Friday Warm Up: Unit 5: Momentum I

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1   Memory Bank

- $\vec{p} = m\vec{v}$ ... Definition of momentum.

- $\vec{p}_{\text{total}} = \vec{p}_1 + \vec{p}_2$ ... Total momentum.

- $\vec{p}_{\text{total,i}} = \vec{p}_{\text{total,f}}$ ... Momentum is conserved.

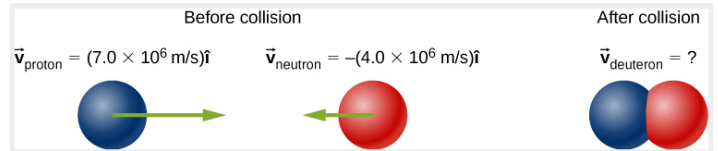- $m_p = 1.67 \times 10^{-27}$ kg ... Mass of protons.

2   Momentum

1. An object that has a small mass and an object that has a large mass have the same momentum. Which object has the largest kinetic energy?

   - A: The one with small mass
   - B: The one with large mass

2. Two objects of equal mass are moving with equal and opposite velocities when they collide. Can all the kinetic energy be lost in the collision?

   - A: Yes
   - B: No

3. Suppose two loaded train cars are moving toward one another, and they couple together. The first has a mass of 1.50×10^5 kg and a velocity of $0.30\hat{i}$ m s^{-1}, and the second has a mass of 1.10×10^5 kg and a velocity of $-0.12\hat{i}$ m s^{-1}. What is their final velocity?

Figure 1: A proton and neutron collide.

with velocity -4.0×10^6 m/s to the left?

5. Check whether or not kinetic energy is conserved. (a) What is the initial total kinetic energy? (b) What is the final total kinetic energy?

4. A proton collides with a neutron (with essentially the same mass as the proton) to form a particle called a deuteron (see Fig. 1). What is the velocity of the deuteron if it is formed from a proton moving with velocity 7.0×10^6 m/s to the right and a neutron moving