

Chapter 02 - Atoms, Elements, and Compounds

1. The statement below describes an intensive property.



“The cost of this container of milk is \$2.99/gal.”

- a. True
- b. False

ANSWER: True

2. An element is a shiny gray solid that can be pressed into a thin sheet. This element is probably a metalloid.

- a. True
- b. False

ANSWER: False

3. Neutral isotopes of the same element have the same number of electrons.

- a. True
- b. False

ANSWER: True

4. The alkali metal found in period 2 is lithium.

- a. True
- b. False

ANSWER: True

5. An isotope of gallium consisting of 31 protons and 37 neutrons can be represented using the symbol shown below.
gallium-37

- a. True
- b. False

ANSWER: False

6. The atomic weight of phosphorus (P) is 30.91 amu or about 31 amu. This indicates that each P atom consists of 15 protons and 16 neutrons.

- a. True
- b. False

ANSWER: False

7. Electron shells define a region in space around the nucleus occupied by certain electrons.

- a. True
- b. False

ANSWER: True

8. The electron arrangement for Na would be:

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shell 1: 2 electrons shell 2: 8 electrons shell 3: 1 electron

- a. True
- b. False

ANSWER: True

9. Elements in the same period of the periodic table generally show similar chemical behavior.

- a. True
- b. False

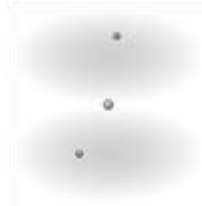
ANSWER: False

10. Group 4A and Group 14 are two different designations for the same column of the periodic table.

- a. True
- b. False

ANSWER: True

11. One of the orbitals in a shell of an atom could be pictured as shown below.



- a. True
- b. False

ANSWER: True

12. An element has the following electron arrangement.

shell 1: 2 electrons shell 2: 8 electrons shell 3: 18 electrons shell 4: 18 electrons shell 5: 7 electrons

The Lewis structure for this element would be:



- a. True
- b. False

ANSWER: False

13. An element with an electron arrangement of:

shell 1: 2 electrons shell 2: 8 electrons shell 3: 18 electrons shell 4: 18 electrons shell 5: 7 electrons

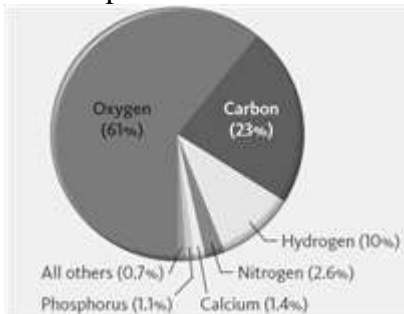
would have 1 valence electron.

- a. True
- b. False

ANSWER: False

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14. The pie chart shown below represents the elemental composition of the human body including water.



- a. True
- b. False

ANSWER: True

15. The elements sodium, potassium, and oxygen are considered to be “elements of life” and are in the category of electrolytes.

- a. True
- b. False

ANSWER: False

16. A mole of an element contains the same number of atoms as a mole of any other element.

- a. True
- b. False

ANSWER: True

17. In 22.99 g of Na there is 6.022×10^{23} atoms of Na.

- a. True
- b. False

ANSWER: True

18. If the atom ratio of Na to N in a compound is 3:1, the mole ratio of Na to N is 3:1.

- a. True
- b. False

ANSWER: True

19. When a particular solid sample is examined under a microscope, it is observed that there are regions that are black and regions which are yellow. What type of matter is this sample?

- a. a compound
- b. an element
- c. a homogeneous mixture
- d. a heterogeneous mixture

ANSWER: d

20. Sodium is a highly reactive metal and chlorine is a toxic gas, but when they come together the resulting material, sodium chloride (a white solid), is essential for life. Which of the following is true when sodium and chlorine are brought into contact with one another?

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- a. They form a heterogeneous mixture.
- b. They form a homogenous mixture
- c. They form a new element.
- d. They form a compound.

ANSWER: d

21. Which of the following is a chemical substance than can be broken down into another substance?

- a. element
- b. homogeneous mixture
- c. heterogeneous mixture
- d. compound

ANSWER: d

22. Which of the following sequences gives the correct order as we move from left to right across a row of the period table?

- a. metal, metalloid, nonmetal
- b. metal, nonmetal, metalloid
- c. nonmetal, metal, metalloid
- d. nonmetal, metalloid, metal

ANSWER: a

23. What are the horizontal rows of the periodic table called?

- a. cycles
- b. periods
- c. groups
- d. columns

ANSWER: b

24. Which of the following groups of elements contains only metals?

- a. Ag, As, Ba, Ca
- b. Ag, Au, Pb, Rb
- c. As, Ge, Si, Te
- d. B, Al, Ga, In

ANSWER: b

25. Which subatomic particle(s) are found in the nucleus?

- a. only electrons
- b. only neutrons
- c. only protons
- d. both protons and neutrons

ANSWER: d

26. Which of the following correctly describes a proton on a **subatomic** scale?

- a. It is massive and has a +1 charge.

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- b. It is massive and has a -1 charge.
- c. It has very small mass and a $+1$ charge.
- d. It has a very small mass and a -1 charge.

ANSWER: a

27. What is the mass number of an atom that is made up of 38 protons, 52 neutrons and 38 electrons?

- a. 38
- b. 52
- c. 90
- d. 128

ANSWER: c

28. Which of the following is true of the atomic weight of an element?

- a. It is the weight of heaviest isotope.
- b. It is the weight lightest isotope.
- c. It is the weight of the most abundant isotope.
- d. It is an average obtained from the weights and abundances of the isotopes.

ANSWER: d

29. If 1 mol of an element has a mass of 63.54 g, the symbol for this element is

- a. Eu.
- b. Zn.
- c. Cu.
- d. Xe.

ANSWER: c

30. Which of the following is the conversion factor that could be used to convert a mass in grams of sodium to the corresponding number of moles?

- a. $\frac{1 \text{ g}}{22.99 \text{ mol}}$
- b. $\frac{1 \text{ mol}}{22.99 \text{ g}}$
- c. $\frac{22.99 \text{ g}}{1 \text{ mol}}$
- d. $\frac{22.99 \text{ mo}}{1 \text{ g}}$

ANSWER: b

31. Which column of the periodic table is commonly called the halogens?

- a. 1A
- b. 4A
- c. 7A

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d. 8A

ANSWER: c

32. A sealed cylinder is filled with a large collection of atoms that have 14 neutrons and 13 protons. Which of the following would behave in a manner similar to this collection of atoms?

- a. a group of atoms with 13 neutrons and 14 protons
- b. a group of atoms with 14 neutrons and 15 protons
- c. a group of atoms with 15 neutrons and 14 protons
- d. a group of atoms with 15 neutrons and 13 protons

ANSWER: d

33. Which of the following is the Lewis structure for a nitrogen atom?

a.



b.



c.



d.



ANSWER: b

34. What are the elements in the “A” columns of the period table called?

- a. representative elements
- b. nonmetal elements
- c. metalloid elements
- d. transition elements

ANSWER: a

35. Use the periodic table to determine about how many helium atoms (He) on the average would be needed to get close to the same mass as an oxygen atom (O).

- a. 6
- b. 4
- c. 12
- d. 1/4

ANSWER: b

36. Naturally occurring lithium (Li) consists of only two isotopes, Li-6 (6.02 amu) and Li-7 (7.02 amu), where the exact isotopic masses are given in parentheses. Use the periodic table and determine which isotope is present in the larger percentage in the natural element.

- a. ${}^6\text{Li}$

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b. ${}^7\text{Li}$

c. The percentage of each isotope is about the same.

d. The relative percent abundance cannot be determined from the information available.

ANSWER: b

37. How many valence electrons are there in an oxygen atom?

a. 2

b. 4

c. 6

d. 8

ANSWER: c

38. The number of valence electrons of a representative element is related to which of the following?

a. atomic number

b. atomic weight

c. group number

d. period number

ANSWER: c

39. How many moles of sulfur are there in a 0.685-g sample of sulfur?

a. 0.0214 mol

b. 46.8 mol

c. 22.0 mol

d. 32.1 mol

ANSWER: a

40. Convert the following number of moles into the corresponding mass.

5.22 mol Br

a. 15.3 g

b. 0.0653 g

c. 417 g

d. 79.9 g

ANSWER: c

41. Sodium chlorate, an ingredient in many common herbicides, has sodium, chlorine and oxygen atoms in the ratio 1:1:3, respectively. What is the formula unit for sodium chlorate?

a. NaCO_3

b. SoClO_3

c. NaClO_3

d. none of these

ANSWER: c

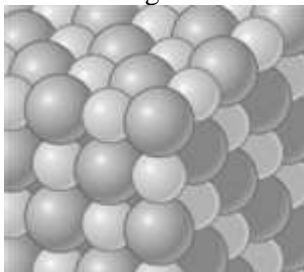
42. What is the meaning of the subscripts in the formula for ethyl alcohol, $\text{C}_2\text{H}_5\text{OH}$?

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- a. Each formula unit contains 2 carbon atoms for each oxygen atom.
- b. There are two carbon atoms per formula unit of ethyl alcohol.
- c. Each formula unit contains 3 times as many hydrogen atoms as carbon atoms.
- d. All of these are correct statements.

ANSWER: d

43. The image shown below represents an atomic view of a compound CsI.

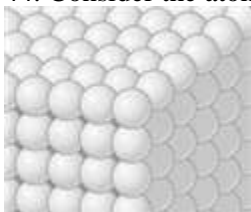


What is the mass of one formula unit?

- a. 259.8 g
- b. 259.8 amu
- c. 1.00 g
- d. 6.022×10^{23} amu

ANSWER: b

44. Consider the atomic view of a substance shown below.



This substance would be classified as a(n)

- a. element
- b. compound
- c. heterogeneous mixture
- d. homogeneous mixture

ANSWER: a

45. Compound consists of five atoms of carbon, ten atoms of hydrogen, and five atoms of oxygen. The formula for this compound is

- a. CH_2O .
- b. $\text{C}_{10}\text{H}_5\text{O}_{10}$.
- c. $\text{C}_5\text{H}_{10}\text{O}_5$.
- d. $\text{C}_5\text{H}_{10}\text{O}_{10}$.

ANSWER: c

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46. What is the mass of one molecule of glucose, $C_6H_{12}O_6$?

- a. 29.02 amu
- b. 180.2 amu
- c. 29.02 g
- d. 180.2 g

ANSWER: b

47. What is the formula weight of ibuprofen, $C_{13}H_{18}O_2$?

- a. 29.0 g/mol
- b. 206.3 g/mol
- c. 289.4 g/mol
- d. 377.7 g/mol

ANSWER: b

48. What is the mass of 3.71 mol diethyl ether, $C_4H_{10}O$?

- a. 20.0 g
- b. 0.0501 g
- c. 74.1 g
- d. 275 g

ANSWER: d

49. A person drinks 1900 g of water, H_2O , per day. How many moles of water did they consume?

- a. 3.4×10^4 mol
- b. 0.009 mol
- c. 105 mol
- d. 18.02 mol

ANSWER: c

50. If you need a sample of 2.841 mol of Na_2S , how many grams do you need?

- a. 0.003640 g
- b. 2.841 g
- c. 78.05 g
- d. 221.7 g

ANSWER: d

51. How many moles of oxygen would be required to make 4 mol of the following compound?

P_4O_{10}

- a. 40 mol O
- b. 4 mol O
- c. 16 mol O
- d. 2.5 mol O

ANSWER: a

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52. What is the mass of one mole of glucose, $C_6H_{12}O_6$?

- a. 29.02 amu
- b. 180.2 amu
- c. 29.02 g
- d. 180.2 g

ANSWER: d

53. Which of the following is the correct unit for the formula weight of a large number of atoms?

- a. amu
- b. g
- c. mol
- d. molecules

ANSWER: b

54. Use the following terms as appropriate to complete the given statement. All terms may not be used.

mass
volume
density
intensive
extensive

The _____ of a substance is an example of a _____ property.

ANSWER: mass, extensive
volume, extensive
density, intensive

55. Use the following terms to complete the two statements given. A term may be used more than once.

heterogeneous mixture
homogeneous mixture
compound

In a restaurant fresh ground pepper is added to olive oil as a dipping sauce for bread. This dip represents a _____. Coffee with caramel flavoring is served for dessert. The coffee is an example of a _____.

ANSWER: heterogeneous mixture, homogeneous mixture

56. Use one the following terms to complete the given statement.

salt
sugar
vegetable oil

When _____ is added to water a heterogeneous mixture forms.

ANSWER: vegetable oil

57. Complete the following statement using one of the following terms.

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compound
element
mixture

In the manufacture of steel, the percent of manganese is adjusted to determine the brittleness of the product. Steel is an example of a _____.

ANSWER: mixture

58. Enter the chemical symbol in the blank for the element that has the electron arrangement given below.

shell 1: 2 electrons shell 2: 8 electrons shell 3: 5 electrons

Symbol for the element: _____

ANSWER: P

59. Enter the chemical symbol in the blank for the element described given below.

Representative element in period 4 whose chemical behavior resembles that of O.

Symbol for the element: _____

ANSWER: Se

60. Enter the chemical symbol of the element in the blank.

An element has the following electron arrangement.

shell 1: 2 electrons shell 2: 8 electrons shell 3: 18 electrons shell 4: 18 electrons shell 5: 4 electrons

The reactivity of this element would most closely resemble that of which element?

Chemical symbol: _____

ANSWER: Pb

61. Enter the chemical symbol of the element in the blank.

An element in period 3 has the Lewis structure:



X should be replaced with what chemical symbol?

Chemical symbol: _____

ANSWER: S

62. Enter the chemical symbol of the element in the blank.

Calcium forms the compound CaF_2 . What other alkaline earth element with a smaller atomic mass would form a compound with a similar formula?

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Chemical symbol: _____.

ANSWER: Mg
Be

63. Based on the text periodic table and using the correct number of significant figures, enter the appropriate number in the blank.

The mass of 5.00 mol of oxygen atoms is _____ g.

ANSWER: 80.000

64. Based on the text periodic table and using the correct number of significant figures, enter the appropriate number in the blank.

The mass of 7.00 mol of sodium chloride, NaCl, is _____ g.

ANSWER: 409

65. Based on the text periodic table and using the correct number of significant figures, enter the appropriate number in the blank.

There are _____ mol is 54.05 g of boron.

ANSWER: 5.000

66. Based on the text periodic table and using the correct number of significant figures, enter the appropriate number in the blank.

There are _____ mol is 72.36 g of citric acid, C₆H₈O₇.

ANSWER: 0.3766

67. Enter an integer number (1, 2, 3, ...) in the blank.

How many electrons are in shell 2 of a P atom?

_____ electrons

ANSWER: 5
five

Fill in each blank with the appropriate term from the list given below.

protons
neutrons
electrons
valence electrons

68. N, P and As have the same number of _____.

ANSWER: valence electrons

69. ¹⁴N and ¹⁵N have the same number of _____.

ANSWER: protons

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electrons

70. ^{14}N and ^{15}O have the same number of _____.

ANSWER: neutrons

71. Enter an integer number (1, 2, 3, ...) in the blank.

Sucrose (table sugar) has the formula $\text{C}_{12}\text{H}_{22}\text{O}_{11}$. How many oxygen atoms would be in 3 formula units of sucrose?

_____ oxygen atoms.

ANSWER: 33

thirty three

thirty-three

72. Enter an integer number (1, 2, 3, ...) in the blank.

Sucrose (table sugar) has the formula $\text{C}_{12}\text{H}_{22}\text{O}_{11}$. A sample of sucrose contains 2400 carbon atoms. How many formula units does this represent?

_____ formula units.

ANSWER: 200

two hundred

73. Classify the following statement as representing an intensive or extensive property by placing intensive or extensive in the blank.

“Vinegar tastes sour.”: _____

ANSWER: intensive

74. Write the chemical symbol for the elements that is in period 2 and group 8A of the periodic table.

ANSWER: Ne

75. Write the name of the following element.

Sn

ANSWER: tin

76. Indicate the number of dots that should be placed around the Lewis symbol for the following element. Use an integer: 1, 2, 3, etc. as appropriate.

Br

ANSWER: 7

77. Convert the following mass moles.

22.98 g glycine, an amino acid, $\text{C}_2\text{H}_5\text{NO}_2$.

ANSWER: 0.3061 mol