

## Quiz.

1. An excited hydrogen atom is capable of emitting radiation of
  - a) a single frequency.
  - b) 3 frequencies.
  - c) many more than 3 frequencies.
2. The Schrodinger equation is restricted to
  - a) subatomic particles.
  - b) submicroscopic and microscopic particles.
  - c) macroscopic particles.
  - d) none of these
3. Most alpha particles fired at a gold foil pass through undeflected because the
  - a) electric field is zero inside the gold.
  - b) gold atoms, unlike most other metal atoms, are relatively far apart.
  - c) atoms of gold, like any others, are mostly empty space.
  - d) net charge of the gold atoms is zero.
  - e) none of these.
4. Some alpha particles fired through a gold foil bounce backward by
  - a) making direct hit with gold atoms.
  - b) electrostatic repulsion when close to gold nuclei.
  - c) electrostatic repulsion with the electron clouds of gold atoms.
  - d) all of these
  - e) none of these
5. The Bohr model of the atom is akin to a
  - a) miniature solar system.
  - b) blob of plum pudding where raisins represent atomic nuclei.
  - c) central heavy ball with lighter balls connected by springs.
  - d) all of these
6. Compared to the average diameter of a hydrogen atom, the average diameter of a helium atom is
  - a) larger.
  - b) smaller.
  - c) about the same.
7. A key feature of the theory of chaos is
  - a) unpredictability
  - b) very small initial differences can lead to very large eventual differences.
  - c) the randomness of molecular motion makes prediction difficult.
  - d) even orderly systems are seen to be disorderly when carefully studied.

8. We now consider the Bohr model of the atom to be
  - a) an accurate picture of a hydrogen atom.
  - b) totally useless – of historical interest only.
  - c) defective and oversimplified, but still useful.
  
9. According to the correspondence principle, a new theory is valid if it
  - a) overlaps and agrees where the old theory works.
  - b) accounts for confirmed results from the old theory.
  - c) predicts the same correct results as the old theory.
  - d) all of these
  - e) none of these

Answer Key.

1. c)

There are more than 3 energy levels in a hydrogen atom, and electrons can jump more than one level at a time (you can think about energy levels like stairs).

2. d)

The Schrodinger equation applies to all matter because all matter can exhibit wave-like behavior.

3. c)

Atoms are mostly empty space, which is probably why it took “so long” to discover the atomic nucleus.

4. b)

Before this experiment, the plum-pudding model was in use, and the atomic nucleus had not yet been discovered. The alpha particles were able to bounce back because they were colliding with the atomic nuclei. It is ironic that alpha rays were used for this experiment because alpha particles are atomic nuclei themselves!

5. a)

Looking at a diagram of the Bohr model this is clear.

6. b)

The more protons in a nucleus the stronger the pull on the inner electron(s).

7. b)

This is also sometimes referred to as the butterfly effect – the notion that something as tiny as the flapping of a butterfly’s wings can lead to monsoons on the other side of the planet.

8. d)

If you are familiar with the Bohr model, then you probably know it is a useful model. However, it is not accurate and does not feature the complexity of the hydrogen atom and its energy levels.

9. d)

All of these answers essentially state the same thing, that a new theory must agree with an old theory and predict the same results.