

Exercise walk-through

Boundary Behavior of Waves and Polarization ■ 14.3

eXercise

You must be able to

- describe **reflection**, **transmission**, and **inversion** of a wave at a boundary
- describe **polarization** 偏振 and state which waves can be polarized
- explain why only transverse waves can be polarized

Method — At a boundary

A wave reaching a boundary is partly **reflected** and partly **transmitted**. Reflecting off a **denser** medium (a fixed end) **inverts** the pulse; off a less dense medium (a free end) it does not.

Method — Polarization

Polarization restricts the vibration to a single plane. Only **transverse** waves can be polarized, because their vibration is perpendicular to travel and so has a plane to restrict.

Method — Why not sound

Sound is longitudinal — its vibration is along the direction of travel, so there is no plane to polarize.

Practice 2.1 ■ 1 mark

State what happens to a wave pulse reflecting off a fixed (denser) end.

Solution 2.1

Method: At a boundary

Worked steps

it is inverted (turned upside down) **B1**.

Practice 2.2 ■ 2 marks

State the two things that happen to a wave meeting a boundary between two media.

Solution 2.2

Method: At a boundary

Worked steps

part of it is reflected and part is transmitted **B1** **B1**.

Practice 2.3 ■ 1 mark

State which type of wave can be polarized.

Solution 2.3

Worked steps

transverse waves **B1**.

Exam-style 3.1 ■ 1 mark

A pulse reflecting from a fixed end is

- A** unchanged
- B** inverted
- C** absorbed completely
- D** doubled in size

Solution 3.1

Method: At a boundary

A unchanged

B inverted 

C absorbed completely

D doubled in size

Worked steps

B.

Exam-style 3.2 ■ 1 mark

Only _____ waves can be polarized.

A longitudinal

B transverse

C sound

D all

Solution 3.2

Method: Polarization

A longitudinal

B transverse



C sound

D all

Worked steps

B.

Exam-style 3.3 ■ 1 mark

Light is passed through a polarizing filter.

- (a) State what the filter does to the light.
- (b) Explain why sound cannot be polarized.

Solution 3.3

Worked steps

- (a) it only lets through light vibrating in one plane (it polarizes the light) **B1**.
- (b) sound is longitudinal, so its vibration is along the direction of travel and has no single plane to restrict **B1** **B1**.