Announcements

- Pick up a pair of "Rainbow glasses" from the front of the room!
- MCAT physics session Thursday, March 6 from 8-9 pm, in O'Leary 232.
- Toys 'n' Tea Thursday, March 6 from 4-5pm in Olin 251A. Fun and games with Oobleck!

Physics & Astronomy Seminar

Conservation of Energy, Time Reversal, and Fireflies

Deepak Iyer

Bucknell University

Olin 268. Thursday, Mar. 6 at 12:00 pm

Pizza provided. Bring your own water bottle.

Lecture 12 — Concept Test 1

Which of the following phase differences $\Delta\phi_{\text{adj}}$ gives fully destructive interference for three-slit or three-source interference? Choose as many answers as are appropriate.

1. $\Delta\phi_{\text{adj}} = 0$
2. $\Delta\phi_{\text{adj}} = \pi/3$
3. $\Delta\phi_{\text{adj}} = 2\pi/3$
4. $\Delta\phi_{\text{adj}} = \pi$
5. $\Delta\phi_{\text{adj}} = 4\pi/3$
6. $\Delta\phi_{\text{adj}} = 2\pi$

Phase difference
$\Delta\phi$

$\Delta\phi = 2\pi\dfrac{\Delta r}{\lambda}$

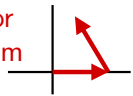
Path length difference
Δr

$\Delta r = r_2 - r_1$

or

$\Delta r = d\sin\theta$ if $d \ll L$

phasor diagram



Interference

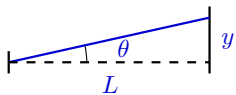
constructive,

destructive,

maxima, minima

Geometry

- pythagoras
- $y = L\tan\theta$



- $\sin\theta \simeq \tan\theta$ for small θ

Lecture 12 — Concept Test 2

For light passing through a diffraction grating, we found for the first side maximum that $\lambda = d \sin\theta$. If we send both red and green light together through the same diffraction grating, what should we expect to see?

1. The green dots line up perfectly with the red dots.
2. The green dots are farther apart than the red dots.
3. The green dots are closer together than the red dots.
4. We can't predict what we will see, because it depends on the diffraction grating spacing d.

Lecture 12 — Concept Test 3

For the first side minimum, what is the phase difference $\Delta\phi_{\text{tot}}$ between beams coming from the top and bottom of the slit?

1. $\Delta\phi_{\text{tot}} = 0$
2. $\Delta\phi_{\text{tot}} = \pi/2$
3. $\Delta\phi_{\text{tot}} = \pi$
4. $\Delta\phi_{\text{tot}} = 3\pi/2$
5. $\Delta\phi_{\text{tot}} = 2\pi$
6. There is no first side minimum

Lecture 12 — Concept Test 4

Under what conditions can you tell that there are two separate objects? That is, when can you "resolve" the two objects?

1. You can resolve them if the angular separation θ is greater than the spreading $\theta_{\text{1st min}}$ due to diffraction.
2. You can resolve them if the angular separation θ is less than the spreading $\theta_{\text{1st min}}$ due to diffraction.
3. You can always resolve them, regardless of the spreading $\theta_{\text{1st min}}$ due to diffraction.
4. You can never resolve them, regardless of the spreading $\theta_{\text{1st min}}$ due to diffraction.