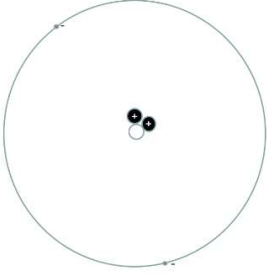
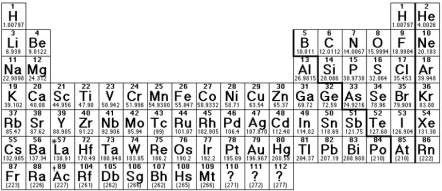


LESSON 2.1 – MODELING ATOMIC STRUCTURE

EVIDENCE NOTEBOOK

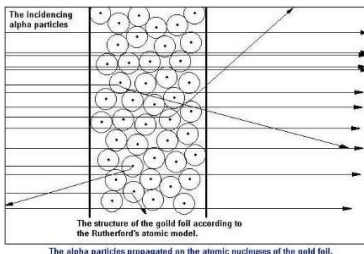
KEY WORDS

Key Word	Definition	Labeled Diagram
Nucleus		
Proton		
Neutron		
Electron		
Metals		Indicate locations on the periodic table
Nonmetals		
Semiconductors (metalloids)		

- In the late 1800s, _____ watched the deflection of charges in a _____ tube and put forth the idea that atoms were composed of positive and negative charges. The negative charges were called electrons, and Thomson guessed that they were sprinkled throughout the positively charged atom like _____ sprinkled throughout a blob of _____.

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2. In the early 1900s, _____ fired _____ at _____ and observed how they were scattered. This experiment led him to conclude that all of the _____ charge in an atom was concentrated in the center, and that an atom is _____. This led to the idea that an atom has a positively charged _____, which contains most of the atom's _____, and that the tiny, negatively charged _____ travel around this nucleus.



3. What is the overall charge of an atom?
4. Helium has 2 protons. How many electrons does it have?

KEY WORDS

Key Word	Definition	Examples
Atomic Number		
Atomic Mass		
Isotopes		
Average Atomic Mass		

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5. The model used to predict electron orbit at specific, fixed radii, like planets orbiting the Sun is known as:

a. Illustrate an example of it:

6. The Heisenberg Uncertainty Principle states that an electron _____ is an area of high _____ where an electron will be found in a region of space.

7. List the four electron subshells in order from lowest energy to highest energy and the order in which they fill:

8. Illustrate the shape of a s subshell:

9. Illustrate the shape of p subshells:

10. Electrons have a _____ charge and will naturally _____ each other. To compensate, electrons in the same orbital will spin in _____ directions to creating opposite _____ fields.

11. Number the electrons in order as they fill an electron diagram for neon:

12. Electron quantum levels:

- a. What is a core electron?

- b. What is a valence electron?

- c. How many core electrons does neon have and in what orbital(s) are they located?

- d. How many valence electrons does neon have and in what orbital(s) are they located?

FLAME TEST

Metal Ion	Observed Color
Calcium	
Copper	
Potassium	
Sodium	
Strontium	

What color(s) did you observe from the banana?

What ion(s) do you think are in a banana chip based on your observations?

CHECKPOINTS

13. Chlorine has a total of 17 electrons and 7 valence electrons. Why are these two numbers different?
- a. Valence electrons are the electrons in the innermost orbital.
 - b. Valence electrons are the electrons in the outermost energy shell.
 - c. Some electrons are located in the nucleus of the atom.
 - d. Some electrons are located outside the atom.

14. Why does the mass number for an element differ from the average atomic mass for that element?
- The mass number only accounts for the number of protons, while the average atomic mass only accounts for the average number of neutrons.
 - The mass number accounts for the number of protons and neutrons, while the average atomic mass only accounts for the average number of protons.
 - The mass number accounts for the mass of each isotope. The average atomic mass is a weighted average of the number of neutrons.
 - The mass number only accounts for the mass of protons and neutrons, while the average atomic mass is a weighted average of the masses of the isotopes.

15. *Select the correct terms to complete the statement.*

Electron-dot notation shows only the electrons in the innermost | outermost energy shell of an atom. These electrons are called valence | orbital electrons and are | are not involved in chemical reactions. Elements with a full outer energy shell are typically very reactive | unreactive.

16. Strontium has an atomic number of 38 and an atomic mass number of 88. Therefore, it has:

- # protons:
- # neutrons:
- # electrons:

17. A scientist picks up a sample of an element. She thinks it might be a metal. Which of the following properties would support her conclusion? *Select all correct answers.*

- The element is shiny.
- The element is dull.
- The element partially conducts electricity.
- The element is a good conductor of electricity.
- The element is very brittle.

18. Which of these claims are supported by the results of a flame test? *Select all correct answers.*

- Different metallic elements give off different colors when they are burned in a flame.
- Electrons absorb energy when they move from one atom to another.
- Protons absorb light when exposed to electricity.
- Neutrons give off energy in the form of light when they absorb energy from a source such as a flame.
- Electrons emit energy when they move from a higher energy level to a lower energy level.

19. What are valence electrons, and why are they important to consider when predicting the properties of elements?
20. Write the electron diagram for oxygen.
21. A chemist repeats the gold foil experiment, but she uses foil made of aluminum (atomic number 13) instead of gold (atomic number 79). How would you expect her results to compare with the experiment that used gold foil?
22. Which statement is true according to modern atomic theory?
- Cathode rays are composed of protons.
 - Atoms can never combine with any other atoms.
 - Atoms may be divided in ordinary chemical reactions.
 - Atoms of the same element may have different mass numbers.
23. Which conclusion can be drawn from a cathode ray being deflected toward the positive plate?
- Atoms are indivisible.
 - There is gas in the tube.
 - A magnetic field is produced.
 - The particles of the ray are negatively charged.
24. Which atomic particle has about the same mass as a proton but has no electrical charge?
- Electron
 - Isotope
 - Neutron
 - Nuclide

25. Which scenario will produce light?
- an electron moving into the nucleus
 - an electron moving to a ground state
 - an electron moving to an excited state
 - an electron is removed from the atom
26. Which term describes the three-dimensional region around a nucleus where an electron may be found?
- energy shell
 - spectral line
 - nuclear ring
 - electron path
27. Which statement is the difference between a 1s subshell and a 2s subshell?
- The 2s subshell is at a higher shell.
 - The 2s subshell has a different shape.
 - The 2s subshell occupies a lower shell.
 - The 2s subshell can hold more electrons.
28. An aluminum isotope consists of 13 protons, 13 electrons, and 14 neutrons. What is its mass number?
- 13
 - 14
 - 26
 - 27
29. During an experiment, four different elements were added to water and observed. Element C showed no reaction. The other three elements bubbled, with Element D bubbling with the greatest vigor and Element A bubbling the least. Which list orders the elements from least reactive with water to most reactive with water?
- A, B, C, D
 - B, D, A, C
 - C, A, B, D
 - D, B, A, C
30. Which technology is used to measure the mass of atoms and to determine the percent composition of compounds?
- gold foil experiment
 - mass spectrometry
 - oil drop apparatus
 - cathode ray tube

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31. Bromine, atomic number 35, belongs to Group 17. How many valence electrons does bromine have in its outermost shell? Refer to the periodic table.
- 7
 - 17
 - 18
 - 35
32. What can you determine about the atomic structure of an element if you know the atomic number of the element and mass number of its isotope?
33. Isotopes:
- What is an atomic similarity between isotopes of the same element?

 - What is an atomic difference between isotopes of the same element?
34. Samples of various unknown elements are on display. How can the elements can be categorized as metals and nonmetals in terms of:
- dull or shiny?

 - good or poor conductor of heat and electricity?

 - brittle or malleability?
35. Flame tests are conducted on various elements. Explain how the elements can be ordered by the amount of energy that is emitted by their colors during the flame test.

