

# WJEC (Wales) Physics A-level

## SP2.5 - Determination of Wavelength Using Young's Double Slits

### Practical Flashcards

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What safety precautions should be taken when operating a laser?



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- Never look directly at the beam
- Ensure no reflective surfaces are in the laser's vicinity
- Display a warning notice so others know that a laser is in use



Why should the screen you use to display the interference patterns on have a matt finish?



Why should the screen you use to display the interference patterns on have a matt finish?

A matt screen should be used to reduce the intensity with which the laser beam is reflected off the screen, potentially into someone's eye. This reduces the chance that such a ray may cause harm.



Describe how you should measure the fringe spacing of an interference pattern.



Describe how you should measure the fringe spacing of an interference pattern.

When measuring the fringe spacing you should measure across a large number of fringes and then divide by the number of spaces that you have measured across.



If you measure from the first bright fringe through to the twelfth bright fringe, what number should you divide by to obtain the fringe spacing?





If you measure from the first bright fringe through to the twelfth bright fringe, what number should you divide by to obtain the fringe spacing?

You need to divide by the number of fringe spaces (not fringes), so in this case you should divide by 11.



What measuring instrument could you use to measure the slit separation?



What measuring instrument could you use to measure the slit separation?

A Vernier Calliper



What measuring instrument could be used to measure the distance from the slit to the screen?



What measuring instrument could be used to measure the distance from the slit to the screen?

A Metre Ruler



What equation links wavelength, slit separation, distance from screen and fringe spacing?



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$$\Delta y = \frac{\lambda D}{d}$$



How can the wavelength of the laser be determined from a graph of fringe width against the distance from the screen?





How can the wavelength of the laser be determined from a graph of fringe width against the distance from the screen?

The gradient of the graph will be  $\Delta y/D$  and so by multiplying the gradient by the slit separation you will obtain the wavelength.



# What is monochromatic light?



## What is monochromatic light?

Monochromatic light, is light of a single wavelength (or frequency).



What does it mean if two light sources are coherent?



What does it mean if two light sources are coherent?

Coherent sources have the same wavelength and a constant phase difference.



What happens to light as it passes through a slit?



What happens to light as it passes through a slit?

Light diffracts as it passes through a slit.  
Maximum diffraction occurs when the slit spacing matches the light's wavelength.



Why do bright fringes form on a screen when light is passed through a double slit?





# Why do bright fringes form on a screen when light is passed through a double slit?

The light diffracts as it passes through the slits.

These diffracted waves meet and undergo superposition. At positions where the waves meet in phase, constructive interference occurs, and bright fringes are formed.



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In a double slit experiment, why might the light be passed through a single slit before the double slit?



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The single slit acts as a point source, and diffracts the light widely so it covers both of the double slits. This means both slits are illuminated by the same source and so have the same wavelength and a constant phase difference.



Describe the interference pattern produced if white light is passed through the double slits.



Describe the interference pattern produced if white light is passed through the double slits.

A central bright white fringe will be produced.

All other bright fringes would consist of a spectra of light, with blue light on the side closest to the centre, and red on the far side of each fringe.

