

MR SULLY UNFOLDS PHYSICS ANSWERS

Sound, ultrasound and seismic waves

AQA 4.6.1.4–4.6.1.5
Waves · Paper 2
Physics only · Higher

Name _____ Class _____ Date _____

Sound waves, ultrasound and seismic waves let us hear, scan inside the body and even explore the inside of the Earth.

KEY IDEAS

- Sound waves can travel through solids, liquids and gases. Human hearing ranges from **20 Hz to 20 kHz**.
- **Ultrasound** is above 20 kHz. It is partially reflected at boundaries; the time for the echo shows how far away the boundary is.
- **Seismic waves**: P-waves are longitudinal; S-waves are transverse and **cannot travel through liquids**.

Section A · Recall

Grade 5–6

1 State the range of normal human hearing. [1]

20 Hz to 20 kHz

2 What is ultrasound? [1]

Sound with a frequency above 20 kHz (too high for humans to hear).

3 Give two uses of ultrasound. [2]

Medical scans (e.g. pre-natal) and industrial imaging / echo sounding.

Section B · Explain and calculate

Grade 6–7

4 Describe how the ear detects sound. [2]

Sound waves make the ear drum and other parts of the ear vibrate,

which causes the sensation of sound.

5 A ship sends an ultrasound pulse to the seabed. The echo returns after 0.8 s. Sound travels at 1500 m/s in water. Calculate the depth. [3]

Distance travelled = 1500 × 0.8 = 1200 m

That's there and back

Depth = 600 m

Section C · Stretch

Grade 7+

6 Explain why ultrasound, rather than X-rays, is used to scan unborn babies. [2]

Ultrasound is not ionising, so it doesn't damage cells,

whereas X-rays are ionising and could harm the baby.

Exam-style question

AQA style

7 After a large earthquake, P-waves are detected all around the world, but S-waves are not detected on the opposite side of the Earth.

a Compare P-waves and S-waves. [2]

P-waves are longitudinal and can travel through solids and liquids.

S-waves are transverse and can't travel through liquids.

b Explain what these observations tell scientists about the Earth's structure. [3]

S-waves can't pass through liquids,

so the large S-wave 'shadow zone' shows part of the core is liquid (outer core).

This gives evidence for the structure and size of the core, which can't be seen directly.

Total: _____ / 16

How confident am I?	Not yet	Nearly	Got it
I can describe the range of human hearing	☐	☐	☐
I can calculate distances using echoes	☐	☐	☐
I can explain what seismic waves show about the Earth	☐	☐	☐