2024 Ph H1 Q6
Section: Our Dynamic Universe
Topic: Collisions, Explosions and Impulse

Question Summary

> Two trolleys move along a level bench as shown:

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Trolley A: 6.0 kg at 1.0 m/s
Trolley B: 2.0 kg at 5.0 m/s
```

They **collide and stick together**.
What is the **velocity immediately after the collision**?

Options:

A. 0.50 m/s
B. 1.3 m/s
C. 2.0 m/s
D. 2.7 m/s
E. 8.0 m/s

✅ Worked Solution

We apply the **principle of conservation of momentum**. Since they **stick together**, it's an **inelastic collision**.

Step 1: Use the formula

$$m_1u_1 + m_2u_2 = (m_1 + m_2)v$$

Where:

- $m_1 = 6.0\,\text{kg},\ u_1 = 1.0\,\text{m/s}$
- $m_2 = 2.0\,\text{kg},\ u_2 = 5.0\,\text{m/s}$
- v = final velocity of the combined trolleys

Step 2: Calculate total momentum before collision

$$p = (6.0 \times 1.0) + (2.0 \times 5.0) = 6.0 + 10.0 = 16.0\,\text{kgm/s}$$

Step 3: Calculate total mass

$$m = 6.0 + 2.0 = 8.0\,\text{kg}$$

Step 4: Solve for final velocity

$$v = \frac{16.0}{8.0} = 2.0\,\text{m/s}$$

✅ Final Answer:

C. 2.0 m/s

📌 Revision Tips

- Momentum is **always conserved** in collisions (elastic or inelastic).
- If objects **stick together**, always add the masses for the final calculation.
- Don't assume the faster trolley "dominates" — always calculate!
- Carefully read diagrams and note which object has which velocity.
