**Spectrum Analysis Lab Pre-lab Questions**

Answer the following questions and perform the following calculations.

1. Define the terms *ground state* and *excited state* and explain how an electron moves from ground to excited and back again.

Ground state –

Excited state-

How it moves-

2, Given the wavelength of a line in an atomic emission spectrum, how do you calculate the energy of the photons released to make that line? Give a formula and an example calculation.

Formula = Example=

3. What events within the electron shells of an atom do the lines in an emission spectrum of an element represent?

4. What does the emission spectrum of an element tell you about the electrons in atoms of that element?

5. Which color line from a spectrum represents a bigger change in energy: a purple line or a red line? Explain

6. Draw a picture that shows the transition between energy levels that produces a purple line next to one in the same atom that produces a red line. What makes the two different?

7. The element helium (He) has lines in its visible spectrum at 389 nm, 447 nm, 588 nm, and 707 nm. Calculate the frequency in Hz for each of these lines. (1 m = 1 × 109 nm).

|  |  |  |  |
| --- | --- | --- | --- |
| Wavelength (nm) | Formula | Calculation | Answer with unit |
| 389 |  |  |  |
| 447 |  |  |  |
| 588 |  |  |  |
| 707 |  |  |  |

8. For each of the spectral lines in the previous problem calculate the energy in joules (J) of the photons emitted by helium atoms to make the lines.

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency (Hz) | Formula | Calculation | Answer with unit |
| 389 |  |  |  |
| 447 |  |  |  |
| 588 |  |  |  |
| 707 |  |  |  |