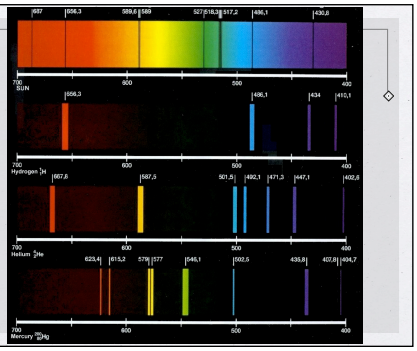
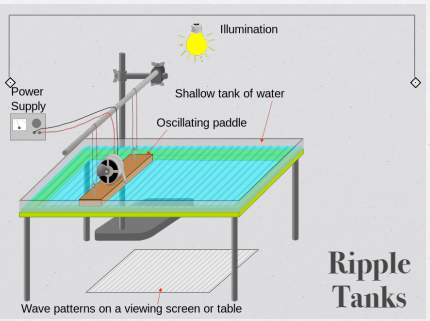
DIFFRACTION

1



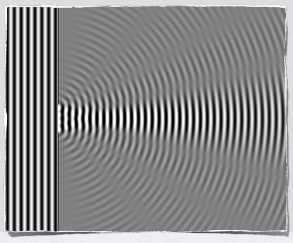
2



Ripple Tanks

3

Constructive and Destructive Interference



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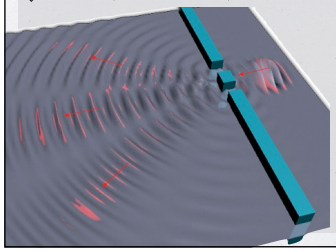
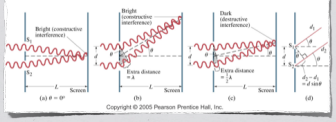
Nodal and Antinodal regions



5

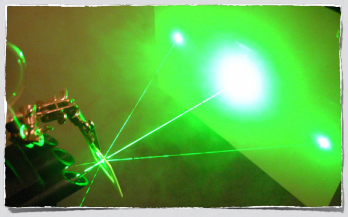
bright fringes

The interference occurs because each point on the screen is not the same distance from both slits. Depending on the path length difference, the wave can interfere constructively (bright spot) or destructively (dark spot).



6

$m\lambda = d\sin\theta$



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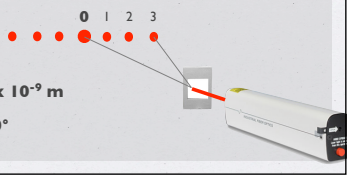
Practice $m\lambda = d\sin\theta$

* How many lines per centimeter does a grating have if the third-order bright fringe occurs at an 18.0° angle for a beam of red (630 nm) light?



m=3

λ= 630 x 10^{-9} m

Θ = 18.0°

8

Practice $m\lambda = d\sin\theta$

How many lines per centimeter does a grating have if the third-order bright fringe occurs at an 18.0° angle for 630 nm light?

m=3

λ= 630 x 10^{-9} m

Θ = 18.0°

* 3(630 (EE-9)) = d (sin18)
* d = 6.116 x10^{-6} m
* 1/6.116 x10^{-6} m = 163,501 lines per meter
* 1635 lines/cm

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Lab - Emission spectrum of Hydrogen

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Lab Part 1

Find the wavelength of our HeNe laser

Known Diffraction Grating 530 lines/ mm

Solve for d

Measure & Calculate Θ

Solve for Wavelength

11

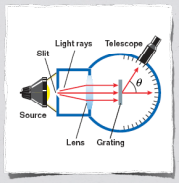
$$m\lambda = d\sin\theta$$

$$d = \frac{1}{lines/m} \qquad \tan^{-1}\frac{y}{x}$$

12

Lab Part 2

Find the grating separation (d)of the grating spectrometer



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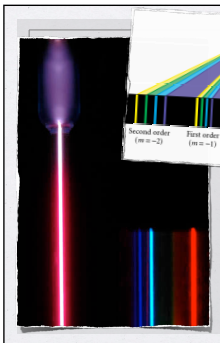

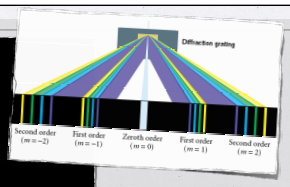

Find the First Order Bright Fringes

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Lab Results

	d	θ	λ_{calc}	λ_{known}
Violet				410 or 434
Cyan				486
Red				656

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Energy in a Wave

$$E = \frac{hc}{\lambda}$$

c = 3.0 x 10 ^{8} m/s

h = 4.136 x 10 $^{-15}$ eVs

1 electron volt = 1.602 x 10 $^{-19}$ Joules

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Energy Levels in the Hydrogen Atom

	E calc	E known
Violet 410 or 434 nm		
Cyan 486 nm		
Red 656 nm		

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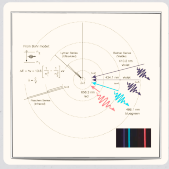
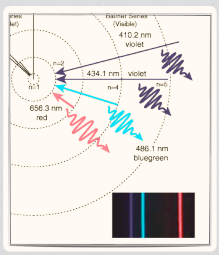
Energy in the Electron Shells





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Binding Energy
E= 13.6 eV/ n^2

Determine what shells are involved in the release of the three photons (as determined on the first page).

		E = 13.6 eV / n^2
O Shell	(n =)	(E=)
N Shell	(n =)	(E=)
M Shell	(n =)	(E=)
L Shell	(n = 2)	(E= 3.4 eV)
K Shell	(n = 1)	(E= 13.6 eV)

E= 10.2 eV

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