Sound: longitudinal waves and travel time

Teacher / technician

YEAR 10 / LESSON 64 / PHYSICS + SCIENCE (DOUBLE AWARD)

Staff preparation and answer guidance. Keep separate from student sheets. Shared concept work with a clearly identified Physics-only practical extension. Supplied numbers are practice examples, not measurements.

Coverage and delivery

Shared Physics / Double Award: 3.23; 3.25P practical extension. Sound waves and speed in air.

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

Requisition • class of 30; optional staff practical, paired analysis

Item	Per pair / setup	Class total
Matched microphones and stands	Optional Physics practical	2 of each
Two-channel scope and compatible microphone supply	Optional staff setup	1 set
Metre rule and quiet click source	Optional staff setup	1 each
Booklets and calculators	All learners	30 of each

Immediate safety

Staff operate the apparatus. Use brief quiet sounds away from ears; stop if uncomfortable and provide a silent trace-analysis route. Secure microphone stands and leads. Never connect a microphone input to mains. No loud bangs, balloons or hearing tests are used.

Preparation and delivery

Read alongside the student method

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1. Pilot direct arrivals at both spacings with low sound level, adequate gain and time resolution. Check channel latency with microphones side by side before interpreting delays.

2. Keep the practical explicitly Physics-only. Provide the labelled trace model and calculation route for Double Award learners; do not require additional equipment for that route.

Close of lesson

• Switch off and disconnect instruments; return stands and retain traces with measured spacing.

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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- Back and forth parallel to propagation.
- So the sound path difference is the microphone separation.
- 0.00294 s.
- About 340 m s^{-1}.
- It measures travel between two positions, not a return echo.
- A reflection from a nearby surface.

References and provenance

Pearson Physics specification

University of Minnesota: direct speed of sound

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.