IGCSE PHYSICS • EXERCISE SHEET

3.4 Sound

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

Objective

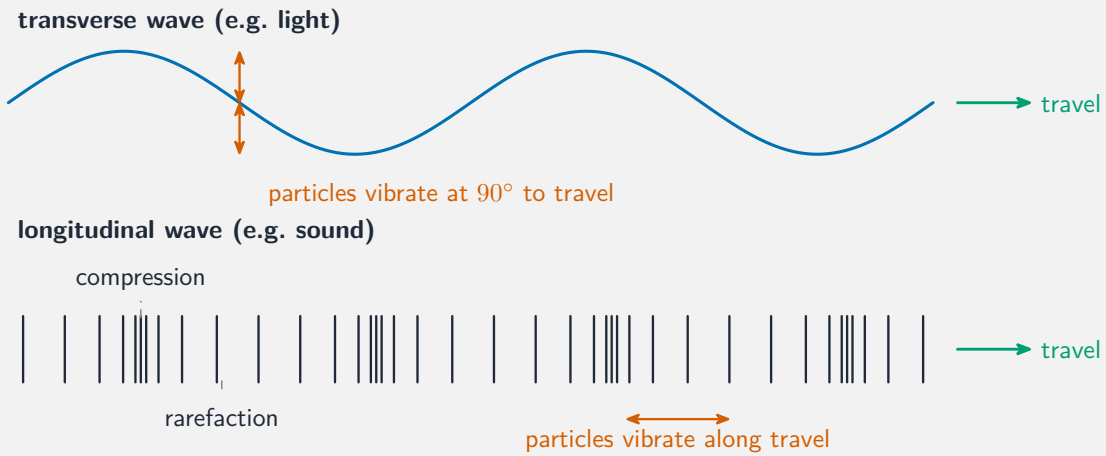
Build the skills to answer exam questions on **sound** 声音—sound as a **longitudinal wave** 纵波, the need for a medium, the range of human hearing, and **echoes** 回声.

You must be able to:

- describe sound as a longitudinal wave (compressions and rarefactions)
- state that sound needs a medium and give the hearing range
- find the speed of sound from an echo

1 Worked examples

Speed of sound from an echo



Sound is longitudinal: the air vibrates along the travel direction, making compressions and rarefactions

Clap 85 m from a wall, echo after 0.50 s: the sound goes there and back, $2 \times 85 = 170$ m, so $v = \dfrac{170}{0.50} = 340$ m/s.

2 Practice

2.1 State why sound cannot travel through a vacuum. [1]

2.2 State the approximate range of frequencies a human can hear. [1]

3 Exam-style questions

3.1 Sound is a: [1]

- **A** transverse wave that needs no medium
- **B** longitudinal wave that needs a medium
- **C** transverse wave that needs a medium
- **D** longitudinal wave that needs no medium

3.2 A person stands 660 m from a cliff and shouts. The echo returns 4.0 s later.

(a) Find the speed of sound. [3]

(b) State whether sound travels faster or slower in water than in air. [1]

3.3 Explain why you see lightning before you hear the thunder. [2]

4 Go further

You are now ready for the real exam questions on this subtopic. Open the **3.4 Sound** past-paper sheet in the Library, or try these in **Practice mode**:

- 0625/21 N25 —Q23 (sound)
- 0625/22 N25 —Q23 (sound)
- 0625/41 N25 —Q5 (sound / echoes)

Solutions

2.1 sound needs a medium (particles) to travel through, and a vacuum has none.

2.2 about 20 Hz to 20 000 Hz.

3.1 B. Sound is a longitudinal wave that needs a medium.

3.2 (a) distance there and back $= 2 \times 660 = 1320$ m; $v = \dfrac{1320}{4.0}$; $= 330$ m/s.
(b) faster in water.

3.3 light travels much faster than sound; so the light from the lightning reaches you almost at once, while the sound takes longer to arrive.