27. An average atomic nucleus has a diameter of about _____ m.

28. Although the nucleus of an atom is very important, it is the _____ of the atom that determine its chemical properties.

4.7 ■ Isotopes

QUESTIONS

29. True or false? Atoms that have the same number of neutrons but different numbers of protons are called isotopes.

30. True or false? The mass number of a nucleus represents the number of protons in the nucleus.

31. For an atom, the number of protons and electrons is (different/the same).

32. The _____ number represents the sum of the number of protons and neutrons in a nucleus.

33. How did Dalton's atomic theory have to be modified after the discovery that several isotopes of an element may exist?

34. Are all atoms of the same element identical? If not, how can they differ?

35. For each of the following elements, use the periodic table on the inside cover of this book to write the element's atomic number.
    a. chromium
    b. Al
    c. selenium
    d. Ar
    e. cesium
    f. N
    g. iron
    h. Cl

36. For each of the following elements, use the periodic table on the inside cover of this book to write the element's atomic number.
    a. Ge
    b. zinc
    c. Cr
    d. tungsten
    e. Sr
    f. cobalt
    g. Be
    h. lithium

37. Write the atomic symbol ($^{A}_{Z}X$) for each of the isotopes described below.
    a. $Z = 8$, number of neutrons = 9
    b. the isotope of chlorine in which $A = 37$
    c. $Z = 27$, $A = 60$
    d. number of protons = 26, number of neutrons = 31
    e. the isotope of I with a mass number of 131
    f. $Z = 3$, number of neutrons = 4

38. Write the atomic symbol ($^{A}_{Z}X$) for each of the atoms described below.
    a. $Z = 5$, $A = 12$
    b. the isotope with 7 protons and 8 neutrons in its nucleus
    c. atomic number = 17, number of neutrons = 18
    d. $Z = 92$, number of neutrons = 143
    e. number of protons = 6, mass number = 14
    f. the isotope of phosphorus with 16 neutrons in its nucleus

39. How many protons and neutrons are contained in the nucleus of each of the following atoms? Assuming each atom is uncharged, how many electrons are present?
    a. $^{244}_{94}Pu$
    b. $^{241}_{95}Am$
    c. $^{227}_{89}Ac$
    d. $^{133}_{55}Cs$
    e. $^{193}_{77}Ir$
    f. $^{56}_{25}Mn$

40. How many protons and neutrons are contained in the nucleus of each of the following atoms? Assuming each atom is uncharged, how many electrons are present?
    a. $^{12}_{6}C$
    b. $^{60}_{27}Co$
    c. $^{37}_{17}Cl$
    d. $^{132}_{55}Cs$
    e. $^{238}_{92}U$
    f. $^{56}_{26}Fe$

41. Complete the following table.

Name	*Symbol*	*Atomic Number*	*Mass Number*	*Neutrons*
sodium	_____	11	23	_____
nitrogen	$^{15}_{7}N$	_____	_____	_____
_____	$^{136}_{56}Ba$	_____	_____	_____
lithium	_____	_____	_____	6
boron	_____	5	11	_____

42. Complete the following table.

Name	*Neutrons*	*Atomic Number*	*Mass Number*	*Symbol*
nitrogen	6	_____	_____	_____
_____	_____	7	14	_____
lead	_____	_____	206	_____
_____	31	26	_____	_____
_____	_____	_____	_____	$^{84}_{36}Kr$

4.8 ■ Introduction to the Periodic Table

QUESTIONS

43. What property of the elements is considered when arranging the elements in the periodic table? Has the periodic table always been arranged based on this property?

44. In which direction on the periodic table, horizontal or vertical, are elements with similar chemical properties aligned? What are families of elements with similar chemical properties called?

45. List the characteristic physical properties that distinguish the metallic elements from the nonmetallic elements.

46. Where are the metallic elements found on the periodic table? Are there more metallic elements or nonmetallic elements?