

Lab 07: Quantum Mechanics

Part A: Light as a wave

Trials	D (distance to Grating)	y_1 (distance between Pts)
Trial 1	.59 m	.215 m
Trial 2	.825 m	.300 m
Trial 3	1.00 m	.37 m

Red laser

Trials	D	y_1
Trial 1	1.01 m	.280 m
Trial 2	1.36 m	.372 m
Trial 3	.59 m	.171 m

Green laser

Part B: Photoelectric effect

Metal: Sodium max wavelength: 538 nm

voltage Threshold Table

Metal: Zinc max $\lambda = 287 \text{ nm}$

wavelength	Voltage	wavelength	Voltage
$\lambda_1 = 493 \text{ nm}$	.2 V	$\lambda_1 = 100 \text{ nm}$	8.1 V
$\lambda_2 = 475 \text{ nm}$	.4 V	$\lambda_2 = 120 \text{ nm}$	6.0 V
$\lambda_3 = 441 \text{ nm}$	.6 V	$\lambda_3 = 140 \text{ nm}$	4.6 V
$\lambda_4 = 406 \text{ nm}$	.8 V	$\lambda_4 = 160 \text{ nm}$	3.4 V
$\lambda_5 = 381 \text{ nm}$	1.0 V	$\lambda_5 = 180 \text{ nm}$	2.8 V
$\lambda_6 = 367 \text{ nm}$	1.2 V	$\lambda_6 = 200 \text{ nm}$	2.0 V
$\lambda_7 = 328 \text{ nm}$	1.6 V	$\lambda_7 = 220 \text{ nm}$	1.6 V
$\lambda_8 = 269 \text{ nm}$	2.2 V	$\lambda_8 = 240 \text{ nm}$	0.8 V

Part C: Emission Spectrum of Incandescent Bulb +

Hydrogen Atom - Bulb Hydrogen

Red: 675-630

Red: 600

Orange: 630-615

Orange: —

Yellow: 685-590

Yellow: 570

Green: 590-515

Green: 540, 490 (BG)

Blue: 515-440

Blue: 430

Violet: 440-400

Violet: 400

For n

ΔE for

$\Delta E =$

ΔE for

$\Delta E =$

ΔE for

$\Delta E =$

Part D:

Neon

Helium

Red: 720-630 (8)

Red: 690-655 (2)

Orange: 630-600 (10)

Orange: 600 (1)

Yellow: 600-570 (5)

Yellow: 575 (1)

Green: 570-490 (15)

Green: 540-500 (2)

Blue: 490 (15)

Blue: 490-470 (3)

Violet: 490-400 (NA)

Violet: 440-400

ΔE for

$\Delta E =$

$\Delta E =$

$\Delta E =$

$n=2$

$n=3$

$n=4$

$n=5$

$n=6$

$n=7$

for hydrogen energy levels:

ΔE for Red $\lambda = 600 \text{ nm}$

$$\Delta E = \frac{hc}{\lambda} = \frac{(6.626 \times 10^{-34})(3 \times 10^8)}{(600 \times 10^{-9})} = 3.313 \times 10^{-19} \text{ J} = \Delta E_{3 \rightarrow 2}$$

ΔE for yellow

$$\Delta E = \frac{(6.626)(3 \times 10^8)}{570 \times 10^{-9}} = 3.49 \times 10^{-19} \text{ J} = \Delta E_{4 \rightarrow 2}$$

ΔE for Green

$$\Delta E = \frac{(6.626 \times 10^{-34})(3 \times 10^8)}{(490 \times 10^{-9})} = 4.06 \times 10^{-19} \text{ J} = \Delta E_{5 \rightarrow 2}$$

ΔE for Blue

$$\Delta E = \frac{(6.626 \times 10^{-34})(3 \times 10^8)}{430 \times 10^{-9}} = 4.62 \times 10^{-19} \text{ J} = \Delta E_{6 \rightarrow 2}$$

ΔE for violet

$$\Delta E = \frac{(6.626 \times 10^{-34})(3 \times 10^8)}{(430 \times 10^{-9})} = 4.97 \times 10^{-19} \text{ J} = \Delta E_{7 \rightarrow 2}$$

$n=2$ @ -3.4 eV

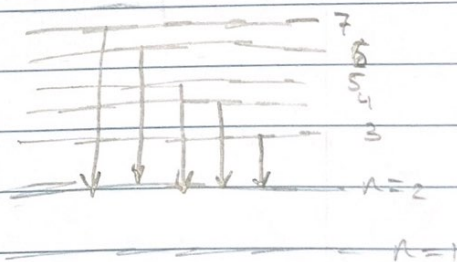
$n=3$ @ -5.47 eV

$n=4$ @ -5.58 eV

$n=5$ @ -5.93 eV

$n=6$ @ -6.20 eV

$n=7$ @ -6.5 eV



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