

Identical constant forces push two identical objects A and B continuously from a starting line to a finish line. Neglect friction. If A is initially at rest and B is initially moving to the right,

1. Object A has the larger change in momentum.
2. Object B has the larger change in momentum.
3. Both objects have the same change in momentum.
4. Not enough information is given to decide.

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**Concept Question: Pushing Identical Carts Answer**

**Answer 1:** Both objects have the same mass, are pushed the same distance, by the same constant force. Object A is pushed for a longer time interval. Therefore the impulse on object A is larger than the corresponding impulse on object B. Hence object A has a larger change in momentum.
Concept Question: Impulse

The figure to the right depicts the paths of two colliding steel balls, A and B. Which of the arrows 1-5 best represents the impulse applied to ball B by ball A during the collision?

Answer: 1. Ball B has changed its momentum in the upward direction in the figure, and as far as the figure can show, there is no change in its horizontal (rightward) velocity.

Concept Q.: Pushing a Baseball Bat

A baseball bat is pushed with a force F. You may assume that the push is instantaneous. Which of the following locations will the force produce an acceleration of the center of mass with the largest magnitude?

1. Pushing at Position 1.
2. Pushing at Position 2 (center of mass).
3. Pushing at Position 3.
4. Pushing at 1,2, and 3 all produce the same magnitude of acceleration of the center of mass.

Answer 4. The external force is equal to the total mass times the instantaneous acceleration of the center-of-mass. It doesn’t matter where the external force acts with regards to the center-of-mass acceleration.