Impact time and average force

Teacher / technician

YEAR 10 / LESSON 19 / 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: 1.26P, 1.28P. Momentum change and safety features.

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 cart and track	Staff demonstration	1 set
Soft buffers and separate safety stop	Staff demonstration	2 buffers; 1 stop
Recording device and balance	Staff demonstration	1 of each
Booklets	1 per learner	30

Immediate safety

Staff perform low-speed runs only. Secure the buffers and add a separate end stop so the cart cannot leave the track. Keep fingers out of impact zones. Never test impacts on people, helmets being worn or fragile objects.

Preparation and delivery

Read alongside the student method

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1. Pilot two soft buffers that stop the cart without a hard impact. Verify sample rate and timing resolution before presenting force calculations.

2. Use wheel-derived velocity and a common sign convention. Repeat each buffer three times at matched measured speeds. If resolution is insufficient, use a labelled recording and discuss that limitation.

3. Do not use a raw accelerometer spike as a precise peak force without an appropriate calibrated measurement and mounting model.

Close of lesson

• Stop recording, remove buffers and switch off the cart 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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- 0.20 kg m s^{-1}.
- 4 N.
- 1 N.
- Different initial momenta would confound the material comparison.
- Reversing velocity increases the momentum-change magnitude compared with just stopping.
- No; peak forces, injury mechanisms and validated testing matter.

References and provenance

Pearson Physics specification

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.