

Mark schemes

Q1.

- (a) P-waves are longitudinal and S-waves are transverse

1

- (b) D

1

only P-waves can travel through liquids

allow only P-waves can travel through the outer core

allow S waves cannot travel through liquids

allow S waves cannot travel through the outer core

MP2 dependent on MP1

1

- (c) $4500 = 3.6 \times \lambda$

allow a correct substitution of an incorrectly / not converted value for v

1

$$\lambda = \frac{4500}{3.6}$$

allow a correct re-arrangement using an incorrectly / not converted value for v

1

$$\lambda = 1250 \text{ (m)}$$

allow 1300 (m)

only allow an answer consistent with a correctly converted value for v

1

- (d) the distance is (directly) proportional to the time between the two waves arriving (at the seismometer)

allow they are (directly) proportional

allow a greater distance means a greater time for 1 mark

allow there is a positive correlation for 1 mark

2

[8]

Q2.

(a) current

*allow charge flow***or**

potential difference

1

(f) **Level 2:** Scientifically relevant features are identified; the way(s) in which they are similar / different is made clear and (where appropriate) the magnitude of the similarity / difference is noted.

3-4

Level 1: Relevant features are identified and differences noted.

1-2

No relevant content

0

Indicative content:

- for all three people, the minimum sound level that can be heard increases as frequency increases

Age

- the minimum sound level that can be heard increases with age
- between 2000 and 3000 Hz the minimum sound level that can be heard increases more in **B** compared to **C**
- **C** has very little variation in the minimum sound level that can be heard at all frequencies

Working in a loud environment:

- increases the minimum sound level that can be heard at all frequencies above 2000 Hz compared to working in a quiet environment
- the minimum sound level that can be heard increases more as frequency increases from 2000 to 4000 Hz compared to working in a quiet environment
- doesn't affect the minimum sound level that can be heard at 2000 Hz

to access **level 2** the answer must include at least **one** comparison for age **and one** comparison for working in a loud environment, using supporting data/information from the graph

[5]

Q3.

(a) specular (reflection) 1

(b) the angle of incidence = the (mean) angle of reflection 1

(c) random 1

any **one** from:

- the student's eye / head might not be in the same position each time

allow parallax

- the centre of the ray may not have been marked correctly
- the mirror / ray box may not have been (re)placed correctly

allow protractor not in the correct position

incorrect measurement of the angle(s) is insufficient

1

(d) all points on a wavefront enter the glass at the same time
allow incident ray (of light) is along the normal 1

(e) the resolution (of the protractor) is $1(^{\circ})$ 1

(so) could not be used to measure the difference between the results

allow (so) could not be used to measure to 1 decimal place

1

(f) different parts of the wavefront enter the glass at different times 1

the velocity / speed (of light) is less in glass 1

(so) one part of the wave front changes speed before other parts 1

[10]