Momentum: two carts separating

Teacher / technician

YEAR 10 / LESSON 18 / PHYSICS ONLY

Staff preparation and answer guidance. Keep separate from student sheets. Record actual measurements separately from labelled practice examples.

Coverage and delivery

Physics only: 1.25P, 1.27P. Momentum and conservation.

Allow about 60 minutes. Follow the student sequence and use the answers to check reasoning.

Requisition • one staff demonstration for 30 learners

Item	Per pair / setup	Class total
Sensor carts	Staff demonstration	2
Level track with padded stops	Staff demonstration	1
Compatible device and balance	Staff demonstration	1 of each
Secure cart mass	Staff demonstration	1 approved set
Booklets	1 per learner	30

Immediate safety

Staff operate the release. Use low speeds, secure added masses and padded end stops. Keep hands and faces out of the track line. Do not let carts fall from the bench or use the plunger to launch loose objects.

Preparation and delivery

Read alongside the student method

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1. Pilot low-speed releases and verify the two sensor sign conventions against one common positive direction. Zero velocity appropriately and measure full cart masses.

2. Record a short interval immediately after separation and before end-stop contact. Provide clearly labelled recorded data if the sensors are unavailable; do not invent live readings.

Close of lesson

• Disarm the plunger, remove added masses and switch off the carts before storage.

Check before teaching

Check the cards, reference data and quantities against this requisition. Keep the staff answer guide separate until the checking stage. Supplied numerical practice datasets are labelled examples; they are not class measurements.

Answers and teaching notes

Expected explanations • do not give as experimental observations

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- Zero when both start at rest.
- +0.10 kg m s^{-1}.
- Momentum has direction and must be added as a vector.
- No; unequal masses can have unequal speeds and equal opposite momenta.
- Track friction or a tilted track can provide external impulse.
- Elastic energy stored in the plunger spring.

References and provenance

Pearson Physics specification

IOP: momentum

Prepared 22 November 2026. Original wording, tables and questions. Sources inform the concepts and technique; the lesson scope and classroom quantities are explicitly described here. No laboratory trial or final school risk approval is claimed.