

- 1) The minimum threshold frequency of zinc for the photoelectric effect is in the ultraviolet range. Which of the following will occur if x-rays are shined on a zinc metal surface?
- (A) No electrons will be emitted from the metal.
 - (B) Electrons will be released from the metal but have no kinetic energy.
 - (C) Electrons will be released from the metal and have high kinetic energy.
 - (D) Electrons will be released from the metal but then will immediately be recaptured by the zinc atoms.
- 2) The metal sodium has a threshold frequency which corresponds to yellow light. Describe what will happen to the electrons in the sodium metal if.....
- (a) yellow light is shined on the sodium surface:

 - (b) red light is shined on the metal surface:

 - (c) green light is shined on the metal surface:

 - (d) green light with a greater intensity (than in previous question) is shined on the metal surface.
- 3) Which of the following is true of the energy of a photon?
- (A) It is directly proportional to the wavelength of the photon.
 - (B) It is inversely proportional to the wavelength of the photon.
 - (C) It is inversely proportional to the square of the wavelength of the photon.
 - (D) It is proportional to the mass of the photon.
- 4) Describe why the photoelectric effect gives evidence that light can exhibit properties of particles.
- 5) Which statement below best describes Heisenberg's Uncertainty Principle?
- (A) There must always be some uncertainty in energy (wavelength).
 - (B) There must always be some uncertainty in location (position).
 - (C) There must always be some uncertainty in energy or in location at any one time.
- 6) Circle the two statements below that correctly describe aspects of Bohr's Model of the atom.
- (A) Electron paths are controlled by probability.
 - (B) Electrons travel in circular paths called orbits.
 - (C) Electrons can have any energy.
 - (D) Electron energies are quantized.

- 7) Which of the two statements that you circled (in previous question) is now known to be false? _____
Rewrite that statement so that it is true. Explain why, in terms of the Heisenberg Uncertainty Principle.
- 8) What is the significance of the square of the wavefunction?
- 9) Explain how our concept of an electron orbital satisfies Heisenberg's uncertainty principle.