

Discovery of the Atom

- _____ 1. The gold foil experiment led to the conclusion that each atom in the foil was composed mostly of empty space because most alpha particles directed at the foil
- A) passed through the foil**
B) remained trapped in the foil
C) were deflected by the nuclei in gold atoms
D) were deflected by the electrons in gold atoms
- _____ 2. Which conclusion was a direct result of the gold foil experiment?
- A) An atom is mostly empty space with a dense, positively charged nucleus.**
B) An atom is composed of at least three types of subatomic particles.
C) An electron has a positive charge and is located inside the nucleus.
D) An electron has properties of both waves and particles.
- _____ 3. Which sequence represents a correct order of historical developments leading to the modern model of the atom?
- A) the atom is a hard sphere → most of the atom is empty space → electrons exist in orbitals outside the nucleus**
B) the atom is a hard sphere → electrons exist in orbitals outside the nucleus → most of the atom is empty space
C) most of the atom is empty space → electrons exist in orbitals outside the nucleus → the atom is a hard sphere
D) most of the atom is empty space → the atom is a hard sphere → electrons exist in orbitals outside the nucleus
- _____ 4. Experiments performed to reveal the structure of atoms led scientists to conclude that an atom's
- A) positive charge is evenly distributed throughout its volume
B) negative charge is mainly concentrated in its nucleus
C) mass is evenly distributed throughout its volume
D) volume is mainly unoccupied
- _____ 5. Experiments with gold foil indicated that atoms
- A) usually have a uniform distribution of positive charges
B) usually have a uniform distribution of negative charges
C) contain a positively charged, dense center
D) contain a negatively charged, dense center
- _____ 6. Compared to the entire atom, the nucleus of the atom is
- A) smaller and contains most of the atom's mass**
B) smaller and contains little of the atom's mass
C) larger and contains most of the atom's mass
D) larger and contains little of the atom's mass
- _____ 7. According to the wave-mechanical model of the atom, an orbital is a region of the most probable location of
- A) an alpha particle B) a gamma ray
C) an electron D) a proton
- _____ 8. Base your answer to the following question on the information below.
- In the gold foil experiment, a thin sheet of gold was bombarded with alpha particles. Almost all the alpha particles passed straight through the foil. Only a few alpha particles were deflected from their original paths.
- Explain, in terms of charged particles, why some of the alpha particles were deflected.
- _____
- _____
- _____

Base your answers to questions **9** and **10** on the information below.

In 1897, J. J. Thomson demonstrated in an experiment that cathode rays were deflected by an electric field. This suggested that cathode rays were composed of negatively charged particles found in all atoms. Thomson concluded that the atom was a positively charged sphere of almost uniform density in which negatively charged particles were embedded. The total negative charge in the atom was balanced by the positive charge, making the atom electrically neutral.

In the early 1900s, Ernest Rutherford bombarded a very thin sheet of gold foil with alpha particles. After interpreting the results of the gold foil experiment, Rutherford proposed a more sophisticated model of the atom.

9. State *one* aspect of the modern model of the atom that agrees with a conclusion made by Thomson.

10. State *one* conclusion from Rutherford's experiment that contradicts one conclusion made by Thomson.

Answer Key
Discovery of the Atom Quiz

1. **A**
2. **A**
3. **A**
4. **D**
5. **C**
6. **A**
7. **C**
8. –Alpha particles are positive and are repelled by the nucleus that is also positive.
–Both protons and alpha particles are positively charged so they repel each other.
–Protons and alpha particles have the same charge.
9. An atom has equal amounts of negative and positive charge; An atom has an equal number of protons and electrons; All atoms contain electrons; Electrons are negatively charged.
10. An atom has a nucleus that is positively charged; An atom is mostly empty space; Negatively charged particles are located outside the positive nucleus.