

Chapter 1

What Is Chemistry?

True/False

1. Chemistry is the study of the interactions of matter with other matter and with energy.
True; Easy
2. Matter is anything that has a mass and takes up space.
True; Easy
3. Air found inside an empty chamber cannot be classified as matter.
False; Easy
4. Physical properties are characteristics of matter that describe how matter changes form in the presence of other matter.
False; Easy
5. Chemical properties are characteristics that describe matter as it exists.
False; Easy
6. A physical change occurs when a sample of matter changes one or more of its physical properties.
True; Easy
7. A burning sparkler is an example of chemical change.
True; Easy
8. Ice melting is an example of a chemical change.
False; Easy
9. A sample of matter that has the different physical and chemical properties throughout is called a substance.
False; Easy
10. An element can be broken down into simpler chemical substances by chemical reactions.
False; Easy
11. A compound is a combination of more than one element.
True; Easy
12. A compound's physical and chemical properties are different than the physical and chemical properties of its constituent elements.
True; Easy
13. Table salt has the same physical properties as its constituent elements, sodium and chlorine gas.
False; Medium

14. Carbonated water, before it is opened, is an example of heterogeneous mixtures.
False; Easy (the CO₂ dissolved in the water makes it homogeneous. However, students will think of the water after it is opened, the CO₂ bubbles are present making it look like it is heterogeneous.)
15. Solution is another word used to describe homogeneous mixtures.
True; Easy
16. A metal is an element that is brittle at room temperature.
False; Easy
17. Elements that have properties of both metals and nonmetals and are called metalloids.
False; Easy
18. Nonmetals do not conduct electricity or heat very well.
True; Easy
19. Science is the process of knowing about the natural universe through observation and experiment.
True; Easy
20. A hypothesis is a general statement that explains a large number of observations.
False; Easy
21. Experiments are not performed if a hypothesis exists on the issue to be tested.
False; Easy
22. A law is a specific statement that is thought to be never violated by the entire natural universe.
True; Easy
23. Science is concerned only with the natural universe.
True; Easy
24. Physics and astronomy are scientific fields concerned with the fundamental interactions between matter and energy.
True; Easy
25. Chemistry is widely regarded as the language of science.
False; Easy
26. A qualitative description implies a description of the extent to which a compound is used in a reaction.
False; Easy
27. The temperature outside is 95 degrees Fahrenheit; this is an example of a quantitative description.
True; Easy
28. A qualitative description means knowing how much of something is present.
False; Easy

Multiple Choice Questions

29. Which of the following statements is the correct description of chemistry?
- It is the study of the interactions of matter with other matter and with energy.
 - It is the study of the static behavior of particles and substances.
 - It is the study of conversion of one form of energy to another form.
 - It is the science that deals with kinetic and potential energy.
 - It is the science that deals with matter, energy, and force.

a; Easy

30. Anything that has mass and takes up space is known as _____.

- gravity
- matter
- leverage
- vacuum
- force

b; Easy

31. Which of the following is not classified as matter?

- Air in a room
- Gas in a chamber
- Blood in blood vessels
- Thoughts of a human brain
- Air in human lungs

d; Easy

32. Which of the following statements describes a chemical property?

- Mercury is the only metal that exists as a liquid at room temperature.
- Women usually have long nails.
- The stereo system is silver in color.
- A kilogram of iron weighs one thousand grams.
- Sodium reacts with water to produce sodium hydroxide and hydrogen.

e; Moderate

33. Chemical properties are characteristics of matter that describe _____.

- how matter changes form in the presence of other matter
- how matter changes form when it releases kinetic or static energy
- how matter changes form when it acquires static energy
- how matter changes form when it acquires kinetic energy
- how matter changes form when it is heated or cooled

a; Easy

34. Which of the following is an example of chemical change?

- Ice melts to form water.
- Water is turned to steam by heating.
- Temperature of the engine goes up by 5°C.
- Alkanes have less mass than alkenes.
- Alkanes burn in the presence of oxygen.

e; Easy

35. A burning match is an example of a(n) _____ change.
- physical
 - mechanical
 - chemical
 - ionic
 - nuclear
- c; Easy**
36. A sample of matter that has the same physical and chemical properties throughout is called a _____.
- form
 - base
 - substance
 - particle
 - structure
- c; Easy**
37. A(n) _____ is the simplest type of chemical substance; it cannot be broken down into simpler chemical substances by ordinary chemical means.
- compound
 - element
 - mixture
 - base
 - structure
- b; Easy**
38. A _____ is a combination of more than one element.
- physical change
 - phase
 - thought
 - chemical change
 - compound
- e; Easy**
39. Which of the following is an example of a heterogeneous mixture?
- Oxygen dissolved in water
 - Carbon dioxide dissolved in water
 - Sodium chloride in water
 - A combination of salt and steel wool
 - A combination of oxygen and hydrogen
- d; Moderate**
40. A(n) _____ is an element that is solid at room temperature, is shiny and silvery, conducts electricity and heat well, can be pounded into thin sheets, and can be drawn into thin wires.
- sub-atom
 - metal
 - ion
 - semimetal
 - nonmetal
- b; Easy**

41. Which of the following elements' property allows them to be pounded into thin sheets?
- Conductivity
 - Resistivity
 - Malleability
 - Ductility
 - Impeditivity
- c; Easy**
42. Which of the following elements' property allows them to be drawn into thin wires?
- Malleability
 - Ductility
 - Conductivity
 - Resistivity
 - Impeditivity
- b; Easy**
43. A nonmetal is an element that is _____.
- brittle when solid
 - conductive to electricity
 - hard when solid
 - conductive to heat
 - characterized by high ductility
- a; Moderate**
44. Which of the following terms refers to the elements that have properties of both metals and nonmetals?
- Base metals
 - Precious metals
 - Noble metals
 - Metalloids/Semimetals
 - Extracted metals
- d; Easy**
45. _____ can be regarded as the process of knowing about the natural universe through observation and experiment.
- Science
 - Civics
 - History
 - Psychology
 - Geography
- a; Easy**
46. Which of the following terms refers to an educated guess about how the natural universe works?
- Experimentation
 - Empirical analysis
 - Hypothesis
 - Postdiction
 - Intuition

c; Easy

47. Which of the following is the first step in a scientific method?

- a. Forming a theory
- b. Stating a hypothesis
- c. Refining a hypothesis
- d. Validating assumptions
- e. Validating a theory

b; Easy

48. Which of the following refer to tests of the natural universe to see if a hypothesis is correct?

- a. Sequences
- b. Topology
- c. Internship
- d. Amendments
- e. Experiments

e; Easy

49. A(n) _____ is a general statement that explains a large number of observations.

- a. hypothesis
- b. model
- c. purpose
- d. theory
- e. experiment

d; Easy

50. A specific statement that is thought to be never violated by the entire natural universe is called a(n) _____.

- a. premise
- b. hypothesis
- c. law
- d. theory
- e. observation

c; Easy

51. The fact that all matter attracts all other matter is an example of a(n) _____.

- a. law
- b. observation
- c. argument
- d. purpose
- e. hypothesis

a; Easy

52. Which of the following scientific fields is known as the language of science?

- a. Physics
- b. Mathematics
- c. Chemistry
- d. Botany
- e. Zoology

b; Easy

53. A _____ description implies a description of the features of an object.
- static
 - quantitative
 - qualitative
 - descriptive
 - dynamic
- c; Easy**
54. Which of the following types of descriptions represents the specific amount of something?
- Qualitative
 - Descriptive
 - Static
 - Dynamic
 - Quantitative
- e; Easy**
55. The compound sulfur is yellow colored. This description of sulfur is an example of a _____ description.
- Qualitative
 - Dynamic
 - Static
 - Quantitative
 - Descriptive
- a; Easy**

Essay Questions

56. What is matter? Explain by providing examples.
Matter is anything that has mass and takes up space. A book, a computer, and food are examples of matter. Air is also an example of matter because it occupies space.
Easy
57. What is meant by physical properties of matter?
Physical properties are characteristics that describe matter as it exists. Some of many physical characteristics of matter are shape, color, size, and temperature. An important physical property is the phase (or state) of matter. The three fundamental phases of matter are solid, liquid, and gas.
Easy
58. What is meant by chemical properties of matter?
Chemical properties are characteristics of matter that describe how matter changes form in the presence of other matter. Burning is an example of a chemical property.
Easy
59. What is physical change? Provide an example.
A physical change occurs when a sample of matter changes one or more of its physical properties. For example, a solid may melt, or alcohol in a thermometer may change volume as the temperature changes. A physical change does not affect the chemical composition of matter.

Easy

60. From the following, which is not an example of a chemical change? Be sure to explain your reasoning.
1. Burning a plastic water bottle
 2. Production of hydrogen gas from water
 3. Tarnishing a copper penny
 4. Chopping a log into sawdust
 5. Charging a cell phone

A chemical change is the process of demonstrating a chemical property. Chopping a log into sawdust is an example of a physical change and not a chemical change. The log is being chopped into smaller pieces, but is not changing the chemical composition of the log. The other choices are all examples of chemical changes. Chemical changes are frequently accompanied by physical changes, as the new matter will likely have different physical properties from the original matter.

Moderate

61. What is called a substance? Provide an example.
A sample of matter that has the same physical and chemical properties throughout is called a substance. Examples are carbon blocks, water etc.

Easy

62. What are elements? Compare elements with compounds.
An element is the simplest type of chemical substance. It cannot be broken down into simpler chemical substances by ordinary chemical means. Each element has its own unique set of physical and chemical properties. Examples of elements include iron, carbon, and gold. A compound is a combination of more than one element. The physical and chemical properties of a compound are different from the physical and chemical properties of its constituent elements.

Moderate

63. What are mixtures? Write the types of mixtures, and then give an example for each type.
Physical combinations of more than one substance are called mixtures. There are two types of mixtures. A heterogeneous mixture is a mixture composed of two or more substances (oil and water). It is easy to tell, sometimes by the naked eye, that more than one substance is present. A homogeneous mixture is a combination of two or more substances that is so intimately mixed that the mixture behaves as a single substance (salt water).

Moderate

64. What is a metal? How is it different from a nonmetal?
A metal is an element that is solid at room temperature, is shiny and silvery, conducts electricity and heat well, can be pounded into thin sheets, and can be drawn into thin wires. A nonmetal is an element that is brittle when solid, does not conduct electricity or heat very well, and cannot be made into thin sheets or wires. Nonmetals also exist in a variety of phases and colors at room temperature.

Easy

65. Explain the concepts of malleability and ductility.
Metals can be pounded into thin sheets. This property is called malleability.

Metals can be drawn into thin wires. This property is called ductility.

Easy

66. What is science? What is its importance?

Science is the process of knowing about the natural universe through observation and experiment. Science is not the only process of knowing, but it has evolved over more than 350 years into the best process that humanity has devised to date to learn about the universe around us.

Easy

67. What is a hypothesis? Provide an example.

An educated guess about how the natural universe works is called a hypothesis. 'If I mix one part of hydrogen with one part of oxygen, I can make a substance that contains both the elements.' This is made before an experiment.

Easy

68. What are experiments? Why are they used?

Experiments are tests of the natural universe to see if a hypothesis is correct. An experiment to test our previous hypothesis would be to actually mix hydrogen and oxygen and see what happens. Most experiments include observations of small, well-defined parts of the natural universe designed to see results of the experiments.

Moderate

69. What is a theory? Provide an example.

A theory is a general statement that explains a large number of observations. "All matter is composed of atoms" is a general statement, a theory, which explains many observations in chemistry.

Easy

70. Science can be either qualitative or quantitative. Explain with examples.

Qualitative implies a description of the quality of an object. For example, physical properties are generally qualitative descriptions: sulfur is yellow, your math book is heavy, or that statue is pretty. A quantitative description represents the specific amount of something; it means knowing how much of something is present, usually by counting or measuring it.

Moderate

Fill in the Blanks

71. _____ is the study of the interactions of matter with other matter and with energy.

Chemistry; Easy

72. Anything that has mass and takes up space can be called _____.

matter; Easy

73. A(n) _____ refers to a characteristic that describes matter as it exists.

Physical property; Easy

74. A(n) _____ refers to a change that occurs when a sample of matter changes one or more of its physical properties.

Physical change; Easy

75. A(n) _____ change is the process of demonstrating a chemical property.
Chemical; Easy
76. A(n) _____ refers to a substance that cannot be broken down into simpler chemical substances by ordinary chemical means.
element; Easy
77. A(n) _____ is a combination of more than one element and its physical and chemical properties are different from the physical and chemical properties of its constituent elements.
compound; easy
78. The constituents of a mixture that are clearly visible to the naked eye, is called a(n) _____.
heterogeneous mixture; Easy
79. A combination of two or more substances that is so intimately mixed that the mixture behaves as a single substance is called a(n) _____.
homogeneous mixture; Moderate
80. _____ is the process of knowing about the natural universe through observation and experiment.
Science; Easy
81. A(n) _____ refers to an educated guess about how the natural universe works.
Hypothesis; Easy
82. A(n) _____ refers to a test of the natural universe to see if a guess (hypothesis) is correct.
Experiment; Easy
83. A(n) _____ is a general statement that explains a large number of observations.
theory; Moderate
84. A(n) _____ refers to a specific statement that is thought to be never violated by the entire natural universe.
Law; Easy
85. A(n) _____ description represents the specific amount of something.
quantitative; Easy