

Quiz.

1. To say that energy levels in an atom are discrete is to say the energy levels are well defined and
 - a. separate from one another.
 - b. separated from one another by the same energy increments.
 - c. continuous.
 - d. private.
2. A throbbing pulse of electromagnetic radiation is called a
 - a. proton.
 - b. photon.
 - c. phonon.
3. The energy of a photon is related to
 - a. the energy given to the atom that emits it.
 - b. the energy level difference through which it falls.
 - c. its frequency.
 - d. all of these
 - e. none of these
4. The highest frequency light of those below is
 - a. red.
 - b. green.
 - c. violet.
 - d. blue.
5. Atoms of neon in a glass tube can be excited
 - a. once per atom.
 - b. over and over again.
6. An atom that emits a certain frequency of light is
 - a. an absorber of the same frequency.
 - b. not likely to absorb that same frequency.
7. It is _____ to remove outer electrons than inner electrons in an atom because of _____.
 - a. easier, the strong force
 - b. more difficult, the strong force
 - c. easier, electron shielding
 - d. more difficult, electron shielding

8. Electrons _____ each other, and protons _____ each other.
- attract, repel
 - attract, attract
 - repel, attract
 - repel, repel
9. The further from the positive nucleus of their atom the _____ the electrons feel the Coulomb force.
- stronger
 - weaker
 - There is no difference depending on distance.

Answer Key.

1. a)

This definition of discrete does not have to do with keeping a secret. Here, discrete is used as the opposite of continuous. The energy levels of an atom are like steps on a staircase. You cannot hover between steps when walking up or down the stairs. The spacing between levels is not equal.

2. b)

A proton is a positively-charged particle, but it has mass and, therefore, cannot travel at the speed of light. A phonon is the quantum of the vibration of a crystal lattice in a solid surface. A photon is a "piece" of light that vibrates with the same frequency as the light wave and has no mass.

3. d)

When an electron is excited it jumps energy levels with the same energy difference as the energy of the photon it absorbed. Similarly, when the electron jumps back down to a lower energy level it emits a photon with the same energy as the difference in energy levels. The energy of a photon is directly proportional to its frequency.

4. c)

"Bluer" light has higher frequencies than "redder" light, but violet light has a higher frequency than even blue light does.

5. b)

Excited atoms are extremely unstable, however when a gas is excited it appears to glow at a constant rate. This is because the electrons become excited and emit photons extremely rapidly over and over again on a very large scale.

6. a)

Atoms can only absorb photons with the same energy as the energy difference between the energy level of at least one of its electrons and a higher energy level. When it becomes de-excited it emits a photon of the exact same frequency as the difference in energy levels that the electron "fell" back to.

7. c)

The strong force keeps protons close together in the nucleus. The Coulomb force that keeps electrons attracted to the positive nucleus obeys the inverse-square law, so electrons in higher energy levels (further from the nucleus) experience a weaker pull to the nucleus. Also, the inner electrons help to further weaken the force the outer electrons experience by repelling them.

8. d)

Electrons and protons attract each other because they are oppositely-charged. But electrons are negatively (like-charged) and repel each other, and protons are positively (like-charged) and repel each other.

9. b)

This is another illustration of the inverse-square relationship in the Coulomb force between the negative electrons and their positive nucleus.