Chapter 2 Reading Guide **Name:**

AP Chemistry 2016-2017 **Date:** **Per:**

This chapter is foundational to concepts in AP Chemistry curriculum in Big Ideas 1 and 3. These two big ideas discuss the building materials of matter and changes in matter. To understand the development of our current knowledge about atoms, we must understand how our ideas came to be. While reading, pay particular attention to data or observations leading to the change in an understanding or a new concept being developed.

2.1 Imaging and Moving Individual Atoms

1. Explain what Binnig and Rohrer discovered/invented and why it is important to chemistry.

2. Explain how an STM works.

3. How many naturally occurring elements are there?

4. So far, how many synthetic elements are there?

2.2 Early Ideas About the Building Blocks of Matter

5. Who proposed the early ideas about the atom? Why where they rejected?

6. What chemist from the 1800s reintroduced the idea of atoms?

2.3 Modern Atomic Theory and the Laws that Led to It

7. Explain the Law of Definite Proportions as stated by Joseph Proust.

8. What data led to the development of the Law of Definite Proportions?

9. Give an example of the Law of Definite Proportions. Explain why this is important in chemistry.

10. Explain the Law of Multiple Proportions as stated by John Dalton.

11. What data led to the development of the Law of Multiple Proportions?

12. Give an example of the Law of Multiple Proportions. Explain why this law is important in chemistry.

13. What are the four parts of Dalton's Theory about atoms?
    a.

    b.

    c.

    d.

14. Which part of Dalton's Theory was later proven incorrect?

15. What data led to the need for a change in Dalton's ideas?

16. Fill in the following table

Law or Theory	Scientist	Data to Support
Law of Definite Proportions		
Law of Multiple Proportions		
Atomic Theory		

2.4 The Discovery of the Electron

17. Draw a cathode ray tube and explain how it works.

18. Draw a diagram to explain the properties of electric charge.

19. Draw a diagram to illustrate your explanation of how the charge of a single electron was determined.

20. Fill in the following chart

Scientist	Discovery	Experiment and Data to Support
J.J. Thompson		
Robert Millikan		

2.5 Structure of the Atom

21. Describe three experiments, run prior to 1930, and the types of energies or particles used to probe the structure of the atom. It will help to make a sketch of the basic parts of the experiment. What did each experiment investigate? Include the names of the scientists associated with each experiment in your answer.

22. Draw a picture of Rutherford's nuclear model of the atom and explain how it differs from J.J. Thompson's Plum Pudding Model.

23. What data led to changing from the Plum Pudding Model to the nuclear model of the atom? What was missing from Rutherford's model of the atom?

24. In 1932 a neutral particle as massive as a proton was detected in the nucleus of an atom. Describe the experiment used to detect the particle.

25. Fill in the following chart

Subatomic Particle Found	Scientist	Experiment	Data Supporting Discovery

2.6 Subatomic Particles: Protons, Neutrons, and Electrons in Atoms

26. Define the following terms in your own words.
    a. Atomic mass unit

    b. Atomic number

    c. Mass number

    d. Isotopes

    e. Ion

27. What is the difference between a cation and an anion? Give an example of each.

28. Explain how to calculate or find the mass number for an atom.

29. Fill in the following table of subatomic particles

Particle	Relative Charge	Mass (g)	Mass (amu)	How to calculate?
Proton				
Neutron				
Electron				

30. Draw a diagram showing the general location of each of the subatomic particles in an atom.

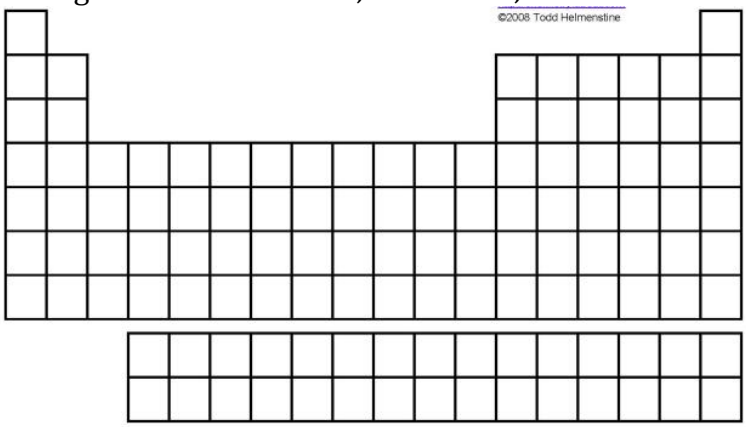
2.7 Finding Patterns: The Periodic Law and the Periodic Table

31. Who was Dmitri Mendeleev and why was he an important scientist?

32. Explain the concept of Periodic Law

33. What new elements were predicted by Mendeleev? How correct were his predictions?

34. Indicate on the following table where metals, nonmetals, and metalloids would be found



35. Explain three properties that define an element as a metal.
    a.

    b.

    c.

36. Explain three properties that define an element as a nonmetal.
    a.

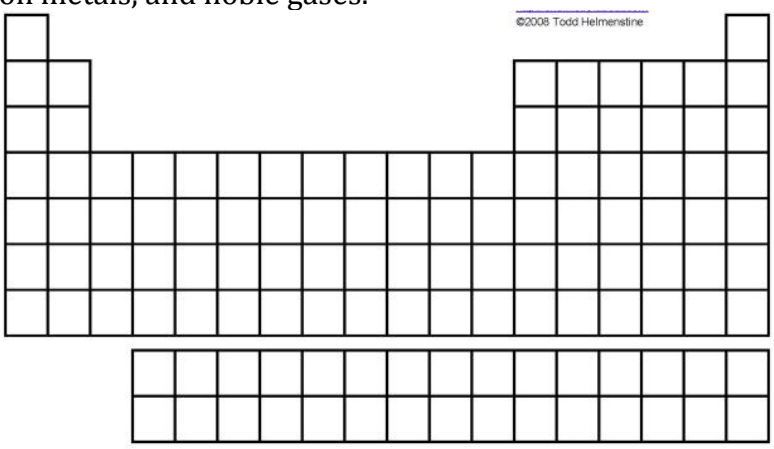
    b.

    c.

37. Which group of elements is the least reactive? Explain why these elements are less reactive.

38. What properties distinguish metalloids from other elements?

39. Label the following periodic table to show where to find alkali metals, alkaline earth metals, halogens, transition metals, and noble gases.



40. Explain how to predict the charge usually observed for a monatomic ion.

41. Explain how the properties of metals and nonmetals are different.

2.8 Atomic Mass: The Average Mass of an Element's Atoms

42. Explain what isotopes are. How do you write a symbol for an isotope?

43. Explain how isotopes can be the same element, yet be different.

44. Explain atomic mass. How is this different from the atomic mass number?

45. Explain how to calculate, in general, the weighted average atomic mass provided for each element on the periodic table.

46. What is mass spectrometry? What is it used for? What does a mass spectrum of neon look like?

2.9 Molar Mass: Counting Atoms by Weighing Them

47. What is a mole in chemistry and why is it so useful?

48. What does Avogadro's number represent?

49. Explain the term *molar mass*.

50. Explain how to count atoms by weighing a sample.

51. Draw a conceptual plan with relationships used (including equations) showing how to change from grams to moles and then moles to number of atoms (see example 2.6).

52. Draw a conceptual plan with relationships used (including equations) showing how to change from number of atoms to moles and then moles to grams.

53. Explain the term *dimensional analysis*. Why is it so useful in addressing chemistry questions involving quantities?

Self-Assessment Answers

1. _____	4. _____	7. _____	10. _____	13. _____
2. _____	5. _____	8. _____	11. _____	14. _____
3. _____	6. _____	9. _____	12. _____	15. _____