Essential Pre-Uni Physics D5.5

A Level

You must give a unit in all of your numeric answers in order to obtain the mark.

Part A Distance from nodes to antinodes

Two waves of amplitude $4.0\,\mathrm{cm}$ and frequency $14\,\mathrm{Hz}$ are moving in opposite directions at $5.6\,\mathrm{m\,s^{-1}}$ along a stretched string. If a standing wave were formed, how far apart would you expect the antinodes to be from the nodes on either side of them?

Part B Minimum length of the string

If the string had two fixed ends, what is the minimum length it must be in order for a standing wave to be possible?

Part C A string of length $0.70\,\mathrm{m}$

If the string had two fixed ends and was $0.70\,\mathrm{m}$ long, why would no standing wave be formed?

- If the string was $0.70\,\mathrm{m}$ long then both ends would be antinodes, which is not possible if both ends are fixed.
- Both ends cannot be nodes as the internodal distance is $0.20\,\mathrm{m}$, so no standing wave can form.
- The wavelength of the standing wave is greater than $0.70\,\mathrm{m}$.

Essential Pre-Uni Physics D5.6

A Level

C C C

You must give a unit in all of your numeric answers in order to obtain the mark. The speed of sound in air is $330\,\mathrm{m\,s^{-1}}$.

Part A Lowest frequency

A wind instrument is $60\,\mathrm{cm}$ long, and can be modelled as a tube with one closed end and one open end. What is the lowest frequency that can be played on this instrument?

Part B Second-lowest frequency

If a note of the second-lowest possible frequency were played on the instrument, state the positions of the nodes (measured as distances from the closed end of the tube).

- One at the closed end, another $20\,\mathrm{cm}$ from the closed end and another $40\,\mathrm{cm}$ from the closed end.
- One $20\,\mathrm{cm}$ from the closed end, another $40\,\mathrm{cm}$ from the closed end.
- One at the closed end, another $40\,\mathrm{cm}$ from the closed end.

Part C Third-lowest frequency

State the positions of the nodes if a note of the third-lowest possible frequency were played.

- One at closed end, another $20\,\mathrm{cm}$ from the closed end and the last $40\,\mathrm{cm}$ from the closed end.
- One at $30\,\mathrm{cm}$ from the closed end.
- One at closed end, another $24\,\mathrm{cm}$ from the closed end and the last $48\,\mathrm{cm}$ from the closed end.

Essential Pre-Uni Physics D8.8

GCSE C C C A Level P P P

Physical constants which may be necessary to answer the problems on this page can be found within the hint tabs.

Refractive index of crown glass: 1.51

Refractive index of flint glass: 1.61

Refractive index of water: 1.34

Refractive index of cubic zirconia: 2.16

Refractive index of diamond: 2.42

Take the refractive index of air to be 1.00.

The critical angle for light passing from flint glass into ethanol is $57.6\,^\circ$. Calculate the refractive index of ethanol. Give your answer to three significant figures.

Essential Pre-Uni Physics D1.7

GCSE C C C A Level C C C

Part A Light intensity at $12\,\mathrm{m}$

The light from a bulb shines equally in all directions. If $20\,\mathrm{W}$ of light is given off, what will the intensity be $12\,\mathrm{m}$ from the lamp to 2 significant figures? (Consider the shape of the region illuminated if the light hits this surface after travelling $12\,\mathrm{m}$ in all directions.)

Part B Light intensity at $24\,\mathrm{m}$

What would the answer be at a distance of $24\,\mathrm{m}$, to 2 significant figures?

Essential Pre-Uni Physics D4.4

A Level

A slide looks like it has one fine transparent line ruled on a black background. In fact there are two lines very close together. When red light ($633\,\mathrm{nm}$) is shone through it, and a screen is placed $5.0\,\mathrm{m}$ away from the slits, ten fringe-spacings measure $5.3\,\mathrm{cm}$. Calculate the separation of the slits on the slide.

Essential Pre-Uni Physics D3.8

A Level

C C C

Two speakers are set up $13.5\,\mathrm{m}$ apart in an auditorium, pointing at each other. A pure sound of frequency $256\,\mathrm{Hz}$ is being played through them. You may assume that the phase difference of the signals as they arrive at the speakers is 0° . A person is standing on the line joining the speakers, $0.25\,\mathrm{m}$ from the mid point.

The speed of sound in air is $330\,\mathrm{m\,s^{-1}}$.

Part A Phase difference

Calculate the phase difference as it would be detected by the person.

Part B Silence

The person moves to the mid point between the speakers (where the sound is loudest due to constructive interference), and then walks towards one speaker until the sound waves cancel out. How far do they walk until they find this point of near silence?

Essential Pre-Uni Physics D4.2

A Level

Complete the questions in the table:

Wavelength	Slit separation	Order of interference	Angle to 'straight through direction'
633 nm	0.10 mm	2	(a)
530 nm	600 lines/mm	1	(b)
(c)	1000 lines/mm	1	10°
1.0×10^{-11}m	(d)	3	20°

Part A Angle

Wavelength	Slit separation	Order of interference	Angle to 'straight through direction'
633 nm	0.10 mm	2	(a)

a) Angle to 'straight through' direction to 2 significant figures?

Part B Angle

Wavelength	Slit separation	Order of interference	Angle to 'straight through direction'
530 nm	600 lines/mm	1	(b)

b) Angle to 'straight through' direction to 3 significant figures?

Part C Wavelength

Wavelength	Slit separation	Order of interference	Angle to 'straight through direction'
(c)	$1000\,\text{lines}/\text{mm}$	1	10°

c) Wavelength?

Part D Slit separation

Wavelength	Slit separation	Order of interference	Angle to 'straight through direction'
$1.0 \times 10^{-11}\text{m}$	(d)	3	20°

d) Slit separation in m?

Essential Pre-Uni Physics D2.2

A Level

For each polariser, the angle given is the one for which light is transmitted and is given clockwise from the vertical.

Unpolarised light of intensity $4.0\,\mathrm{W\,m^{-2}}$ is incident on a polariser placed at $15\,^{\circ}$ to the vertical. State the intensity of the transmitted light.