Path and Phase Difference 11.3

A Level

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 $v = 330\,\mathrm{m\,s^{-1}}$.

Path and Phase Difference 11.5

A Level

$20\,\mathrm{GHz}$ 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.

Gameboard:

STEM SMART Physics 49 - Revision - Waves

Path and Phase Difference 11.7

A Level

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.

Gameboard:

STEM SMART Physics 49 - Revision - Waves

Essential Pre-Uni Physics D4.6

A Level

P P P

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

Gameboard:

STEM SMART Physics 49 - Revision - Waves

Essential Pre-Uni Physics D4.3

A Level

C C C

A diffraction grating has $600\,\text{lines}/\text{mm}$. Yellow light from a street lamp is shone onto the grating. The yellow light contains two main wavelengths - of $589.6\,\text{nm}$ and $589.0\,\text{nm}$. 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.

Gameboard:

STEM SMART Physics 49 - Revision - Waves

Essential Pre-Uni Physics D5.2

A Level

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?

Gameboard:

STEM SMART Physics 49 - Revision - Waves

Standing Waves on a String 15.4

A Level

C C C

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.

Gameboard:

STEM SMART Physics 49 - Revision - Waves

Standing Waves on a String 15.5

A Level

C C C

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.

Gameboard:

STEM SMART Physics 49 - Revision - Waves

Essential Pre-Uni Physics D8.3

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.

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 / °**	**Material**	**Angle of Refraction / °**
Water	**(a)**	Air	60
Flint Glass	**(b)**	Air	90

Part A Water to air

Light passing from ...		**...to**	
Material	**Angle of Incidence / °**	**Material**	**Angle of Refraction / °**
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 / °**	**Material**	**Angle of Refraction / °**
Flint Glass	**(b)**	Air	90

b) What is the angle of incidence in degrees?

Gameboard:

STEM SMART Physics 49 - Revision - Waves

Essential Pre-Uni Physics D8.9

GCSE C C C A Level P P P

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 $38.0\,^\circ$, the angle of refraction is $39.0\,^\circ$. Calculate the refractive index of ice. Give your answer to 3 significant figures.