***Introductory Chemistry, 2e* (Burdge)**

**Chapter 1 Atoms and Elements**

1) What is a unifying principle that explains a body of experimental observations?

A) law

B) hypothesis

C) theory

D) phenomena

E) prediction

Answer: C

Difficulty: 1 Easy

Topic: Study of Chemistry

Bloom's: 2. Understand

Subtopic: Scientific Method

Accessibility: Keyboard Navigation

Gradable: automatic

2) What is the term used for findings that are summarized based on a pattern or trend?

A) law

B) hypothesis

C) theory

D) phenomena

E) prediction

Answer: A

Difficulty: 1 Easy

Topic: Study of Chemistry

Bloom's: 2. Understand

Subtopic: Scientific Method

Accessibility: Keyboard Navigation

Gradable: automatic

3) Which of the following is an example of an *observation*?

A) Gases expand as their temperature increases because the gas molecules are moving more rapidly.

B) Paraffin wax begins to melt at 57°C.

C) Three samples of wax are heated to 75°C.

D) The force acting on an object is equal to its mass times its acceleration.

E) Will all waxes melt at the same temperature?

Answer: B

Difficulty: 1 Easy

Topic: Study of Chemistry

Bloom's: 2. Understand

Subtopic: Scientific Method; Properties of Matter

Accessibility: Keyboard Navigation

Gradable: automatic

4) When applying the scientific method, it is important to avoid any form of hypothesis.

Answer: FALSE

Difficulty: 1 Easy

Topic: Study of Chemistry

Bloom's: 3. Apply

Subtopic: Scientific Method

Accessibility: Keyboard Navigation

Gradable: automatic

5) Which of these scientists developed the nuclear model of the atom?

A) John Dalton

B) Robert Millikan

C) J. J. Thomson

D) Henry Moseley

E) Ernest Rutherford

Answer: E

Difficulty: 1 Easy

Topic: Components of Matter

Bloom's: 1. Remember

Subtopic: Structure of the Atom; Atomic Theories

Accessibility: Keyboard Navigation

Gradable: automatic

6) Rutherford's experiment with alpha particle scattering by gold foil established that

A) protons are not evenly distributed throughout an atom.

B) electrons have a negative charge.

C) electrons have a positive charge.

D) atoms are made of protons, neutrons, and electrons.

E) protons are 1840 times heavier than electrons.

Answer: A

Difficulty: 1 Easy

Topic: Components of Matter

Bloom's: 2. Understand

Subtopic: Structure of the Atom

Accessibility: Keyboard Navigation

Gradable: automatic

7) Who is credited with discovering the atomic nucleus?

A) Dalton

B) Gay-Lussac

C) Thomson

D) Chadwick

E) Rutherford

Answer: E

Difficulty: 1 Easy

Topic: Components of Matter

Bloom's: 1. Remember

Subtopic: Structure of the Atom; Atomic Theories

Accessibility: Keyboard Navigation

Gradable: automatic

8) Rutherford bombarded gold foil with alpha (α) particles and found that a small percentage of the particles were deflected. Which of the following was not accounted for by the model he proposed for the structure of the atom?

A) the small size of the nucleus

B) the charge on the nucleus

C) the total mass of the atom

D) the existence of protons

E) the presence of electrons outside the nucleus

Answer: C

Difficulty: 1 Easy

Topic: Components of Matter

Bloom's: 4. Analyze

Subtopic: Structure of the Atom; Atomic Theories

Accessibility: Keyboard Navigation

Gradable: automatic

9) Which one of the following statements about atoms and subatomic particles is correct?

A) Rutherford discovered the atomic nucleus by bombarding gold foil with electrons.

B) The proton and the neutron have identical masses.

C) The neutron's mass is equal to that of a proton plus an electron.

D) A neutral atom contains equal numbers of protons and electrons.

E) An atomic nucleus contains equal numbers of protons and neutrons.

Answer: D

Difficulty: 2 Medium

Topic: Components of Matter

Bloom's: 2. Understand

Subtopic: Structure of the Atom; Atomic Theories

Accessibility: Keyboard Navigation

Gradable: automatic

10) What is the term for the number of protons in the nucleus of each atom of an element? It also indicates the number of electrons in the atom.

A) isotope number

B) mass number

C) mass-to-charge ratio

D) atomic number

E) atomic mass units

Answer: D

Difficulty: 1 Easy

Topic: Components of Matter

Bloom's: 1. Remember

Subtopic: Structure of the Atom; Atomic Theories

Accessibility: Keyboard Navigation

Gradable: automatic

11) The mass of a neutron is equal to the mass of a proton plus the mass of an electron.

Answer: FALSE

Difficulty: 1 Easy

Topic: Components of Matter

Bloom's: 2. Understand

Subtopic: Structure of the Atom

Accessibility: Keyboard Navigation

Gradable: automatic

12) Almost all the mass of an atom is concentrated in the nucleus.

Answer: TRUE

Difficulty: 1 Easy

Topic: Components of Matter

Bloom's: 2. Understand

Subtopic: Structure of the Atom; Atomic Theories

Accessibility: Keyboard Navigation

Gradable: automatic

13) The elements in a column of the periodic table are known as

A) metalloids.

B) a period.

C) noble gases.

D) a group.

E) nonmetals.

Answer: D

Difficulty: 1 Easy

Topic: Components of Matter; Chemical Periodicity

Bloom's: 1. Remember

Subtopic: Elements and the Periodic Table; Periodic Classification of the Elements

Accessibility: Keyboard Navigation

Gradable: automatic

14) Which of the following is a nonmetal?

A) Lithium, Li, *Z* = 3

B) Bromine, Br, *Z* = 35

C) Mercury, Hg, *Z* = 80

D) Bismuth, Bi, *Z* = 83

E) Sodium, Na, *Z* = 11

Answer: B

Difficulty: 1 Easy

Topic: Components of Matter; Chemical Periodicity

Bloom's: 3. Apply

Subtopic: Elements and the Periodic Table; Periodic Classification of the Elements

Accessibility: Keyboard Navigation

Gradable: automatic

15) Which of the following is a metal?

A) Nitrogen, N, *Z* = 7

B) Phosphorus, P, *Z* = 15

C) Arsenic, As, Z = 33

D) Thallium, Tl, *Z* = 81

E) Silicon, Si, *Z* = 14

Answer: D

Difficulty: 1 Easy

Topic: Components of Matter; Chemical Periodicity

Bloom's: 3. Apply

Subtopic: Elements and the Periodic Table; Periodic Classification of the Elements

Accessibility: Keyboard Navigation

Gradable: automatic

16) Which of the following is a metalloid?

A) Carbon, C, *Z* = 6

B) Sulfur, S, *Z* = 16

C) Germanium, Ge, *Z* = 32

D) Iridium, Ir, Z = 77

E) Bromine, Br, *Z* = 35

Answer: C

Difficulty: 2 Medium

Topic: Components of Matter; Chemical Periodicity

Bloom's: 3. Apply

Subtopic: Elements and the Periodic Table; Periodic Classification of the Elements

Accessibility: Keyboard Navigation

Gradable: automatic

17) A row of the periodic table is called a(n)

A) group.

B) period.

C) isotopic mixture.

D) family.

E) subshell.

Answer: B

Difficulty: 1 Easy

Topic: Components of Matter; Chemical Periodicity

Bloom's: 1. Remember

Subtopic: Elements and the Periodic Table; Periodic Classification of the Elements

Accessibility: Keyboard Navigation

Gradable: automatic

18) In the periodic table, atoms are arranged in order of

A) increasing atomic mass.

B) increasing atomic number.

C) physical properties.

D) periodicity.

E) chemical reactivities.

Answer: B

Difficulty: 1 Easy

Topic: Components of Matter

Bloom's: 2. Understand

Subtopic: Elements and the Periodic Table; Atomic Number, Mass Number, Atomic Symbol, and Isotopes

Accessibility: Keyboard Navigation

Gradable: automatic

19) The elements in Group 7A are known by what name?

A) transition metals

B) halogens

C) alkali metals

D) alkaline earth metals

E) noble gases

Answer: B

Difficulty: 1 Easy

Topic: Components of Matter; Chemical Periodicity

Bloom's: 1. Remember

Subtopic: Elements and the Periodic Table; Periodic Classification of the Elements

Accessibility: Keyboard Navigation

Gradable: automatic

20) The elements in Group 2A are known by what name?

A) transition metals

B) halogens

C) alkali metals

D) alkaline earth metals

E) noble gases

Answer: D

Difficulty: 2 Medium

Topic: Components of Matter; Chemical Periodicity

Bloom's: 1. Remember

Subtopic: Elements and the Periodic Table; Periodic Classification of the Elements

Accessibility: Keyboard Navigation

Gradable: automatic

21) The alkali metal elements are found in \_\_\_\_\_\_\_\_ of the periodic table.

A) Group 1A

B) Group 2A

C) Group 3A

D) Period 7

E) Period 1

Answer: A

Difficulty: 2 Medium

Topic: Components of Matter; Chemical Periodicity

Bloom's: 1. Remember

Subtopic: Elements and the Periodic Table; Periodic Classification of the Elements

Accessibility: Keyboard Navigation

Gradable: automatic

22) Which element would be expected to have properties similar to calcium?

A) Ba

B) K

C) Sc

D) Na

E) Rb

Answer: A

Difficulty: 1 Easy

Topic: Components of Matter; Chemical Periodicity

Bloom's: 4. Analyze

Subtopic: Elements and the Periodic Table; Periodic Classification of the Elements

Accessibility: Keyboard Navigation

Gradable: automatic

23) Which element would be expected to have properties similar to argon?

A) F

B) Cl

C) H

D) Br

E) Kr

Answer: E

Difficulty: 1 Easy

Topic: Components of Matter; Chemical Periodicity

Bloom's: 4. Analyze

Subtopic: Elements and the Periodic Table; Periodic Classification of the Elements

Accessibility: Keyboard Navigation

Gradable: automatic

24) Which element would be expected to have properties similar to antimony?

A) Se

B) Sn

C) P

D) As

E) Pb

Answer: D

Difficulty: 2 Medium

Topic: Components of Matter; Chemical Periodicity

Bloom's: 4. Analyze

Subtopic: Elements and the Periodic Table; Periodic Classification of the Elements

Accessibility: Keyboard Navigation

Gradable: automatic

25) What elements and groups have properties that are most similar to those of chlorine?

A) F, Br, I, and nonmetals in Group 7A

B) Cl, K, C, and metals in Group 1B

C) N, P, As, and lanthanides

D) He, Ne, Xe, and nonmetals in Group 7A

E) O, S, and P

Answer: A

Difficulty: 2 Medium

Topic: Components of Matter; Chemical Periodicity

Bloom's: 4. Analyze

Subtopic: Elements and the Periodic Table; Periodic Classification of the Elements

Accessibility: Keyboard Navigation

Gradable: automatic

26) Which of these elements exhibits chemical behavior similar to that of potassium?

A) Magnesium

B) Sodium

C) Sulfur

D) Chlorine

E) Iron

Answer: B

Difficulty: 1 Easy

Topic: Components of Matter; Chemical Periodicity

Bloom's: 4. Analyze

Subtopic: Elements and the Periodic Table; Periodic Classification of the Elements

Accessibility: Keyboard Navigation

Gradable: automatic

27) Which of these elements exhibits chemical behavior similar to that of oxygen?

A) Magnesium

B) Sodium

C) Sulfur

D) Chlorine

E) Iron

Answer: C

Difficulty: 1 Easy

Topic: Components of Matter; Chemical Periodicity

Bloom's: 4. Analyze

Subtopic: Elements and the Periodic Table; Periodic Classification of the Elements

Accessibility: Keyboard Navigation

Gradable: automatic

28) Which of these elements exhibits chemical behavior similar to that of silver?

A) Nickel

B) Gold

C) Sulfur

D) Chlorine

E) Iron

Answer: B

Difficulty: 1 Easy

Topic: Components of Matter; Chemical Periodicity

Bloom's: 4. Analyze

Subtopic: Elements and the Periodic Table; Periodic Classification of the Elements

Accessibility: Keyboard Navigation

Gradable: automatic

29) In what groups are transition metals located?

A) 1A, 7A, and 1B

B) 2A, 4A, and 7A

C) 1B through 8B

D) 2B and 3B through 6B

E) 3A through 6A

Answer: C

Difficulty: 2 Medium

Topic: Components of Matter; Chemical Periodicity

Bloom's: 4. Analyze

Subtopic: Elements and the Periodic Table; Periodic Classification of the Elements

Accessibility: Keyboard Navigation

Gradable: automatic

30) Which one of these elements is a transition element?

A) Sr

B) Pb

C) As

D) Fe

E) H

Answer: D

Difficulty: 1 Easy

Topic: Components of Matter; Chemical Periodicity

Bloom's: 4. Analyze

Subtopic: Elements and the Periodic Table; Periodic Classification of the Elements

Accessibility: Keyboard Navigation

Gradable: automatic

31) Which one of these elements is a transition element?

A) Nickel

B) Tin

C) Sodium

D) Sulfur

E) Calcium

Answer: A

Difficulty: 1 Easy

Topic: Components of Matter; Chemical Periodicity

Bloom's: 4. Analyze

Subtopic: Elements and the Periodic Table; Periodic Classification of the Elements

Accessibility: Keyboard Navigation

Gradable: automatic

32) Copper (Cu) is a transition metal.

Answer: TRUE

Difficulty: 1 Easy

Topic: Components of Matter; Chemical Periodicity

Bloom's: 2. Understand

Subtopic: Elements and the Periodic Table; Periodic Classification of the Elements

Accessibility: Keyboard Navigation

Gradable: automatic

33) Lead (Pb) is a main group element.

Answer: TRUE

Difficulty: 1 Easy

Topic: Components of Matter; Chemical Periodicity

Bloom's: 2. Understand

Subtopic: Elements and the Periodic Table; Periodic Classification of the Elements

Accessibility: Keyboard Navigation

Gradable: automatic

34) Which of these elements is chemically similar to magnesium?

A) Sulfur

B) Calcium

C) Iron

D) Nickel

E) Potassium

Answer: B

Difficulty: 2 Medium

Topic: Components of Matter

Bloom's: 5. Evaluate

Subtopic: Elements and the Periodic Table; Periodic Classification of the Elements

Accessibility: Keyboard Navigation

Gradable: automatic

35) Which of these elements is chemically similar to oxygen?

A) Sulfur

B) Calcium

C) Iron

D) Nickel

E) Potassium

Answer: A

Difficulty: 2 Medium

Topic: Components of Matter

Bloom's: 5. Evaluate

Subtopic: Elements and the Periodic Table; Periodic Classification of the Elements

Accessibility: Keyboard Navigation

Gradable: automatic

36) Which of these elements is chemically similar to potassium?

A) Calcium

B) Arsenic

C) Phosphorus

D) Cerium

E) Cesium

Answer: E

Difficulty: 2 Medium

Topic: Components of Matter

Bloom's: 5. Evaluate

Subtopic: Elements and the Periodic Table; Periodic Classification of the Elements

Accessibility: Keyboard Navigation

Gradable: automatic

37) What element is represented by X in the atomic symbol notation  ?

A) Iridium

B) Platinum

C) Palladium

D) Selenium

E) Magnesium

Answer: B

Difficulty: 2 Medium

Topic: Components of Matter

Bloom's: 4. Analyze

Subtopic: Elements and the Periodic Table; Atomic Number, Mass Number, Atomic Symbol, and Isotopes

Gradable: automatic

38) Determine the number of electrons and identify the correct symbol for an atom with 17 protons and 18 neutrons.

A) 17 electrons, 

B) 18 electrons, 

C) 17 electrons, 

D) 17 electrons, 

E) 18 electrons, 

Answer: A

Difficulty: 1 Easy

Topic: Components of Matter

Bloom's: 4. Analyze

Subtopic: Structure of the Atom; Atomic Number, Mass Number, Atomic Symbol, and Isotopes

Gradable: automatic

39) Determine the number of protons, electrons, and neutrons for the isotope gold-197. The symbol for gold is Au.

A) 118 protons, 118 electrons, 79 neutrons

B) 79 protons, 79 electrons, 118 neutrons

C) 79 protons, 79 electrons, 39 neutrons

D) 118 protons, 118 electrons, 39 neutrons

E) 79 protons, 39 electrons, 118 neutrons

Answer: B

Difficulty: 2 Medium

Topic: Components of Matter

Bloom's: 4. Analyze

Subtopic: Structure of the Atom; Atomic Number, Mass Number, Atomic Symbol, and Isotopes

Accessibility: Keyboard Navigation

Gradable: automatic

40) Determine the number of protons and identify the correct symbol for an atom with 20 neutrons and 20 electrons.

A) 20 protons, 

B) 20 protons, 

C) 20 protons, 

D) 40 protons, 

E) 40 protons, 

Answer: B

Difficulty: 1 Easy

Topic: Components of Matter

Bloom's: 4. Analyze

Subtopic: Structure of the Atom; Atomic Number, Mass Number, Atomic Symbol, and Isotopes

Gradable: automatic

41) C(graphite) and C(diamond) are examples of

A) isotopes of carbon.

B) allotropes of carbon.

C) the law of definite proportions.

D) different carbon ions.

Answer: B

Difficulty: 1 Easy

Topic: Components of Matter

Bloom's: 3. Apply

Subtopic: Molecules and Ions

Accessibility: Keyboard Navigation

Gradable: automatic

42) Bromine is the only nonmetal that is a liquid at room temperature. Consider the isotope bromine-81, . Select the combination which lists the correct atomic number, number of neutrons, and mass number, respectively.

A) 35, 46, 81

B) 35, 81, 46

C) 81, 46, 35

D) 46, 81, 35

E) 35, 81, 116

Answer: A

Difficulty: 2 Medium

Topic: Components of Matter

Bloom's: 3. Apply

Subtopic: Elements and the Periodic Table; Atomic Number, Mass Number, Atomic Symbol, and Isotopes

Gradable: automatic

43) Atoms X, Y, Z, and R have the following nuclear compositions:

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
|   **I**  |  **II**  | **III**  | **IV**  |

Which of the following are isotopes of the same element?

A) I and II

B) I and IV

C) II and IV

D) III and IV

E) I and III

Answer: E

Difficulty: 2 Medium

Topic: Components of Matter

Bloom's: 5. Evaluate

Subtopic: Atomic Number, Mass Number, Atomic Symbol, and Isotopes

Gradable: automatic

44) Which isotope is *not* possible?

A) 

B) 

C) 

D) 

E) All of these isotopes are possible.

Answer: D

Difficulty: 3 Hard

Topic: Components of Matter

Bloom's: 5. Evaluate

Subtopic: Atomic Number, Mass Number, Atomic Symbol, and Isotopes

Gradable: automatic

45) Atoms of the same element with different mass numbers are called

A) Ions.

B) Neutrons.

C) chemical groups.

D) chemical families.

E) Isotopes.

Answer: E

Difficulty: 1 Easy

Topic: Components of Matter

Bloom's: 2. Understand

Subtopic: Structure of the Atom; Atomic Number, Mass Number, Atomic Symbol, and Isotopes

Accessibility: Keyboard Navigation

Gradable: automatic

46) How many neutrons are there in an atom of lead whose mass number is 208?

A) 82

B) 126

C) 208

D) 290

E) None of the answers is correct.

Answer: B

Difficulty: 2 Medium

Topic: Components of Matter

Bloom's: 3. Apply

Subtopic: Structure of the Atom; Atomic Number, Mass Number, Atomic Symbol, and Isotopes

Accessibility: Keyboard Navigation

Gradable: automatic

47) An atom of the isotope sulfur-31 consists of how many protons, neutrons, and electrons? (p = proton, n = neutron, e = electron)

A) 15 p, 16 n, 15 e

B) 16 p, 15 n, 16 e

C) 16 p, 31 n, 16 e

D) 32 p, 31 n, 32 e

E) 16 p, 16 n, 15 e

Answer: B

Difficulty: 2 Medium

Topic: Components of Matter

Bloom's: 3. Apply

Subtopic: Structure of the Atom; Atomic Number, Mass Number, Atomic Symbol, and Isotopes

Accessibility: Keyboard Navigation

Gradable: automatic

48) Give the number of protons (p), electrons (e), and neutrons (n) in one atom of chlorine-37.

A) 37 p, 37 e, 17 n

B) 17 p, 17 e, 37 n

C) 17 p, 17 e, 20 n

D) 37 p, 17 e, 20 n

E) 17 p, 37 e, 17 n

Answer: C

Difficulty: 2 Medium

Topic: Components of Matter

Bloom's: 3. Apply

Subtopic: Structure of the Atom; Atomic Number, Mass Number, Atomic Symbol, and Isotopes

Accessibility: Keyboard Navigation

Gradable: automatic

49) Two isotopes of an element differ only in their

A) symbol.

B) atomic number.

C) atomic mass.

D) number of protons.

E) number of electrons.

Answer: C

Difficulty: 1 Easy

Topic: Components of Matter

Bloom's: 3. Apply

Subtopic: Structure of the Atom; Atomic Number, Mass Number, Atomic Symbol, and Isotopes

Accessibility: Keyboard Navigation

Gradable: automatic

50) Silicon, which makes up about 25% of Earth's crust by mass, is used widely in the modern electronics industry. It has three naturally occurring isotopes, 28Si, 29Si, and 30Si. Calculate the atomic mass of silicon.

|  |  |  |
| --- | --- | --- |
| Isotope | Isotopic Mass (amu) | Abudance % |
| 28Si    | 27.976927          | 92.22      |
| 29Si    | 28.976495          | 4.69      |
| 30Si    | 29.973770          | 3.09      |

A) 29.2252 amu

B) 28.9757 amu

C) 28.7260 amu

D) 28.0855 amu

E) 27.9801 amu

Answer: D

Difficulty: 2 Medium

Topic: Components of Matter

Bloom's: 3. Apply

Subtopic: Elements and the Periodic Table; Atomic Number, Mass Number, Atomic Symbol, and Isotopes

Accessibility: Keyboard Navigation

Gradable: automatic

51) Lithium forms compounds which are used in dry cells, storage batteries, and in high-temperature lubricants. It has two naturally occurring isotopes, 6Li (isotopic mass = 6.015123 amu) and 7Li (isotopic mass = 7.016005 amu). Lithium has an atomic mass of 6.9412 amu. What is the percent abundance of lithium-6?

A) 92.53%

B) 86.65%

C) 49.47%

D) 7.47%

E) 6.015%

Answer: D

Difficulty: 3 Hard

Topic: Components of Matter

Bloom's: 3. Apply

Subtopic: Elements and the Periodic Table; Atomic Number, Mass Number, Atomic Symbol, and Isotopes

Accessibility: Keyboard Navigation

Gradable: automatic