

Physics

Waves & Particles

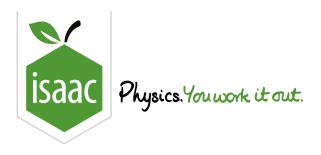
Superposition

Path and Phase Difference 11.3

Path and Phase Difference 11.3



A $440\,\mathrm{Hz}$ sound wave reaches a microphone by two routes. The sound travels $2.50\,\mathrm{m}$ directly and travels $4.00\,\mathrm{m}$ if it reflects off a wall on the way. Calculate the phase difference on arrival. Assume that the wave speed $v=330\,\mathrm{m\,s^{-1}}$.



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Physics Waves & Particles

Superposition

Path and Phase Difference 11.5

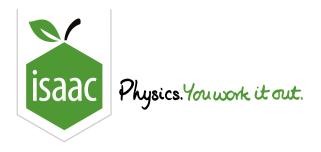
Path and Phase Difference 11.5



 $20\,\mathrm{GHz}$ microwaves pass through a pair of narrow slits $10\,\mathrm{cm}$ apart. Calculate the fringe spacing (y when n=1) on a screen $2.00\,\mathrm{m}$ behind the slits.

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Waves & Particles

Superposition

Path and Phase Difference 11.7

Path and Phase Difference 11.7



Using the wave speed $v=330\,\mathrm{m\,s^{-1}}$, calculate the phase difference $\Delta\phi$ for a microphone placed between two speakers which are $1.5\,\mathrm{m}$ apart if:

Part A $f=440\,\mathrm{Hz}$ and the microphone is $37.5\,\mathrm{cm}$ from one speaker

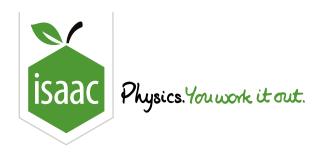
The frequency $f=440\,\mathrm{Hz}$ and the microphone is $37.5\,\mathrm{cm}$ from one speaker.

Part B $f=660\,\mathrm{Hz}$ and the microphone is $65\,\mathrm{cm}$ from one speaker

The frequency $f=660\,\mathrm{Hz}$ and the microphone is $65\,\mathrm{cm}$ from one speaker.

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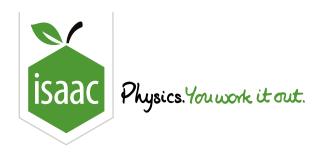
Essential Pre-Uni Physics D4.6



A teacher is trying to demonstrate 'Young's fringes' using green $(530\,\mathrm{nm})$ light. Assuming that the slit separation is $0.050\,\mathrm{mm}$, how far away from the slits will she need to put the screen to ensure that the fringe spacing is at least $1.0\,\mathrm{mm}$?

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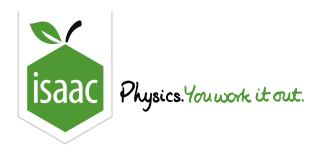
Essential Pre-Uni Physics D4.3



A diffraction grating has $600 \, \mathrm{lines/mm}$. Yellow light from a street lamp is shone onto the grating. The yellow light contains two main wavelengths - of $589.6 \, \mathrm{nm}$ and $589.0 \, \mathrm{nm}$. Calculate the angular separation of the second order (n=2) of these two components as they emerge from the grating. Give your answer to 2 significant figures.

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Essential Pre-Uni Physics D5.2



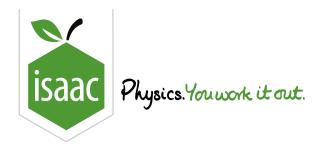
Consider a particle that is at a particular antinode of a standing wave, which we'll call point A. Fill in the table below to state how the motion of certain other particles will compare to this one. [For amplitude, state whether it will be smaller/larger/the same; for phase, state the phase difference in degrees.]

Position of Particle	Amplitude	Difference in Phase
Between point A and the next node along	(a)	(b)

Part A	Amplitude
a)	Amplitude compared to point A?
	The same
	Larger
	Smaller
Part B	Phase
b)	Phase relative to point A?

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Physics

Waves & Particles

Wave Motion

Standing Waves on a String 15.4

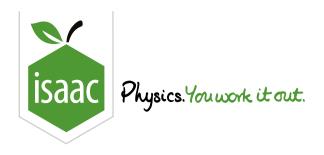
Standing Waves on a String 15.4



A standing wave has 4 nodes including the two at each end. The length of the vibrating string is $85.0\,\mathrm{cm}$, the tension in the string is $75.0\,\mathrm{N}$, and it vibrates at a frequency of $50\,\mathrm{Hz}$. Calculate the linear mass density μ of the string.

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Physics

Waves & Particles

Wave Motion

Standing Waves on a String 15.5

Standing Waves on a String 15.5

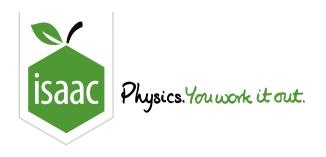


A $2.00\,\mathrm{m}$ long string has a mass of $10.9\,\mathrm{g}$. It is used in an experiment where two bridges are placed horizontally $90\,\mathrm{cm}$ apart. The string is kept under tension by suspending an unknown mass on the end of the string, which passes over a low-friction pulley wheel. The other end of the string is clamped in place. A large speaker nearby produces vibrations of $50.0\,\mathrm{Hz}$, which causes the string to resonate with 3 nodes between the bridges.

Calculate the mass suspended on the string.

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Home Gameboard Physics Waves & Particles Optics Essential Pre-Uni Physics D8.3

Essential Pre-Uni Physics D8.3



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.

Complete the table to show the missing angles. In some cases, refraction is impossible. In these cases give your answer as "99" with the unit "none".

Consider all angles to have been given to 2 significant figures.

Light passing from		to	
Material	Angle of Incidence / $^{\circ}$	Material	Angle of Refraction / $^{\circ}$
Water	(a)	Air	60
Flint Glass	(b)	Air	90

Part A Water to air

Light passing from		to	
Material	Angle of Incidence / $^{\circ}$	Material	Angle of Refraction / $^\circ$
Water	(a)	Air	60

a) What is the angle of incidence in degrees?

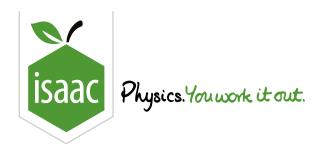
Part B Flint glass to air

Light passing from		to	
Material	Angle of Incidence / $^\circ$	Material	Angle of Refraction / $^\circ$
Flint Glass	(b)	Air	90

b) What is the angle of incidence in degrees?

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Optics

Essential Pre-Uni Physics D8.9

Essential Pre-Uni Physics D8.9



Physical constants which may be necessary to answer the problem 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.

When light passes from water into ice at an incident angle of 38.0° , the angle of refraction is 39.0° . Calculate the refractive index of ice. Give your answer to 3 significant figures.