

14.6 Wave Interference and Standing Waves

Name: _____ Class: _____ Date: _____ **Total: 8 marks**

KEY WORDS standing wave 驻波 • destructive 相消 • constructive 相长 • nodes 波节
• principle of superposition 叠加原理

Objective

Build the skills to answer exam questions on **wave interference and standing waves**.**You must be able to:**

- apply the **principle of superposition** 叠加原理 to combine overlapping waves
- distinguish **constructive** 相长 from **destructive** 相消 interference
- describe **standing waves** 驻波 with nodes and antinodes

1 Worked examples

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

■ Superposition

Where waves overlap, their displacements **add**.

■ Constructive and destructive

- **In phase** → crests meet crests → **constructive** (larger amplitude).
- **Out of phase** → crest meets trough → **destructive** (cancellation).

■ Standing waves

Two waves travelling in opposite directions form a standing wave with fixed **nodes** (no motion) and **antinodes** (maximum motion) — as on a guitar string or in a pipe.

2 Practice

2.1 State the principle of superposition. [1]**2.2** State the condition for two waves to interfere destructively. [1]**2.3** Define a node on a standing wave. [1]

3 Exam-style questions

3.1 Two waves meeting in phase interfere [1]

- | | |
|---|---|
| A | B |
| C | D |
- A destructively
B constructively
C not at all
D randomly

3.2 A point of zero displacement on a standing wave is a [1]

- | | |
|---|---|
| A | B |
| C | D |
- A antinode
B node
C crest
D trough

3.3 Two identical waves overlap.

- (a) State the result when they meet in phase. [1]
(b) State the result when they meet exactly out of phase. [1]
(c) Name the general principle used. [1]