Modern Physics Review Activity

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| Suspect | Element |
| Clever | Aluminum |
| The Fleet Duo | Calcium |
| Rowland | Copper |
| The Benabe Duo | Iron |
| Thrall | Potassium |
| Brelje | Platinum |
| Allen/Byers | Silicon |
| Bush/Schreiner | Zinc |

Mr. Kappas is dead. He’s been shot by an unknown assailant!!! We are not sure yet who the murderer is but have a few suspects. Each of the teachers below have known aspirations for the job of principal and are known to be expert marksmen/women. Each suspect prefers to use a special metal for his or her bullets. These are the metals associated with each suspect:

* To start our analysis, we first shine light with varying wavelengths at the bullet. We find that photo-electrons are emitted from the bullet when the wavelength of light is in the range of 190 nm - 350 nm. Below are the work functions for the different elements. Who can be eliminated from the suspect list?

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| Element | Work Function (eV) |
| Aluminum | 4.08 |
| Calcium | 2.9 |
| Copper | 4.7 |
| Iron | 4.5 |
| Potassium | 2.3 |
| Platinum | 6.35 |
| Silicon | 4.52 |
| Zinc | 4.3 |

* Next we send electricity through the bullet, which brings the electron in the ground state of the bullet up to the 3rd energy state. Do not ask how we know this, we just do. We find that a spectrum is given off from the bullet where the wavelengths of the light is under 1 nm. Who is eliminated after this evidence?
* Next, a few atoms of the most abundant isotope are removed and stripped of all of their electrons and accelerated to a speed of 5 m/s. When the stream of nuclei hit a double slit with a separation of about 3 nm. The very clear interference pattern occurs up to the 2nd order points but not the 3rd. Who is eliminated after this event?
* Lastly we make at the nuclei of the bullet’s atoms become unstable (don’t ask how) and emits an α particle with a velocity of 6.4% of the speed of light. Assuming the α particle holds all the excess energy, determine who the murderer is. (Note: Ignore any negative mass defect, no activity is perfect)