**Inquiry Lab Activity Sheet**

Sometimes You Behave like a WAVE, sometimes you Don’t! -

An Exploration of EM Radiation at Cornell

Objectives:

1. Explain the duality of EM radiation with simple intelligence, (non-scientist would understand).
2. Express an interest in further studies of Quantum Mechanics including matter waves.
3. Consider research as a component of their future education and careers.

Vocabulary:

Quantum Mechanics

Electromagnetic Spectrum

Constructive Interference

Destructive Interference

Diffraction

Photon

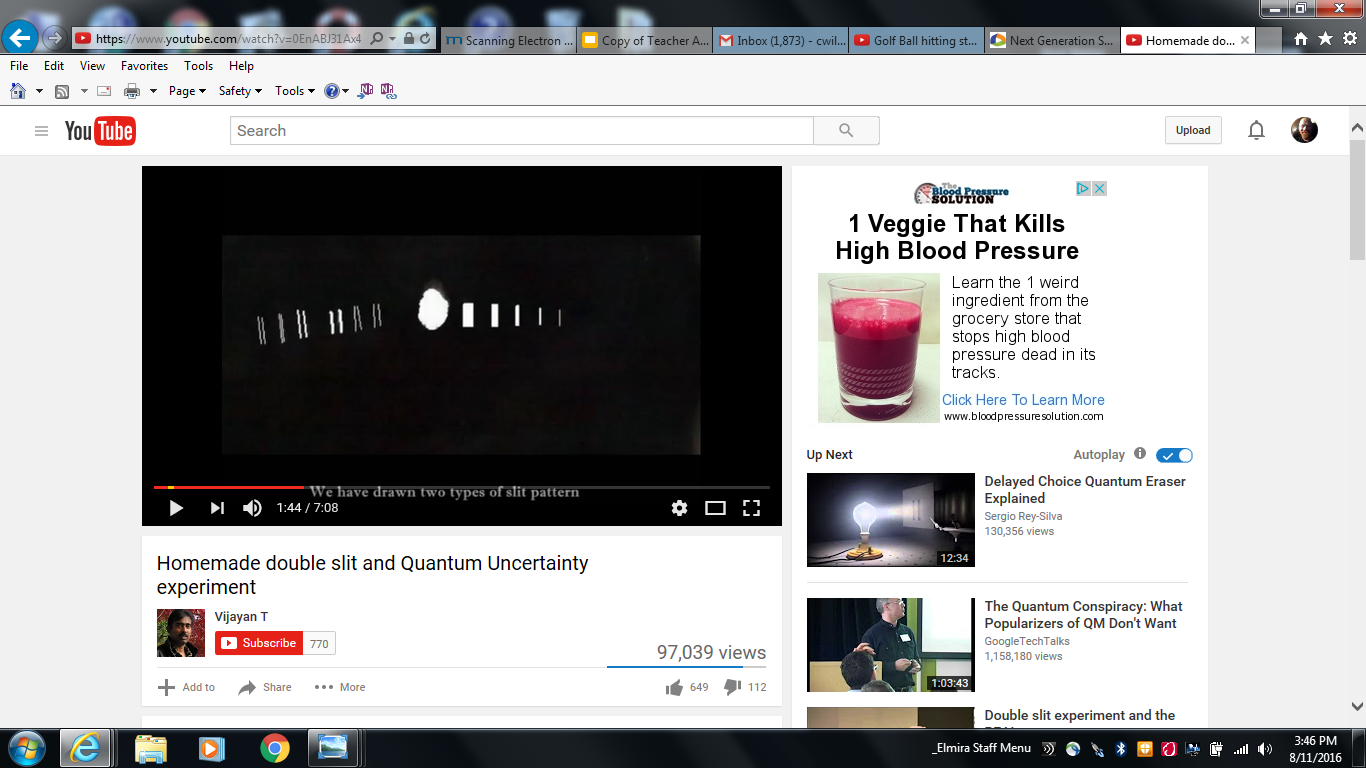
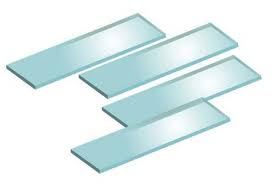
DeBroglie Wavelength (Matter Waves)

Heisenberg Uncertainty Principle

Materials:

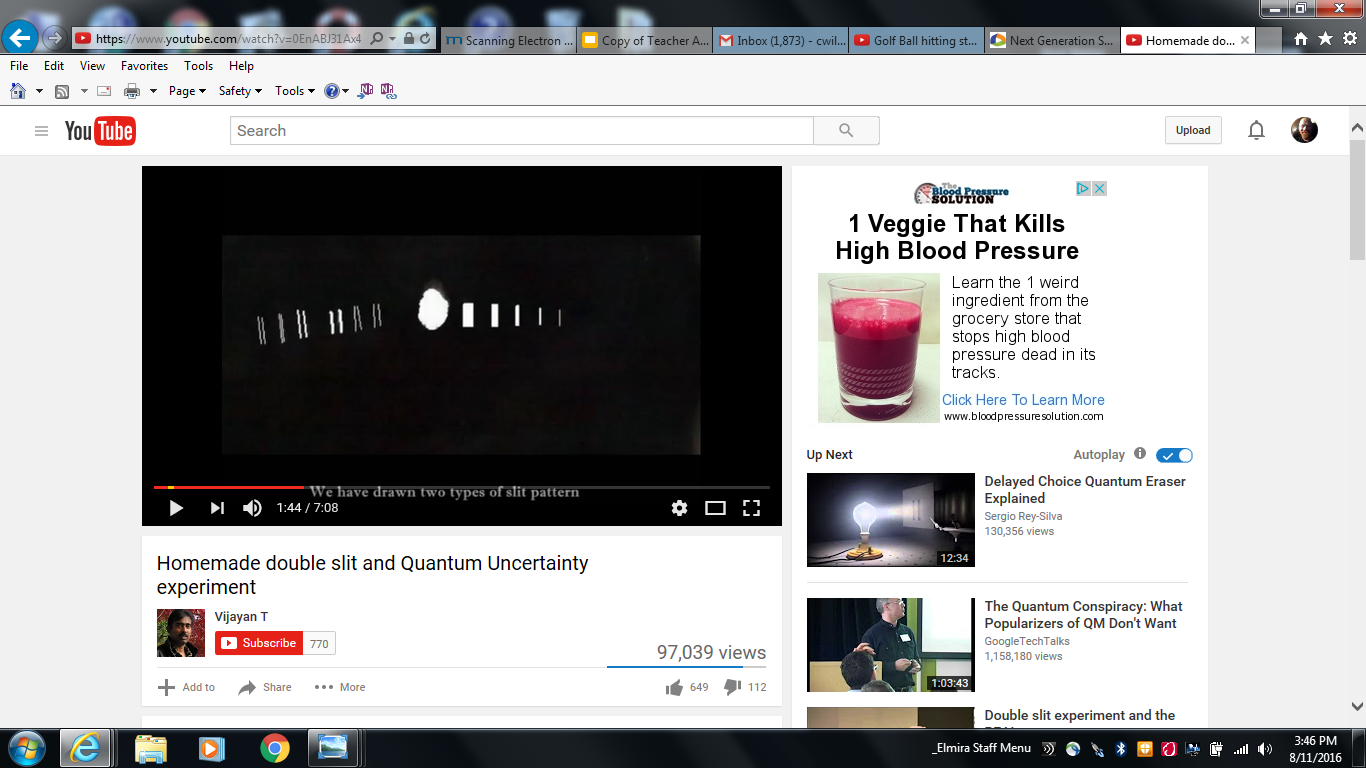
Glass slide, candle, matches, Laser pointer, Laser pointer tripod, digital vernier calipers, & safety pin

Safety: Be cautious with the candle and the glass. Assume glass is HOT because it looks the same hot or cold!



Procedure:

1. Individually consider and respond in writing to this question: “How do we modify light for scientific observations and demonstrate duality?”
2. Gently grab and hold the glass slide with tweezers. Ignite a match and light your candle. Safely apply a layer of carbon to your glass slide from the open flame.
3. Skillfully etch into the carbon layer double-slit, single hole, and single slit patterns as shown.



1. Use your optical interference Pattern on glass slides to explore the dual nature of the electromagnetic spectrum. Share out results as a team with the rest of the class.
2. Complete an Exit Survey.

Observations and Results:

Consider the following quote and describe your Patterns from left to right. Be sure and chose **W**ave or **P**article nature as the more obvious for each.

“I will not describe it in terms of an analogy with something familiar. I will simply describe it.”

Richard Feynman at Cornell *Character of Physical Law* Lecture, 1964

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| P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 | P9 | P10 | P11 | P12 |
|  |  |  |  |  |  |  |  |  |  |  |  |

Conclusion: Explain the dual nature of matter and light as if you were trying to convince a skeptic that both exist in nature.