Assignment #3: Atomic Models Regents Questions

1.) An orbital of an atom is defined as the most probable location of
   (1) an electron
   (2) a neutron
   (3) a positron
   (4) a proton

2.) According to the wave-mechanical model of the atom, an orbital is a region of the most probable location of
   (1) an alpha particle
   (2) a gamma ray
   (3) an electron
   (4) a proton

3.) Which phrase describes an atom?
   (1) a negatively charged nucleus surrounded by positively charged protons
   (2) a negatively charged nucleus surrounded by positively charged electrons
   (3) a positively charged nucleus surrounded by negatively charged protons
   (4) a positively charged nucleus surrounded by negatively charged electrons

4.) An orbital is defined as a region of the most probable location of
   (1) an electron
   (2) a neutron
   (3) a nucleus
   (4) a proton

5.) Which conclusion is based on the “gold foil experiment” and the resulting model of the atom?
   (1) An atom is mainly empty space, and the nucleus has a positive charge.
   (2) An atom is mainly empty space, and the nucleus has a negative charge.
   (3) An atom has hardly any empty space, and the nucleus has a positive charge.
   (4) An atom has hardly any empty space, and the nucleus has a negative charge.

6.) Which of these phrases best describes an atom?
   (1) a positive nucleus surrounded by a hard negative shell
   (2) a positive nucleus surrounded by a cloud of negative charges
   (3) a hard sphere with positive particles uniformly embedded
   (4) a hard sphere with negative particles uniformly embedded

7.) In the wave-mechanical model, an orbital is a region of space in an atom where there is
   (1) a high probability of finding an electron
   (2) a high probability of finding a neutron
   (3) a circular path in which electrons are found
   (4) a circular path in which neutrons are found

8.) The modern model of the atom is based on the work of
   (1) one scientist over a short period of time
   (2) one scientist over a long period of time
   (3) many scientists over a short period of time
   (4) many scientists over a long period of time

9.) The region that is the most probable location of an electron in an atom is
   (1) the nucleus
   (2) an orbital
   (3) the excited state
   (4) an ion
10.) Which statement best describes electrons?
(1) They are positive subatomic particles and are found in the nucleus.
(2) They are positive subatomic particles and are found surrounding the nucleus.
(3) They are negative subatomic particles and are found in the nucleus.
(4) They are negative subatomic particles and are found surrounding the nucleus.

11.) John Dalton was an English scientist who proposed that atoms were hard, indivisible spheres. In the modern model, the atom has a different internal structure.

a. Identify one experiment that led scientists to develop the modern model of the atom.
   
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b. Describe this experiment.
   → Shot + particles at gold foil
   → Most particles went thru foil
   → Oddly, some particles bounced back or off at angles

c. State one conclusion about the internal structure of the atom, based on this experiment.
   - Atoms are mostly empty space
   - Atoms have a very small, dense, positive nucleus

Base your answers to questions 12 through 14 on the information and diagram below.

One model of the atom states that atoms are tiny particles composed of a uniform mixture of positive and negative charges. Scientists conducted an experiment where alpha particles were aimed at a thin layer of gold atoms. Most of the alpha particles passed directly through the gold atoms. A few alpha particles were deflected from their straight-line paths. An illustration of the experiment is shown below.

![Diagram of alpha particles deflected by gold atoms](image)

12.) Most of the alpha particles passed directly through the gold atoms undisturbed. What does this evidence suggest about the structure of the gold atoms?

   mostly made of empty space

13.) A few of the alpha particles were deflected. What does this evidence suggest about the structure of the gold atoms?

   there is a dense, positive, small nucleus

14.) How should the original model be revised based on the results of this experiment?

   an atom is mostly empty space e⁻, but has a dense, small, + nucleus