Quantum/Nuclear Physics

Name: _____

1. Determine the number of protons, electrons, and neutrons each of these isotopes possesses:
   Pu-239, N-14, and Rn-222.

2. What is the energy in eV of (a) a microwave photon with a wavelength of 2.00 cm and (b) an x-ray photon with a wavelength of 2.00 nm?

3. A certain metal is illuminated with light of frequency 9.00×10^{14} Hz, the stopping potential is found to be 2.00 V. What is the work function for the metal?

4. Describe the Compton effect. How does it demonstrate the wave/particle nature of light?

5. A 1.50 kg ball is released from the top of a 135 m tall building. (a) What is its DeBroglie wavelength just before it strikes the earth? (b) What is its kinetic energy?

6. Explain how an incandescent light bulb produces light.

7. An electron has a wavelength of 5.82×10^{-11}m. (a) What is its kinetic energy? (b) What potential difference is required to accelerate it from rest and give it this much energy in a distance of 5.00 cm?

8. A monatomic gas is illuminated with visible light of wavelength 400.0 nm. The gas is observed to absorb some of the light and subsequently to emit visible light at both 400.0 nm and 600.0 nm.

    a. In the box at the side, complete an energy level diagram that would be consistent with these observations. Indicate and label the observed absorption and emissions.

    b. If the initial state of the atoms has energy -5.0 eV, what is the energy of the state to which the atoms were excited by the 400.0 nm light?
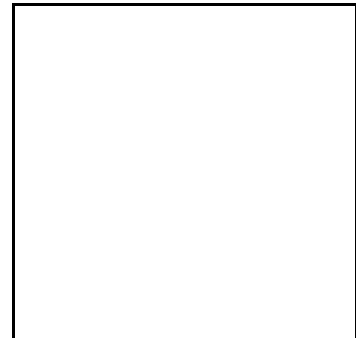
    c. At which other wavelength(s) outside the visible range do these atoms emit radiation after they are excited by the 400.0 nm light?