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Name:_____ Class:_____ Date:_____

Chapter 01

1. Which choice is the best definition of matter?
   a. Anything that has a solid form
   b. Anything that can be seen
   c. Anything that takes up space and has mass
   d. Anything that can undergo chemical reactions

ANSWER: c

2. What is mass?
   a. The amount of matter present in a sample
   b. The size of a sample
   c. The amount of space occupied by a sample
   d. The dimensions of a sample

ANSWER: a

3. What is an example of matter?
   a. Sunlight
   b. Infrared radiation
   c. Limestone rock
   d. Electricity

ANSWER: c

4. What is true of matter?
   a. It can be natural, but not artificial (human-made).
   b. It can be living or nonliving.
   c. It can be energy.
   d. It is visible, not invisible.

ANSWER: b

5. Which of the following is a property of both liquids and solids, but not gases?
   a. Definite shape
   b. Indefinite shape
   c. Definite volume
   d. Indefinite volume

ANSWER: c

6. What is unique to gases?
   a. Definite shape and definite volume
   b. Definite shape and indefinite volume
   c. Indefinite shape and definite volume
   d. Indefinite shape and indefinite volume

ANSWER: d

7. Which of the following is a property of both gases and liquids?
   a. Definite shape

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b. Indefinite shape
c. Definite volume
d. Indefinite volume

ANSWER: b

8. A flexible 2-L bottle of an unknown chemical is subjected to pressure and decreases in volume to 1.75 L. What does this tell you about the chemical?
a. It is a solid or liquid.
b. It is a liquid.
c. It is a liquid or gas.
d. It is a gas.

ANSWER: d

9. In which of the following pairs of properties are both properties *chemical* properties?
a. Freezes at 10°C and is nonflammable
b. Decomposes at 500°C and reacts with bromine
c. Is a poor conductor of heat and is reddish brown in color
d. Has a low density and is very hard

ANSWER: b

10. When a substance undergoes a *chemical* change, it is always true that
a. it liquifies.
b. it changes from a solid to a gas.
c. it is converted to a new kind of matter with a different composition.
d. the temperature of the substance increases.

ANSWER: c

11. The description "two substances present, two phases present" is correct for
a. heterogeneous mixtures
b. homogeneous mixtures
c. elements
d. compounds

ANSWER: a

12. What is an example of a homogeneous mixture?
a. Lemonade made by mixing lemonade powder and water
b. A bar of pure gold that can be melted down to a liquid
c. Oxygen gas stored in a cylinder
d. A chocolate chip muffin made by adding chocolate chips to muffin mix

ANSWER: a

13. Which of the following statements is *correct*?
a. Elements, but not compounds, are pure substances.
b. Compounds, but not elements, are pure substances.

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c. Both elements and compounds are pure substances.
d. Neither elements nor compounds are pure substances.

ANSWER: c

14. An element is a substance that
a. can be broken down into simpler substances by physical means.
b. cannot be broken down into simpler substances by physical means.
c. can be broken down into simpler substances by chemical means.
d. cannot be broken down into simpler substances by chemical or physical means.

ANSWER: d

15. A pure substance F is found to change upon heating into two new pure substances M and Y. Both M and Y may be decomposed by chemical means. From this, we may conclude that
a. F is an element, and M and Y are compounds.
b. F is a compound, and M and Y are elements.
c. F, M, and Y are all elements.
d. F, M, and Y are all compounds.

ANSWER: d

16. Which of the following statements concerning the known elements is *correct*?
a. No new elements have been identified within the last 40 years.
b. Most elements occur naturally.
c. 108 elements are known at present.
d. Scientists have synthesized all possible non-natural elements.

ANSWER: b

17. The most abundant elements in the universe and in the Earth's crust are, respectively,
a. oxygen and iron.
b. hydrogen and helium.
c. helium and carbon.
d. hydrogen and oxygen.

ANSWER: d

18. Which chemical symbol represents sodium?
a. S
b. Si
c. Na
d. N

ANSWER: c

19. Which chemical symbol represents silver?
a. Au
b. Si
c. Ag

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d. S

ANSWER: c

20. What element is represented by the symbol Fe?
    a. Tin
    b. Lead
    c. Silver
    d. Iron

ANSWER: d

21. Which one of the following statements about atoms is *incorrect*?
    a. An atom is the smallest "piece" of an element that can exist and still have the properties of the element.
    b. Free isolated atoms are rarely encountered in nature.
    c. Atoms may be decomposed using chemical change.
    d. Only one kind of atom may be present in a homoatomic molecule.

ANSWER: c

22. Which one of the following statements about heteroatomic molecules is *correct*?
    a. Two atoms in a heteroatomic molecule may be the same.
    b. Upon chemical subdivision, heteroatomic molecules always yield two or more kinds of atoms.
    c. Heteroatomic molecules maintain the properties of their constituent elements.
    d. Molecules of certain elements are heteroatomic.

ANSWER: b

23. Which of the following pairings of chemical formulas and "molecular descriptions" is *incorrect*?
    a. LiCN and "triatomic"
    b. KCl and "heteroatomic"
    c. N_2 and "homoatomic"
    d. SiO_2 and "diatomic"

ANSWER: d

24. In which of the following pairs of chemical formulas do both formulas represent compounds?
    a. O_2 and O_3
    b. CO_2 and O_2
    c. HCN and N_2
    d. N_2O_4 and NO_2

ANSWER: d

25. Which of the following is a correct description of a sample of ice cubes in water?
    a. One phase present, one substance present
    b. One phase present, two substances present
    c. Two phases present, one substance present

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d. Two phases present, two substances present

ANSWER: c

26. Consider the chemical formulas CoI_2 and COI_2. It is true that they

a. contain identical kinds of atoms.

b. represent the same compound.

c. contain different kinds and numbers of atoms.

d. can be described by none of the above.

ANSWER: c

27. In which of the following pairs of chemical formulas do the two members of the pair contain the same number of elements as well as the same number of atoms?

a. Cs and CS

b. $CoBr_2$ and $COBr_2$

c. $CoCl_2$ and $CoCl_3$

d. NH_4Br and $NiSO_4$

ANSWER: d

28. The total number of atoms present in one formula unit of $Co_2(SO_4)_3$ is

a. 14

b. 15

c. 16

d. 17

ANSWER: d

29. Which of the following changes is a *chemical* change?

a. Melting of ice

b. Pulverizing of hard sugar cubes

c. Rusting of iron

d. Boiling water

ANSWER: c

30. The description "two substances present, two phases present" is *correct* for which combination, assuming that they are mixed together?

a. Ice and water

b. Oil and water

c. Milk and water

d. Sugar dissolved in water

ANSWER: b

31. Which of the following statements concerning mixtures is *correct*?

a. The composition of a homogeneous mixture cannot vary.

b. A homogeneous mixture can have components present in two physical states.

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c. It is impossible for a mixture containing only one phase to be heterogeneous.
d. A heterogeneous mixture can only be separated by chemical means.

ANSWER: c

32. Which of the following statements concerning pure substances is *correct*?
a. Elements, but not compounds, are pure substances.
b. A pure substance can never be separated into simpler pure substances using chemical means.
c. Pure substances cannot have a variable composition.
d. Pure substances can be separated into simpler pure substances by physical means.

ANSWER: c

33. Which of the following statements about compounds and mixtures is *correct*?
a. Both mixtures and compounds must contain two or more kinds of atoms.
b. Mixtures must always contain at least one compound.
c. Both mixtures and compounds can have a variable composition.
d. Compounds must always contain at least one mixture.

ANSWER: a

34. Which of the following statements concerning elemental abundances in Earth's crust is *correct*?
a. One element accounts for over one-half of all atoms present.
b. Silicon and aluminum are the two most abundant elements in terms of atom percent.
c. Elemental abundances in Earth's crust closely parallel elemental abundances in the universe as a whole.
d. The most abundant element in Earth’s crust is silicon.

ANSWER: a

35. In which of the following sequences of elements do all members of the sequence have chemical symbols starting with the same letter?
a. Sulfur, silicon, sodium
b. Gold, silver, aluminum
c. Potassium, phosphorus, lead
d. Silver, silicon, tin

ANSWER: b

36. In which of the following pairs of chemical formulas do both members of the pair have the same number of atoms per molecule?
a. NaSCN and H_2CO_3
b. $CoCl_2$ and $COCl_2$
c. O_2N_2 and NH_3
d. $CaCO_3$ and $Al_2(SO_4)_3$

ANSWER: c

37. In which of the following sequences of chemical formulas do all members of the sequence fit the description “heteroatomic and triatomic”?

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a. HCN, H_2O and O_3

b. CO_2, NO_2 and N_2O

c. S_2O, SO_2, and SO_3

d. CO_2, CO, and O_2

ANSWER: b

Use the following to answer the questions below:

In each of the following multiple-choice questions, characterize EACH of the three given statements as being TRUE or FALSE and then indicate the collective true-false status of the statements using the choices.
(a) All three statements are true.
(b) Two of the three statements are true.
(c) Only one of the statements is true.
(d) None of the statements is true.

38. Statements:
(1) No more than two visibly distinct phases may be present in a homogeneous mixture.
(2) Elements are chemically rather than physically combined in a compound.
(3) A common characteristic for both solids and liquids is a definite volume.

a. All three statements are true.

b. Two of the three statements are true.

c. Only one of the statements is true.

d. None of the statements is true.

ANSWER: b

39. Statements:
(1) The determination of a physical property of a substance causes no change in the identity of the substance.
(2) Matter is anything that has mass, occupies space, and can be seen by the naked eye.
(3) The two most abundant elements in the Earth's crust are oxygen and carbon.

a. All three statements are true.

b. Two of the three statements are true.

c. Only one of the statements is true.

d. None of the statements is true.

ANSWER: c

40. Statements:
(1) A basis for distinguishing between an element and a compound is whether the substance can be decomposed into other substances using chemical means.
(2) Compounds, but not elements, can be broken down by physical means.
(3) The elements silver, gold, and aluminum all have chemical symbols that start with the letter A.

a. All three statements are true.

b. Two of the three statements are true.

c. Only one of the statements is true.

d. None of the statements is true.

ANSWER: b

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41. Statements:
(1) The first letter in a chemical symbol is always the same as the first letter in the element's name.
(2) Two elements account for over 70% of the atoms in the Earth's crust.
(3) The limit of chemical subdivision for a compound is a molecule.

a. All three statements are true.
b. Two of the three statements are true.
c. Only one of the statements is true.
d. None of the statements is true.

ANSWER: b

42. Statements:
(1) The classification "triatomic molecule" denotes molecules in which three different elements are present.
(2) Common physical properties for a substance include color, melting point, boiling point, flammability, and hardness.
(3) The chemical formulas HN_3 and NH_3 represent two ways of denoting the same compound.

a. All three statements are true.
b. Two of the three statements are true.
c. Only one of the statements is true.
d. None of the statements is true.

ANSWER: d

43. Statements:
(1) A molecule is a group of two or more atoms that functions as a unit because the atoms are bound together by chemical forces.
(2) The crushing of ice to make ice chips is a physical procedure that involves a chemical change.
(3) Samples of pure substances can be found naturally.

a. All three statements are true.
b. Two of the three statements are true.
c. Only one of the statements is true.
d. None of the statements is true.

ANSWER: b

44. Statements:
(1) When the formula for a compound contains parentheses, it is an indication that the compound is unstable and subject to decomposition.
(2) The fact that an unknown substance reacts with chlorine is an insufficient basis for classifying the unknown as a compound.
(3) All chemical symbols use a two-letter notation to represent the name of an element.

a. All three statements are true.
b. Two of the three statements are true.
c. Only one of the statements is true.
d. None of the statements is true.

ANSWER: c

45. Statements:
(1) Temperature and pressure are the only major factors that determine the state of matter (solid, liquid, gas) observed for a particular substance.

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(2) The components of a mixture maintain their identity if the mixture is heterogeneous but lose their identity if the mixture is homogeneous.
(3) No more than six atoms may be present in a heteroatomic molecule.

a. All three statements are true.
b. Two of the three statements are true.
c. Only one of the statements is true.
d. None of the statements is true.

ANSWER: d

46. Statements:
(1) A compound must always contain two or more types of atoms.
(2) The description “one substance present, two phases present, all molecules are homoatomic” is consistent with a sample that is an element.
(3) The number of known elements is less than 100.

a. All three statements are true.
b. Two of the three statements are true.
c. Only one of the statements is true.
d. None of the statements is true.

ANSWER: b

47. For the elements calcium, iron, and beryllium, choose the appropriate characterization of the set's chemical symbols from the response list.

a. All symbols have one letter.
b. All symbols have two letters.
c. All symbols start with the same letter.
d. All symbols start with a letter other than the first letter of the element's English name.

ANSWER: b

48. For the elements silver, sodium, and potassium, choose the appropriate characterization of the set's chemical symbols from the response list.

a. All symbols have one letter.
b. All symbols have two letters.
c. All symbols start with the same letter.
d. All symbols start with a letter other than the first letter of the element's English name.

ANSWER: d

49. For the elements iodine, fluorine, and nitrogen, choose the appropriate characterization of the set's chemical symbols from the response list.

a. All symbols have one letter.
b. All symbols have two letters.
c. All symbols start with the same letter.
d. All symbols start with a letter other than the first letter of the element's English name.

ANSWER: a

50. For the elements gold, lead, and bromine, choose the appropriate characterization of the set's chemical symbols from

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the response list.

a. All symbols have one letter.
b. All symbols have two letters.
c. All symbols start with the same letter.
d. All symbols start with a letter other than the first letter of the element's English name.

ANSWER: b

51. For the elements silicon, sulfur, and tin, choose the appropriate characterization of the set's chemical symbols from the response list.

a. All symbols have one letter.
b. All symbols have two letters.
c. All symbols start with the same letter.
d. All symbols start with a letter other than the first letter of the element's English name.

ANSWER: c

52. Give the classification of matter when two substances exist with three phases present.

a. Heterogeneous mixture
b. Homogeneous mixture
c. Compound
d. Element

ANSWER: a

53. Give the classification of matter when two substances exist with two phases present.

a. Heterogeneous mixture
b. Homogeneous mixture
c. Compound
d. Element

ANSWER: a

54. Give the classification of matter when two substances exist with one phase present.

a. Heterogeneous mixture
b. Homogeneous mixture
c. Compound
d. Element

ANSWER: b

55. Give the classification of matter when only one type of heteroatomic molecules is present.

a. Heterogeneous mixture
b. Homogeneous mixture
c. Compound
d. Element

ANSWER: c

56. A substance is silvery-gray in color. Choose the appropriate classification from the response list below.

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a. Could be an element or a compound
b. Could be an element but not a compound
c. Could be a compound but not an element
d. Can neither be an element nor a compound

ANSWER: a

57. A substance decomposes upon heating. Choose the appropriate classification from the response list below.
a. Could be an element or a compound
b. Could be an element but not a compound
c. Could be a compound but not an element
d. Can neither be an element nor a compound

ANSWER: c

58. A substance is composed of diatomic molecules. Choose the appropriate classification from the response list below.
a. Could be an element or a compound
b. Could be an element but not a compound
c. Could be a compound but not an element
d. Can neither be an element nor a compound

ANSWER: a

59. A substance reacts vigorously with chlorine. Choose the appropriate classification from the response list below.
a. Could be an element or a compound
b. Could be an element but not a compound
c. Could be a compound but not an element
d. Can neither be an element nor a compound

ANSWER: a

60. A substance has a variable composition. Choose the appropriate classification from the response list below.
a. Could be an element or a compound
b. Could be an element but not a compound
c. Could be a compound but not an element
d. Can neither be an element nor a compound

ANSWER: d

61. A substance has a freezing point of –20°C. This is an example of a
a. physical property.
b. chemical property.
c. physical change.
d. chemical change.

ANSWER: a

62. A substance is melted. Choose the appropriate classification from the response list below.
a. Could be an element or a compound
b. Could be an element but not a compound

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c. Could be a compound but not an element
d. Can neither be an element nor a compound

ANSWER: a

63. A substance has a high density. Choose the appropriate classification from the response list below
a. Could be an element or a compound
b. Could be an element but not a compound
c. Could be a compound but not an element
d. Can neither be an element nor a compound

ANSWER: a

64. Substance A spontaneously decomposes into substances B and C under the right conditions. Based on this information, substance A
a. could be an element or a compound.
b. could be an element but not a compound.
c. could be a compound but not an element.
d. can neither be an element nor a compound.

ANSWER: c

65. A substance is reacted with chlorine gas. The substance
a. could be an element or a compound.
b. could be an element but not a compound.
c. could be a compound but not an element.
d. can neither be an element nor a compound.

ANSWER: a

66. Which of the following substances is both homoatomic and tetraatomic?
a. HCN
b. H_2O_2
c. P_4
d. H_2CO_3

ANSWER: c

67. Which of the following substances is both heteroatomic and triatomic?
a. HCN
b. H2O2
c. P_4
d. H_2CO_3

ANSWER: a

68. Which of the following substances contains the same number of elements as atoms?
a. HCN

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b. H_2O_2

c. P_4

d. H_2CO_3

ANSWER: a

69. Which of the following substances contains fewer atoms of one kind than other kinds?

a. HCN

b. H_2O_2

c. P_4

d. H_2CO_3

ANSWER: d

70. Which of the following substances contains the largest total number of atoms??

a. HCN

b. H_2O_2

c. P_4

d. H_2CO_3

ANSWER: d

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