**Fall 2020 Physics Individual Investigation Proposal**

**Name: Michael Li Date: 11/4/2020 Period: 4**

Flesh out your idea for your II below:

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| **Topic Investigating (what do you want to find out . . . if the idea came from a source online, include a citation):**  I want to investigate the strength of lead in mechanical pencils.  **Why it is interesting to you:**  Whether for math scratch paper or for my physical diary, I use mechanical pencils quite a bit. It’s always annoying when a bit too much pressure is applied and the lead snaps. I hence want to investigate how well different sizes of lead can withstand force. | | |
| **Investigative Question (how does \_\_\_\_ affect \_\_\_)?**  How does the thickness of a piece of lead from a mechanical pencil affect the force needed to snap it? | | |
| **Independent Variable (must be quantifiable):**  Diameter of the lead  **How will you change the independent variable?**  I will buy lead with varying thicknesses (0.5 mm, 0.7 mm, etc.)  **How will you measure your independent variable?**  This property should be labeled by the vendor | **Dependent Variable (must be quantifiable):**  Force needed to snap the pencil lead  **How will you measure your dependent variable?**  I will hang increasingly heavy masses on the lead until the lead snaps; playdoh can be a good adjustable mass | **Possible Control Variables:**  Length of lead  Positioning of the point on the lead where force is applied  Room temperature |

**Materials:** What objects will you need to carry out your investigation? Where will these materials come from?

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| **Material** | **How will you use the item . . . why do you need it?** | **Where will this item come from?** |
| Lead | The lead will be snapped to measure force | Stores – Target, Amazon, etc. |
| String | Used to hand masses on the lead | Home |
| Playdoh (or other masses) | Exerts a variable, measurable weight force | Probably home |
| Computer | To record data | Home |

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| **What problems do you foresee in implementation of your investigation?**  A big problem may be figuring out what is the exact mass I need to snap the lead. If the intervals by which I add mass are too big, the error bars in my data become huge as a result. I’m also not sure if this experiment even works… |

Possible alternative ideas/questions that surfaced while brainstorming:

How does temperature affect rate of evaporation of water? (looking at shape of graph)

How does pressure affect the energy lost after each rebound of a basketball?

How does diameter affect the distance a ball can roll on a frictional surface?

How does viscosity of a liquid affect the distance which it can be propelled with a water gun?