

# Chemistry I Reading Guide - Chapter 4, Chapter 12

## Chapter 4

1. Who first suggested the idea of atoms? Describe the "Atomists" concept of the atom.
2. Explain why Democritus' ideas were not useful for explaining chemical behavior.
3. What did John Dalton hope to learn from his experiments?
4. Write a paragraph that summarizes the main points of Dalton's atomic theory.
5. Write the definition of **atom**.
6. What important revision has been made to Dalton's theory?
7. Explain why Thomson concluded that:
  - a. All electrons are negatively charged.
  - b. Electrons must be a part of atoms of all elements.
8. Explain how you can conclude that if an atom contains negatively charged particles, then it must contain particles that are positively charged.
9. Write a paragraph that compares the 3 subatomic particles that make up an atom.
10. Explain why the results of Rutherford's experiment disproved the prevailing theory that protons and electrons were evenly distributed throughout the atom.
11. What quantity uniquely identifies an element? What is the name for this quantity?
12. What quantity is represented by the mass number of an element?
13. Define the term **isotope**. What do all of the isotopes of any particular element have in common?
14. Define an **atomic mass unit**.
15. Explain why the atomic masses of elements listed on the periodic table are not whole numbers. (With the exception of synthetic elements.)
16. Work through problem 20 on p. 101.

## Chapter 12

17. What are the flaws in each of the following atomic models?

### Dalton's model   Thomson's model   Rutherford's model

18. How did Bohr's model explain why electrons of an atom do not "fall" into the nucleus?
19. Explain the meaning of the term **quantized**.
20. How does the quantum mechanical model of the atom differ from the earlier models of the atom?
21. Compare the Bohr model of the atom with the quantum mechanical model of the atom.
22. Explain the relationship between **principal energy levels** and **sublevels**.

23. Explain how the position of an electron is described in the quantum mechanical model of the atom.
24. Draw sketches showing the shape of the **s**, **p** and **d** orbitals in an atom. Explain what these orbitals represent.
25. What is an **electron configuration**?
26. Summarize and explain the 3 rules that are used to find electron configurations.
27. Write the electron configuration for boron. Refer to example 1 on p. 332.
28. What is **electromagnetic radiation**?
29. Explain the meaning of the following terms: Use words and pictures.  
**amplitude wavelength frequency**
30. What is a **spectrum**? Describe the difference between the spectrum of white light and the spectrum of light emitted by atoms.
31. How is a spectrum useful?
32. Why do you think that the synthesis of dyes was an important breakthrough?
33. How is the energy of radiation related to the frequency of radiation?
34. Why was the idea of "quantized" energy so revolutionary?
35. What is a **photon**? Why do photons suggest that light behaves like particles?
36. What is the **photoelectric effect**? How is it related to the idea of quantized energy?
37. How does the emission spectrum of hydrogen atoms show that the energy differences between higher energy levels is smaller than the energy differences between lower energy levels in an atom?
38. What did Louis De Broglie propose about the behavior of particles of matter?
39. Why is the wave behavior of a baseball insignificant but the wave behavior of an electron is very significant?
40. Compare and contrast **classical mechanics** and **quantum mechanics** as models of motion of matter.
41. What is the Heisenberg uncertainty principle? Why does it become more important in describing the motion of an electron than for the motion of a bowling ball?