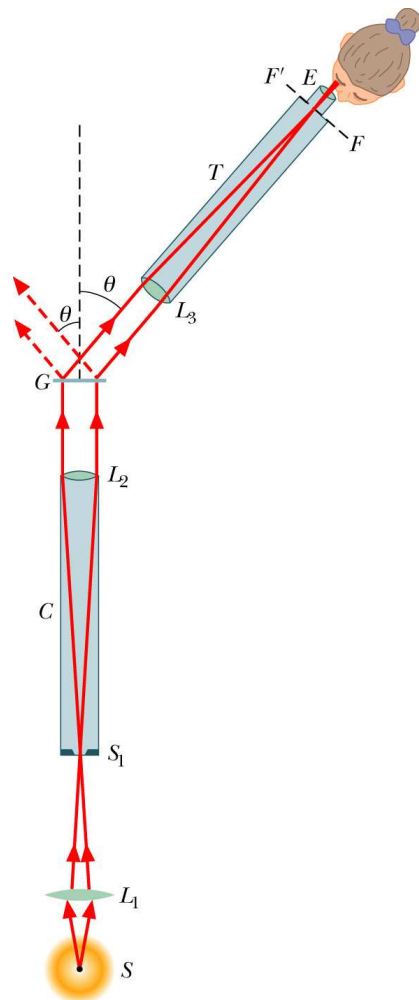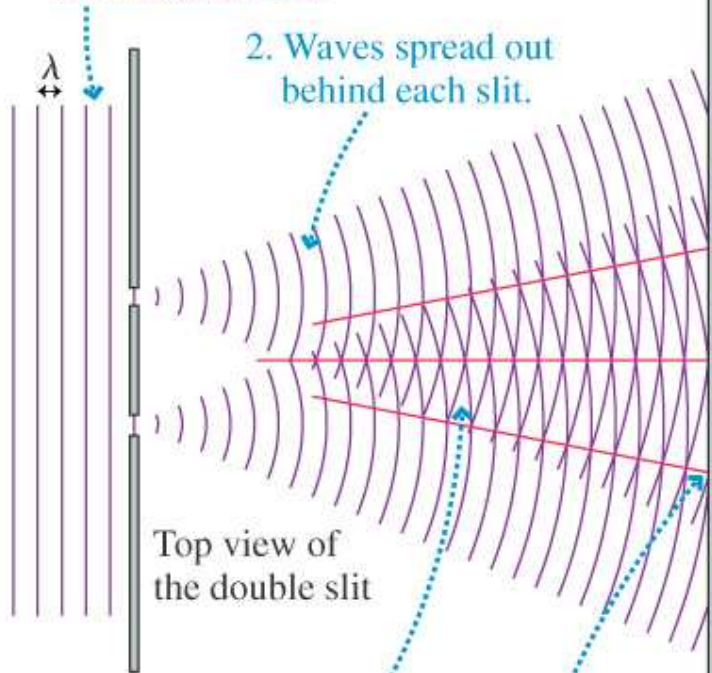# The Optical Spectrum of Hydrogen

Double-Slit Interference
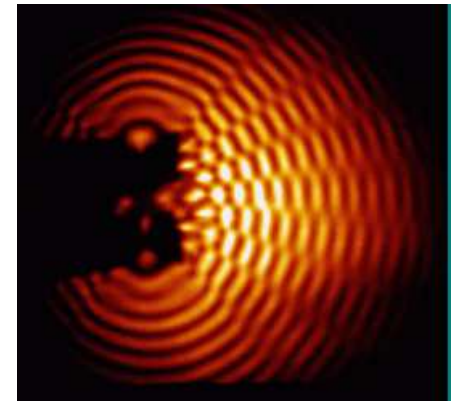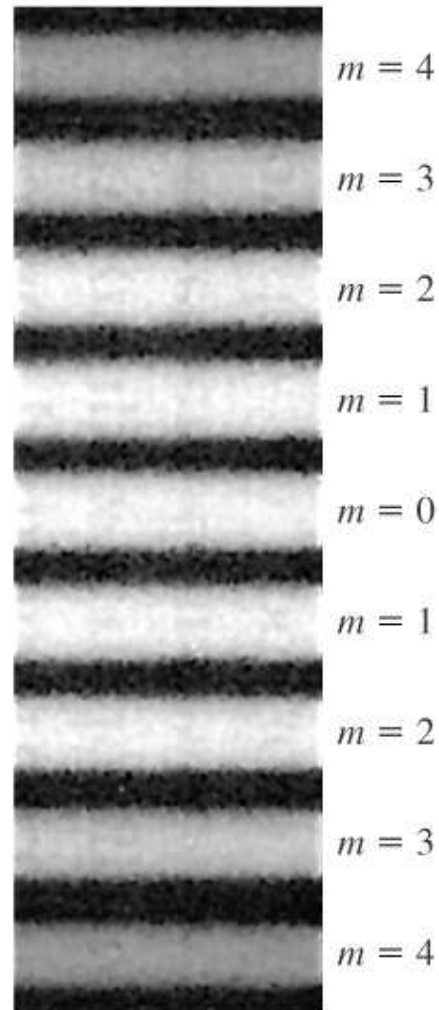
(b)

1. A plane wave is incident on the double slit.

λ
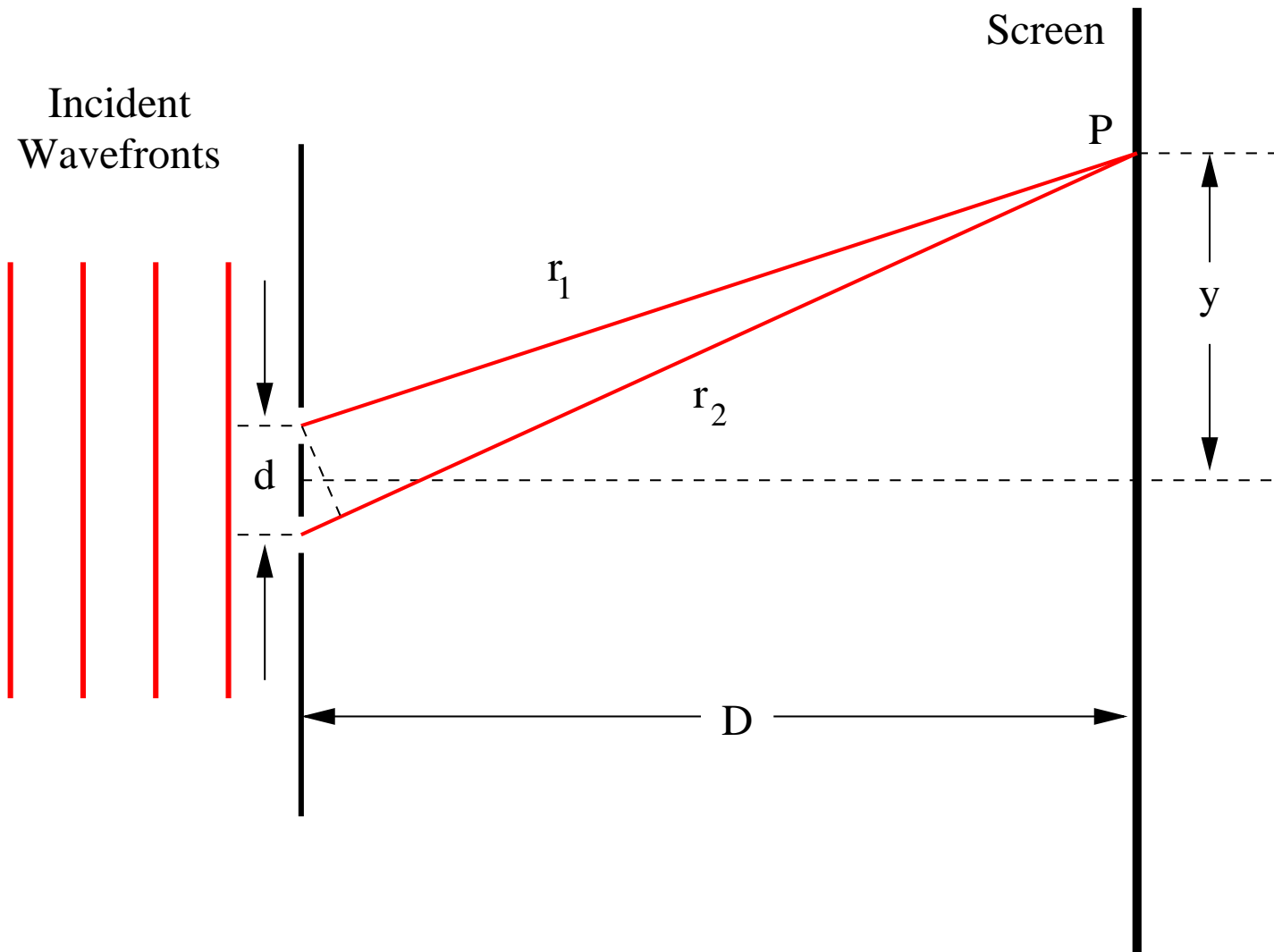
2. Waves spread out behind each slit.

Top view of the double slit

3. The waves interfere in the region where they overlap.

4. Bright fringes occur where the antinodal lines intersect the viewing screen.
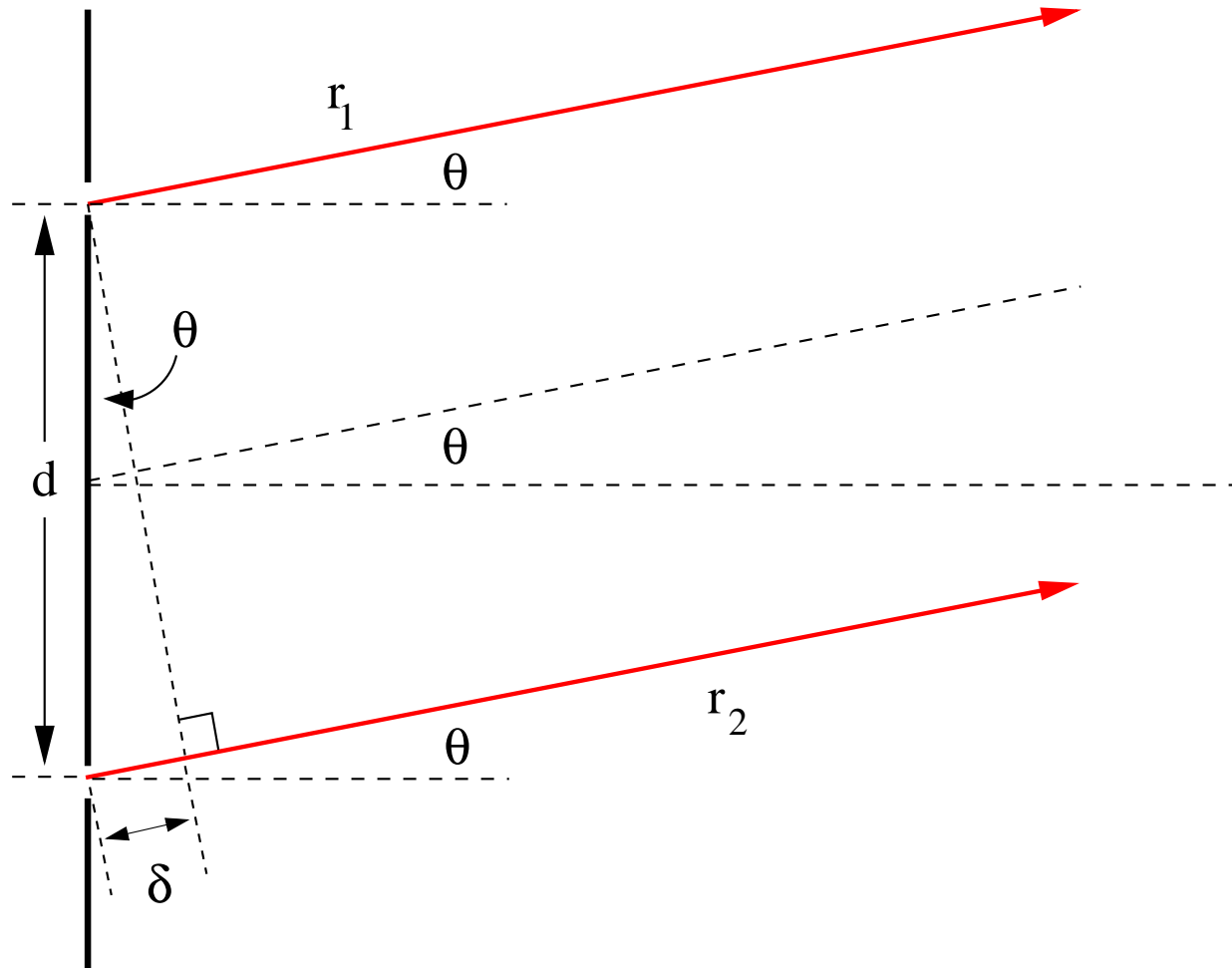
$m = 4$

$m = 3$

$m = 2$

$m = 1$

$m = 0$

$m = 1$

$m = 2$

$m = 3$

$m = 4$

Double Slit Interference

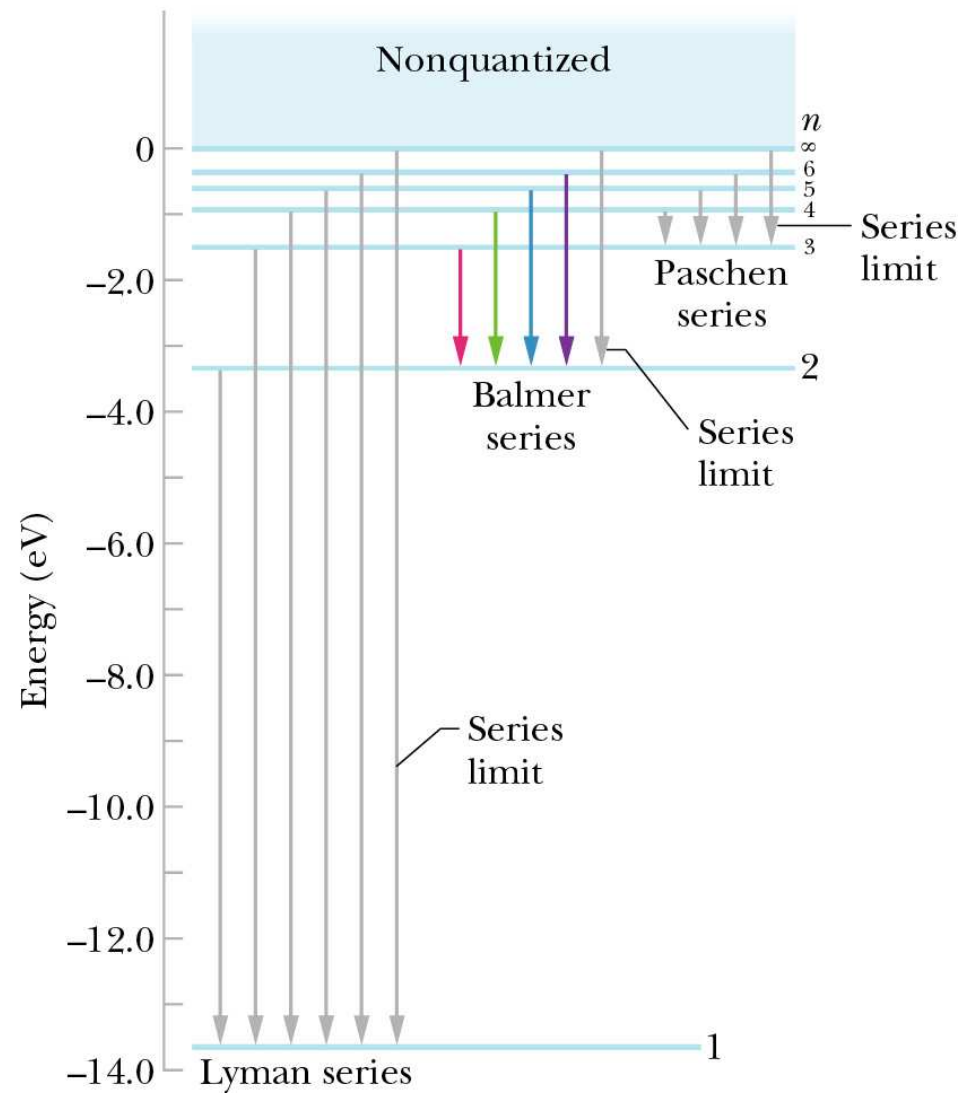Incident
Wavefronts

Screen

P
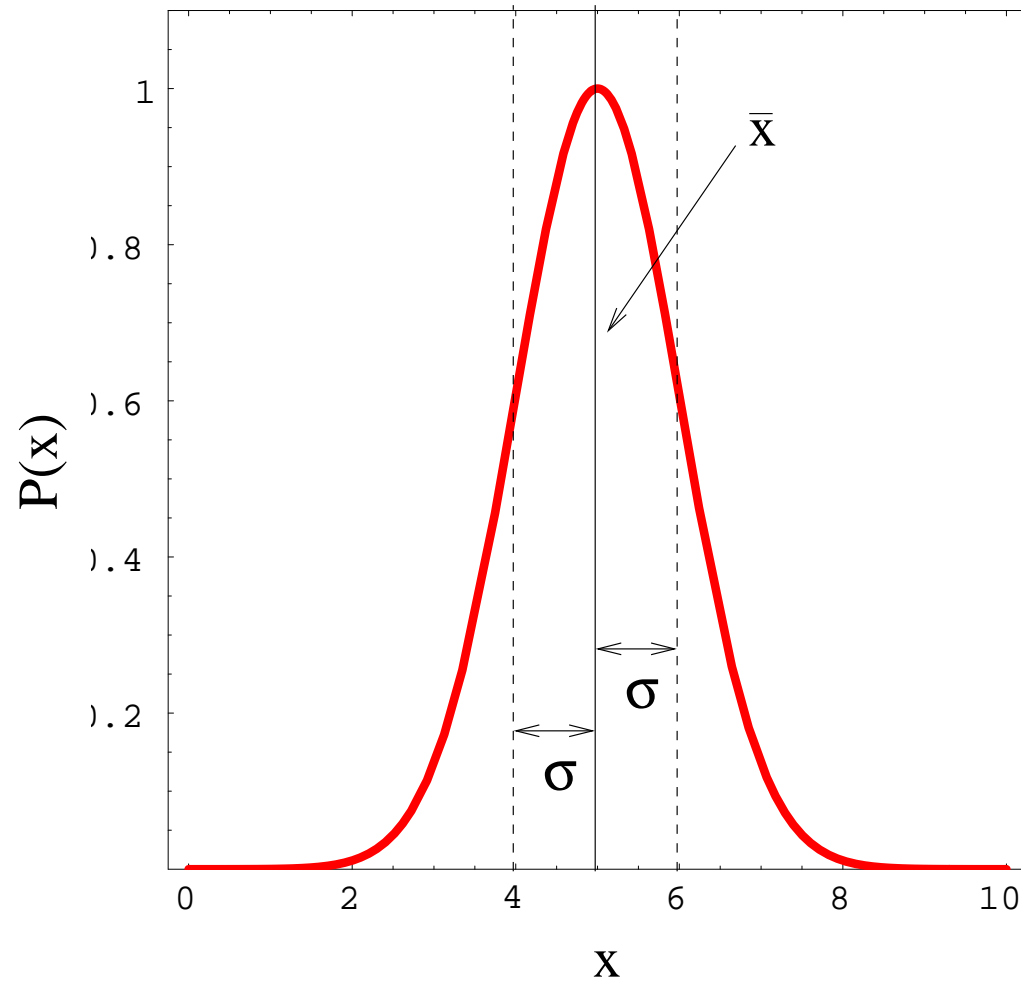
r_1

r_2

d

y

D

Double Slit Interference
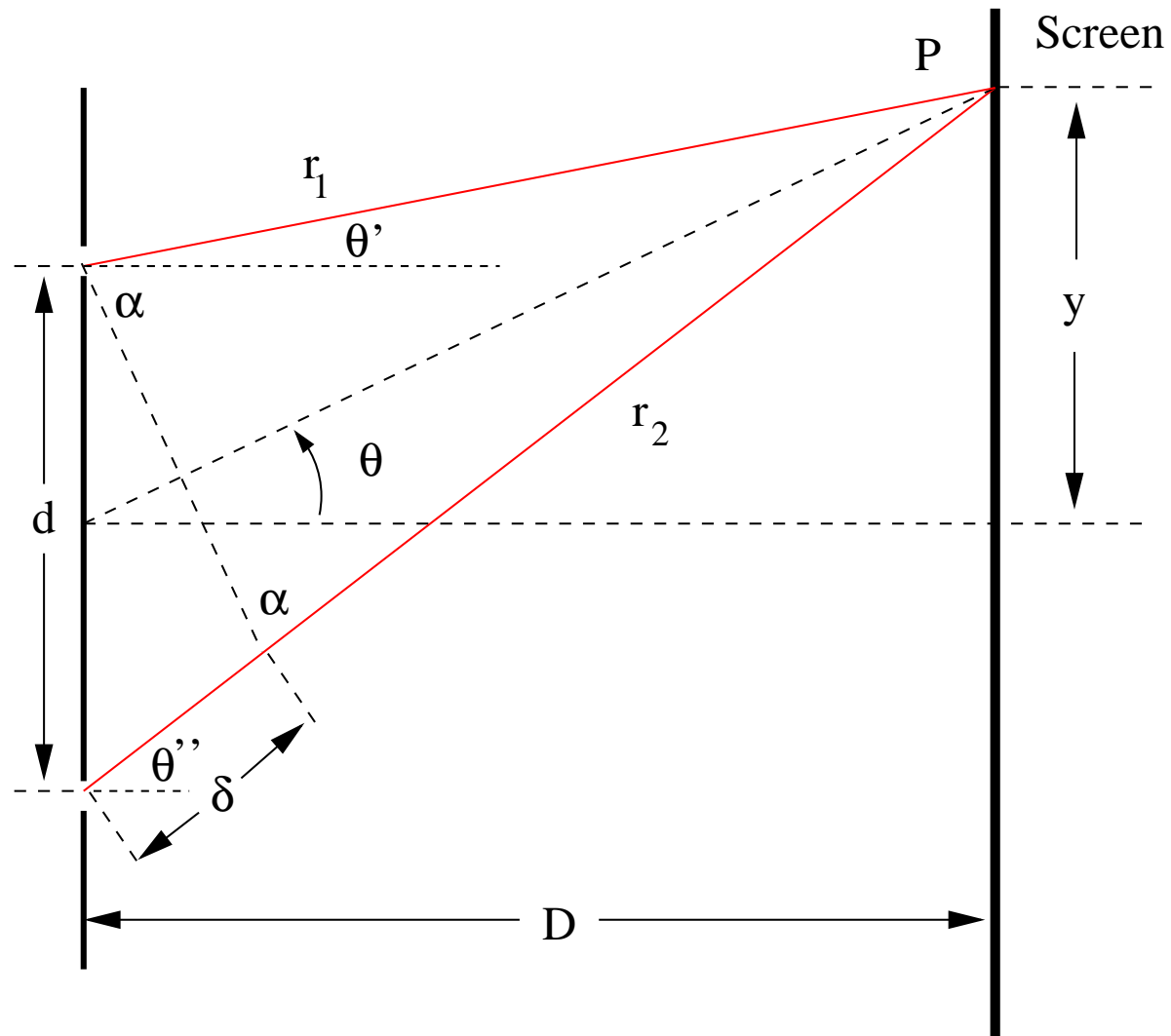
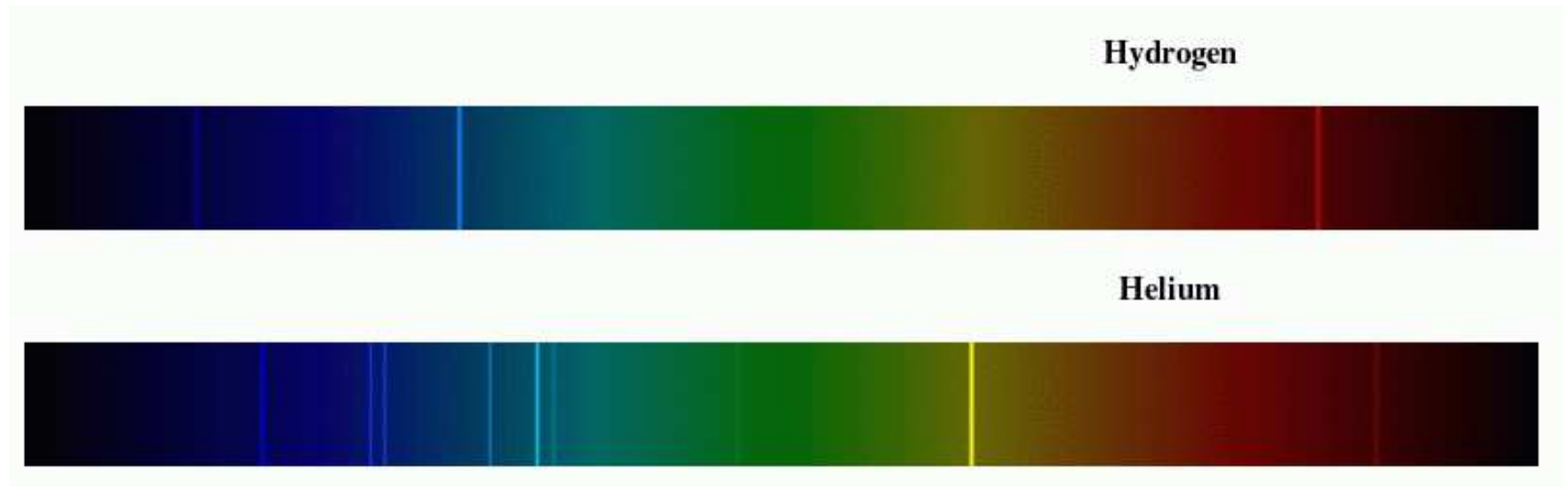# Double Slit Interference

The Hydrogen Lines

The Gaussian Distribution

$$y = P(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\overline{x})^2}{2\sigma^2}}$$
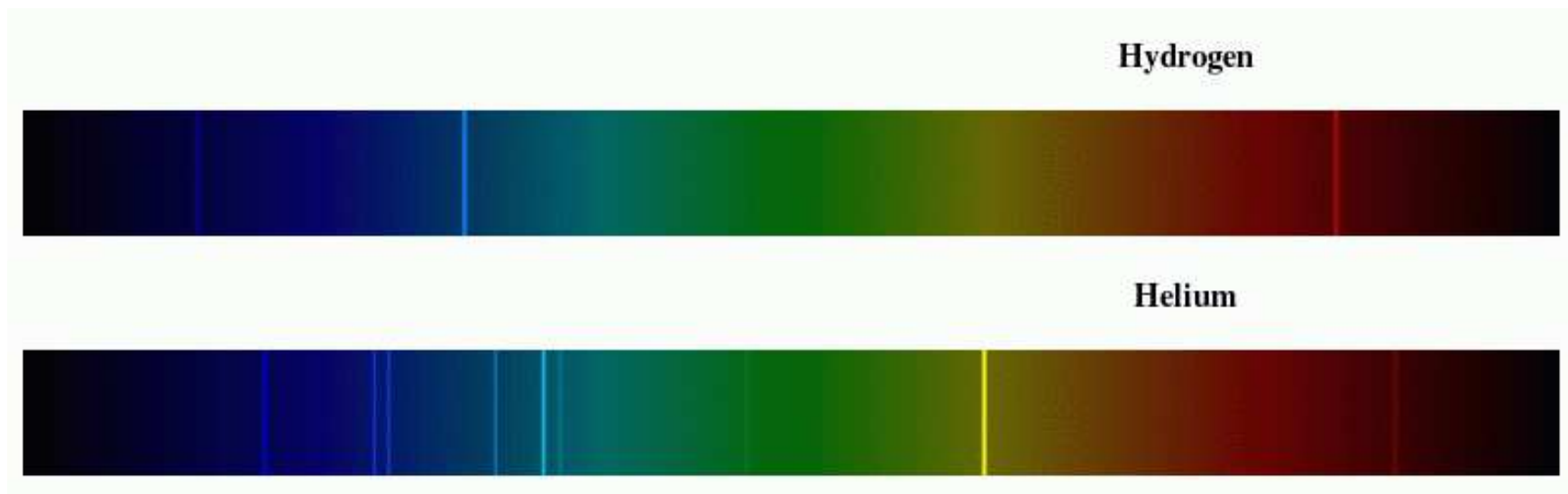
Identifying Your Unknown

1. Pattern recognition first.

Identifying Your Unknown

1. Pattern recognition first.

2. Quantitative comparison in units of σ.

Line	My Results (Å)	NIST Results (Å)	Normalized Difference
α	$6.64 \pm 0.09 \times 10^3$	6.56272×10^3	0.95
β	$4.85 \pm 0.15 \times 10^3$	4.86133×10^3	0.11
γ	$4.39 \pm 0.06 \times 10^3$	4.34047×10^3	0.9