Check the Collision Model

Grade 12 | Science | Assessment | 40 minutes

Learning target

Apply momentum conservation and compare kinetic energy in a perfectly inelastic collision.

Prerequisites and materials

Signed velocities; quadratic arithmetic; SI units. Provide pages 2-3, pencil, and a calculator if needed. These are paper-based analyses of fictional data; no physical experiment is required.

Teaching sequence

5 min: Clarify directions and permitted references.

25 min: Learners respond independently with the reference page.

10 min: Collect work, then review reasoning and misconceptions.

Assessment and access

12 points: 3 per response. Keep calculations, units, and reasoning visible. Allow oral rehearsal, annotate variables, and supply a calculator or worked example with different values during practice. For assessment, clarify directions without giving answers.

Extension

Find the shared velocity if cart B's initial velocity were +1 m/s instead.

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PREVIEW - first two pages only. Full package includes responses and answer key.



Lesson reference

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Two fictional simulation carts move on a line. Cart A has mass 2 kg and velocity +3 m/s. Cart B has mass 1 kg and velocity -1 m/s. They stick together. Assume negligible net external impulse during collision; positive points right. No physical collision experiment is required.

Vocabulary	Meaning
momentum	Mass multiplied by velocity: p = mv.
isolated model	A system with negligible net external impulse during the event.
perfectly inelastic	A collision in which the objects move together afterward.

Reference data

Quantity	Rule
Momentum	p_total = sum of signed mv
After sticking	(m_A + m_B)v_final = p_initial
Kinetic energy	K = (1/2)mv^2, always nonnegative

Rules and assumptions

Momentum is conserved for the isolated two-cart model. Kinetic energy need not be conserved when carts stick; track the decrease as transfer to other forms within a broader energy account.



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