Skills Worksheet

Directed Reading

Section: Matter

1. What is matter?

2. What does mass mean?

PROPERTIES OF MATTER

3. What are two types of properties of matter?
   a. physical and atomic
   b. chemical and magnetic
   c. physical and chemical
   d. chemical and mental

4. What kind of properties can be observed without changing the composition of the substance?
   a. chemical
   b. physical
   c. magnetic
   d. atomic

5. Which of the following are all physical properties of matter?
   a. density, color, hardness
   b. density, reactions, hardness
   c. chemistry, freezing point, color
   d. lightness, electrons, boiling point

6. The properties that describe how a substance reacts with other substances to produce different substances are
   a. chemical properties.
   b. physical properties.
   c. magnetic properties.
   d. atomic properties.
7. When iron reacts with oxygen to form rust, the reaction is an example of a
   a. physical property of oxygen.
   b. magnetic property of oxygen.
   c. chemical property of iron.
   d. physical property of iron.

8. Which of the following is a chemical property of helium?
   a. Helium does not react with other substances but does form new substances.
   b. Helium reacts with other substances but does not form new substances.
   c. Helium reacts with other substances to form new substances.
   d. Helium does not react with other substances to form new substances.

9. A substance that cannot be broken down into simpler, stable substances by chemical means is
   a. an element.
   b. an atom.
   c. matter.
   d. mass.

10. What does each element have that can be used to identify it?
    a. a group of chemicals and atoms
    b. a group of compounds
    c. a characteristic set of physical and chemical properties
    d. a characteristic set of magnetic properties

11. About how many elements occur naturally on Earth?
    a. more than 1,000
    b. more than 90
    c. more than 900
    d. more than 9,000

12. About how many elements have been created in laboratories?
    a. about 36
    b. about 12
    c. about 60
    d. about 24

13. How many elements make up 98% of Earth’s crust?
    a. two
    b. four
    c. eight
    d. six
14. What is an atom?
   a. the smallest unit of an element
   b. the smallest unit of oxygen
   c. the smallest unit of matter
   d. the smallest unit in the universe

15. How many atoms lined up side by side would equal the thickness of a book page?
   a. about a hundred
   b. more than a million
   c. less than a hundred thousand
   d. less than a thousand

ATOMIC STRUCTURE

16. Atoms are made up of smaller parts called
   a. elemental particles.
   b. subatomic particles.
   c. material particles.
   d. energy particles.

17. What are the three major kinds of subatomic particles?
   a. matter, energy, elements
   b. atoms, elements, subtrons
   c. nucleus, positrons, magnitrons
   d. protons, electrons, neutrons

In the space provided, write the letter of the definition that best matches the term or phrase.

18. protons
   a. particles that have a negative charge
   b. particles that have no charge
   c. particles that have a positive charge

19. electrons
   a. particles that have a negative charge
   b. particles that have no charge
   c. particles that have a positive charge

20. neutrons

21. What is the nucleus of an atom?

22. Why does the nucleus of an atom have a positive charge?
23. How much of an atom’s mass does the nucleus make up?

24. How much of an atom’s volume does the nucleus make up?

25. What makes up most of the volume of an atom?

26. What is an electron cloud?

27. Why are electrons attracted to the nucleus of an atom?

28. What holds the electrons in an atom?

ATOMIC NUMBER

29. What is the atomic number of an element?
   a. the number of neutrons in the nucleus of the atom
   b. the number of protons and neutrons in the nucleus of the atom
   c. the number of protons in the nucleus of the atom
   d. the number of electrons in the nucleus of an atom

30. An uncharged atom has an equal number of
   a. neutrons and electrons.
   b. protons and electrons.
   c. protons and neutrons.
   d. protons, electrons, and neutrons.

31. The atomic number of an uncharged atom is also equal to
   a. the number of its neutrons.
   b. the number of its subatomic particles.
   c. the number of its elements.
   d. the number of its electrons.
____ 32. Elements on the periodic table are ordered according to  
   a. their weight.  
   b. their atomic numbers.  
   c. their mass.  
   d. their number of neutrons.

____ 33. The periodic table is a system for  
   a. classifying neutrons.  
   b. classifying chemicals.  
   c. classifying elements.  
   d. classifying matter.

____ 34. Elements in the same column on the periodic table have similar arrangements of what?  
   a. electrons in their atoms  
   b. protons in their atoms  
   c. neutrons in their atoms  
   d. positrons in their atoms

____ 35. Elements that have similar arrangements of electrons also have  
   a. similar numbers of neutrons.  
   b. similar chemical properties.  
   c. similar elemental properties.  
   d. similar physical properties.

**ATOMIC MASS**

____ 36. What is the mass number of an atom?  
   a. the sum of its protons and electrons  
   b. the sum of its protons, electrons, and neutrons  
   c. the sum of its neutrons and electrons  
   d. the sum of its protons and neutrons

____ 37. Since the mass of a subatomic particle is too small to be expressed easily in grams, what special unit is used?  
   a. atomic matter unit (amu)  
   b. elemental mass unit (emu)  
   c. atomic mass unit (amu)  
   d. subatomic mass unit (smu)

____ 38. Which subatomic particles each have an atomic mass unit close to 1?  
   a. electrons and neutrons  
   b. protons and neutrons  
   c. protons and electrons  
   d. electrons and positrons
39. The mass of one proton is equal to the combined mass of how many electrons?
   a. less than 1
   b. about 184
   c. about 1,840
   d. much more than 1,840

40. When calculating an atom’s approximate mass, how is the mass of electrons figured?
   a. It is ignored.
   b. It is figured at 1 over 1,840.
   c. It is figured at 1 for every proton.
   d. It is figured at 1,840 for every proton.

41. Although all atoms of the same element contain the same number of protons, the number of its
   a. neutrons may differ.
   b. neutrons is always smaller.
   c. positrons may differ.
   d. electrons may differ.

42. Which of the following is true of atoms of helium?
   a. All have two neutrons, but some have only one electron.
   b. Most have two neutrons, but some have only one neutron.
   c. Most have one proton, but some have only one neutron.
   d. All have one neutron, but some have only one proton.

43. An atom with the same number of protons as other atoms
   a. has a different atomic number.
   b. has no mass.
   c. has no atomic number.
   d. has the same atomic number.

44. What is an isotope?

45. How does a helium atom that has two neutrons compare with a helium atom that has only one neutron?
46. Why do different isotopes of the same element have slightly different properties?

THE PERIODIC TABLE OF ELEMENTS

47. What is the atomic number of hydrogen?
   a. 2
   b. 3
   c. 1
   d. 6

48. What is the symbol of hydrogen?
   a. C
   b. H
   c. He
   d. 1

49. What is the atomic number of sodium?
   a. 1
   b. 6
   c. 11
   d. 0

50. What is the name of the element that has the symbol Ca?
   a. Cesium
   b. Californium
   c. Cobalt
   d. Calcium

51. What is the symbol of iron?
   a. I
   b. Ir
   c. Fe
   d. F
Directed Reading continued

52. What is the atomic number of iron?
   a. 26  
   b. 8   
   c. 55  
   d. 4   

53. What is the symbol of uranium?
   a. Ur  
   b. U   
   c. Fe  
   d. Um  

54. What is the atomic number of uranium?
   a. 92 
   b. 28 
   c. 238 
   d. 7  

In the space provided, write the letter of the atomic number that matches the element on the periodic table.

55. helium  
   a. 8  
56. carbon 
   b. 10 
57. nitrogen 
   c. 6  
58. oxygen 
   d. 16 
59. neon 
   e. 13 
60. aluminum 
   f. 2  
61. sulfur 
   g. 17 
62. chlorine 
   h. 7  

63. Why does the periodic table use an average atomic mass for each element?

   ____________________________________________________________

64. What does average atomic mass mean?

   ____________________________________________________________
   ____________________________________________________________
65. How many naturally occurring isotopes of hydrogen are there?

66. Why does each isotope of hydrogen have a mass number different from the others?

67. How can you determine the average atomic mass of hydrogen?

68. What is the average atomic mass of hydrogen, as noted in the periodic table?

VALENCE ELECTRONS AND PERIODIC PROPERTIES

69. Elements are arranged in columns on the period table based on what?
   a. similarities in their physical properties
   b. similarities in their chemical properties
   c. differences in their physical properties
   d. differences in their chemical properties

70. What are columns called on the periodic table?
   a. properties
   b. rows
   c. valences
   d. groups

71. The number of outermost electrons in an atom’s electron cloud largely determine an atom’s
   a. chemical properties.
   b. physical properties.
   c. magnetic properties.
   d. atomic properties.

72. What are the outermost electrons in an atom’s electron cloud called?
   a. atomic electrons
   b. nuclear electrons
   c. valence electrons
   d. periodic electrons
73. Within each group on the periodic table, the atoms of each element generally have
   a. the same physical properties.
   b. different chemical properties.
   c. the same number of valence atoms.
   d. the same atomic numbers.

74. How many valence electrons do atoms of elements in Groups 3–12 have?
   a. 3 or more
   b. 2 or more
   c. only 1
   d. 1 or 2

75. In groups 13-18 on the periodic table, what is the number of valence electrons in each atom?

76. What is true of an atom that has 8 valence electrons?

77. What is true of elements whose atoms have 1, 2, or 3 valence electrons?

78. What is the main difference between metals and nonmetals?
19. To balance the equation, you would use a coefficient. Because combining the reactants will result in an extra oxygen atom, the coefficient 2 can be used in front of the H₂ so that the product will use all the oxygen atoms and now will be 2 molecules of water. The balanced equation is 2H₂ + O₂ → 2H₂O.

20. Because sodium normally has 11 electrons and is neutral, it must also have 11 protons. If an electron is lost, the atom of sodium will now have 11 positively charged protons and 10 negatively charged electrons, a net positive charge. It is now a stable sodium ion.

**Directed Reading**

**SECTION: MATTER**

1. anything that takes up space and has mass
2. the amount of matter in any object
3. C
4. B
5. A
6. A
7. C
8. D
9. A
10. C
11. B
12. D
13. C
14. A
15. B
16. B
17. D
18. C
19. A
20. B
21. protons and neutrons packed close together in the center of an atom
22. because protons have a positive charge and neutrons have no charge
23. most of an atom’s mass
24. very little of an atom’s volume
25. empty space
26. a region of space that surrounds the nucleus, where electrons move
27. Opposite charges attract each other, and the negatively charged electrons are attracted to the positively charged nucleus.

28. the attraction of the negatively charged electrons to the positively charged nucleus
29. C
30. B
31. D
32. B
33. C
34. A
35. B
36. D
37. C
38. B
39. C
40. A
41. A
42. B
43. D
44. an atom that has the same number of protons as other atoms of the same element, but has a different number of neutrons
45. It is more massive than a helium atom that has one neutron.
46. because of their different number of neutrons and their different masses
47. C
48. B
49. C
50. D
51. C
52. A
53. B
54. A
55. F
56. C
57. H
58. A
59. B
60. E
61. D
62. G
63. because isotopes of an element have different masses
64. the weighted average of the atomic masses of the naturally occurring isotopes of an element
65. three
66. because each isotope has a different number of neutrons
67. by calculating the weighted average of the atomic masses of the three isotopes of hydrogen
68. 1.00794 amu
69. B
70. D
71. A
72. C
73. C
74. B
75. The number is the same as the atom's group number minus 10, except for helium, which has only two valence electrons.
76. It is considered stable or chemically unreactive.
77. They tend to lose electrons easily.
78. Metals tend to lose electrons easily; nonmetals are more likely to gain electrons.

SECTION: COMBINATIONS OF ATOMS
1. B
2. A
3. D
4. C
5. A
6. B
7. D
8. B
9. A
10. D
11. B
12. C
13. C
14. D
15. B
16. A
17. One molecule of methane, CH₄, reacts with two molecules of oxygen, O₂, to yield one molecule of carbon dioxide, CO₂, and two molecules of water, H₂O.
18. when the number of atoms of each element on the right side of the equation is equal to the number of atoms of the same element on the left side
19. Changing chemical formulas would mean that there are different substances in the reaction.
20. numbers put in front of chemical formulas to balance an equation
21. The methane molecule on the left side of the equation has four hydrogen atoms, and on the right side each water molecule has two hydrogen atoms. The coefficient 2 is placed in front of the formula for water to balance the number of hydrogen atoms.
22. The coefficient 2 is placed in front of the oxygen molecule on the left side of the equation to give both sides four oxygen atoms.
23. D
24. B
25. C
26. A
27. C
28. B
29. D
30. D
31. B
32. B
33. C
34. A
35. D
36. C
37. C
38. D
39. A
40. C
41. B
42. a bond that is formed by the attraction between atoms that share electrons
43. the positive nucleus of each atom is attracted to the shared negative electrons
44. the pull between the positive and negative charges
45. a compound formed by the sharing of electrons
46. Two hydrogen atoms share their single valence electrons with an oxygen atom that has six valence electrons. This creates a bond and gives oxygen a stable number of 8 outermost valence electrons. The oxygen atom shares two of its electrons with the hydrogen atoms, which gives each hydrogen atom two electrons.
47. because the ability of atoms of some elements to attract electrons from atoms of other elements differs
48. a covalent bond where the bonded atoms have an unequal attraction for the shared electrons
49. Two hydrogen atoms share electrons with an oxygen atom to form a water molecule. The oxygen atom has more ability to attract electrons than the