

14.3 Boundary Behavior of Waves and Polarization

Name: _____ Class: _____ Date: _____

Total: 9 marks

Objective

Build the skills to answer exam questions on **boundary behaviour of waves and polarization**.

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

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ 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.

■ 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.

■ Why not sound

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

2 Practice

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

[1]

2.2 State the two things that happen to a wave meeting a boundary between two media.[2]

2.3 State which type of wave can be polarized. [1]

3 Exam-style questions

3.1 A pulse reflecting from a fixed end is [1]

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

3.2 Only _____ waves can be polarized. [1]

- **A** longitudinal
- **B** transverse
- **C** sound
- **D** all

3.3 Light is passed through a polarizing filter.

(a) State what the filter does to the light. [1]

(b) Explain why sound cannot be polarized. [2]

4 Go further

- work through the **14.3 Boundary Behavior of Waves and Polarization** lesson on the **Learn** page;

- read the **Waves and Sound** section of the AP Physics 2 handout on the **Know** page.

Solutions

2.1 it is inverted (turned upside down).

2.2 part of it is reflected and part is transmitted.

2.3 transverse waves.

3.1 B.

3.2 B.

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