Unit 1: Atomic Spectra Worksheet - 1

1. How did Bohr expand on Rutherford's model of the atom?

2. Compare the energy of an electron in the ground state and an electron in the excited state.

3. When an electron falls from a higher level to a lower level, how is the energy released?

4. Explain how the gaseous neon atoms in a neon sign emit light.

5. List the seven colors of the visible spectrum in order of increasing energy.

6. What is the energy difference between a photon of yellow light and a photon of violet light?

7. Determine the type of radiation (gamma rays, infrared waves, or radio waves) that has the:

    a. longest wavelength

    b. highest frequency

    c. greatest energy

8. Arrange the type of electromagnetic radiation (ultraviolet light, microwaves, radio waves, X-rays) in order of increasing:

    a. wavelength

    b. frequency

    c. energy

9. Compare the energy of the different types of radiation on the electromagnetic spectrum to help you answer the following questions.

    a. Why is ultraviolet (UV) radiation more harmful to your skin cells than visible light? (or …why is tanning dangerous?)

b. You have to wear a lead shield when you get X-rays taken at the dentist. Why does lead shield the X-rays but will not block gamma radiation?

10. What is the wavelength of electromagnetic radiation having a frequency of $5.00 \times 10^{12}\ s^{-1}$? What kind of electromagnetic radiation is this?

11. What is the frequency of electromagnetic radiation having a wavelength of 3.33×10^{8} m? What type of electromagnetic radiation is this?

12. The laser in a CD player uses light with a wavelength of 7.70×10^{-7} m (780 nm). What is the frequency of this light?

13. A mercury lamp emits radiation with a wavelength of 4.36×10^{-7} m (436 nm).
    a. What is the color of the light from the mercury lamp?

    b. Calculate the frequency of this radiation.

14. A very bright yellow line in the emission spectrum of sodium has a frequency of $5.10 \times 10^{14}\ s^{-1}$. Calculate the wavelength of this yellow light.

15. When an electron falls from the forth to the second energy level, it emits a photon of green light with a frequency of $5.80 \times 10^{14}\ s^{-1}$. Calculate the energy of this photon.

16. A photon of red light has a wavelength of 6.45×10^{-7} m (645 nm). Calculate the energy of this photon. (hint: you will have to use both equations.)

17. If it takes 8.17×10^{-19} J of energy to remove one electron from a gold surface. What is the wavelength of light capable of causing this effect? Is this wavelength of light part of the visible spectrum? (hint: you will have to use both equations.)