General, Organic, and Biological Chemistry, 4e **(Timberlake)**
Chapter 3 Atoms and Elements

3.1 Multiple-Choice Questions

1) The primary substances of which all other things are composed are
A) molecules.
B) compounds.
C) elements.
D) electrons.
E) protons.
Answer: C
Objective: 3.1
Global Outcomes: GO7

2) Au is the symbol for
A) gold.
B) silver.
C) argon.
D) aluminum.
E) sodium.
Answer: A
Objective: 3.1
Global Outcomes: GO2

Select the correct symbol for the element.

3) aluminum
A) Al
B) Am
C) Au
D) Sn
E) Ag
Answer: A
Objective: 3.1
Global Outcomes: GO7

4) iron
A) Ir
B) Fs
C) Fe
D) In
E) FE
Answer: C
Objective: 3.1
Global Outcomes: GO7

5) sodium
A) So
B) Na
C) No
D) Sm
E) Au
Answer: B
Objective: 3.1
Global Outcomes: GO7

6) potassium
A) P
B) Po
C) Pt
D) K
E) Ko
Answer: D
Objective: 3.1
Global Outcomes: GO7

7) silver
A) S
B) Si
C) Ag
D) Au
E) AG
Answer: C
Objective: 3.1
Global Outcomes: GO7

8) Ca is the symbol for
A) calcium.
B) carbon.
C) cobalt.
D) copper.
E) cadmium.
Answer: A
Objective: 3.1
Global Outcomes: GO7

9) What elements are in hydroxyapatite, $Ca_5(PO_4)_3OH$, a major compound in human bones and teeth?
A) carbon, potassium, oxygen, hydrogen
B) calcium, phosphorus, oxygen, hydrogen
C) carbon, phosphorus, oxygen, helium
D) calcium, phosphorus, oxygen, helium
E) carbon, potassium, oxygen, helium
Answer: B
Objective: 3.1
Global Outcomes: GO2

10) Which of the following is a characteristic of the modern periodic table?
A) A group is a horizontal row on the periodic table.
B) A period is a column on the periodic table.
C) The elements in each group have similar chemical properties.
D) The B groups contain the representative elements.
E) The A groups contain the transition elements.
Answer: C
Objective: 3.2
Global Outcomes: GO2

11) Which of the following properties is NOT a characteristic of the Group 1A(1) elements (alkali metals)?
A) They are shiny.
B) They are good conductors of heat.
C) They react vigorously with water.
D) Most of them are liquids at room temperature.
E) They are good conductors of electricity.
Answer: D
Objective: 3.2
Global Outcomes: GO2

12) The Group 8A(18) elements
A) are unreactive and are rarely found in combination with other elements.
B) are good conductors of electricity.
C) melt at high temperatures.
D) are liquids at room temperature.
E) react vigorously with water.
Answer: A
Objective: 3.2
Global Outcomes: GO2

13) Which of the following elements is a metal?
A) nitrogen
B) fluorine
C) argon
D) strontium
E) phosphorus
Answer: D
Objective: 3.2
Global Outcomes: GO7

14) Which of the following is a characteristic of nonmetals?
A) shiny
B) malleable
C) good conductors of heat
D) low melting points
E) good conductors of electricity
Answer: D
Objective: 3.2
Global Outcomes: GO7

15) Which of the following elements is a nonmetal?
A) nitrogen
B) sodium
C) iron
D) silver
E) calcium
Answer: A
Objective: 3.2
Global Outcomes: GO7

16) Which of the following elements is a noble gas?
A) oxygen
B) chlorine
C) bromine
D) argon
E) nitrogen
Answer: D
Objective: 3.2
Global Outcomes: GO7

17) Which element would have physical and chemical properties similar to chlorine?
A) Ar
B) Br
C) S
D) O
E) P
Answer: B
Objective: 3.2
Global Outcomes: GO2

18) What is the symbol of the element in Group 4A(14) and Period 2?
A) Be
B) Mg
C) Ca
D) C
E) Si
Answer: D
Objective: 3.2
Global Outcomes: GO2

19) What is the symbol of the element in Period 4 and Group 2?
A) Be
B) Mg
C) Ca
D) C
E) Si
Answer: C
Objective: 3.2
Global Outcomes: GO2

20) Identify the noble gas in the following list.
A) helium
B) nitrogen
C) oxygen
D) gold
E) chlorine
Answer: A
Objective: 3.2
Global Outcomes: GO2

21) Identify the metalloid in the following list.
A) sulfur
B) fluorine
C) silver
D) copper
E) germanium
Answer: E
Objective: 3.2
Global Outcomes: GO2

22) Semiconductors are located in the periodic table on (or in) the
A) left side of the table.
B) right side of the table.
C) line dividing metals from nonmetals in the table.
D) first period of the table.
E) last period of the table.
Answer: C
Objective: 3.2
Global Outcomes: GO2

23) The element in this list with chemical properties similar to magnesium is
A) sodium.
B) boron.
C) carbon.
D) strontium.
E) chlorine.
Answer: D
Objective: 3.2
Global Outcomes: GO2

24) The smallest particle of an element that retains the characteristics of the element is a(n)
A) electron.
B) neutron.
C) proton.
D) atom.
E) nucleus.
Answer: D
Objective: 3.3
Global Outcomes: GO2

25) According to the Atomic Theory,
A) all atoms are different.
B) atoms are neither created nor destroyed during a chemical reaction.
C) atoms of the same element combine to form compounds.
D) all matter is made up of tiny particles called electrons.
E) a compound can contain different numbers of atoms as long as it has the same kinds of atoms.
Answer: B
Objective: 3.3
Global Outcomes: GO2

26) Which of the following descriptions of a subatomic particle is correct?
A) A proton has a positive charge and a mass of approximately 1 amu.
B) An electron has a negative charge and a mass of approximately 1 amu.
C) A neutron has no charge and its mass is negligible.
D) A proton has a positive charge and a negligible mass.
E) A neutron has a positive charge and a mass of approximately 1 amu.
Answer: A
Objective: 3.3
Global Outcomes: GO2

27) In an atom, the nucleus contains
A) an equal number of protons and electrons.
B) all the protons and neutrons.
C) all the protons and electrons.
D) only neutrons.
E) only protons.
Answer: B
Objective: 3.3
Global Outcomes: GO2

28) The atomic number of an atom is equal to the number of
A) nuclei.
B) neutrons.
C) neutrons plus protons.
D) electrons plus protons.
E) protons.
Answer: E
Objective: 3.4
Global Outcomes: GO7

29) The number of neutrons in an atom is equal to
A) the atomic number.
B) the mass number.
C) the mass number + the atomic number.
D) the mass number - the atomic number.
E) the number of protons.
Answer: D
Objective: 3.4
Global Outcomes: GO7

30) The mass number of an atom can be calculated from
A) the number of electrons.
B) the number of protons plus neutrons.
C) the number of protons.
D) the number of electrons plus protons.
E) the number of neutrons.
Answer: B
Objective: 3.4
Global Outcomes: GO7

31) What is the mass number of an atom of potassium that has 20 neutrons?
A) 15
B) 19
C) 35
D) 39
E) 59
Answer: D
Objective: 3.4
Global Outcomes: GO4

32) Consider a neutral atom with 30 protons and 34 neutrons. The atomic number of the element is
A) 30.
B) 32.
C) 34.
D) 64.
E) 94.
Answer: A
Objective: 3.4
Global Outcomes: GO3

33) Consider a neutral atom with 30 protons and 34 neutrons. The mass number for this atom is
A) 30.
B) 32.
C) 34.
D) 64.
E) 94.
Answer: D
Objective: 3.4
Global Outcomes: GO4

34) Consider a neutral atom with 30 protons and 34 neutrons. The number of electrons in this atom is
A) 30.
B) 32.
C) 34.
D) 64.
E) 94.
Answer: A
Objective: 3.4
Global Outcomes: GO4

35) How many protons are in an isotope of sodium with a mass number of 25?
A) 11
B) 14
C) 15
D) 25
E) 32
Answer: A
Objective: 3.4
Global Outcomes: GO4

36) Consider an isotope of sodium with a mass number of 25. The number of neutrons in this isotope of sodium is
A) 11.
B) 14.
C) 16.
D) 25.
E) 32.
Answer: B
Objective: 3.4
Global Outcomes: GO4

37) Which of the following gives the correct numbers of protons, neutrons, and electrons in a neutral atom of $^{118}_{50}\text{Sn}$?

A) 118 protons, 50 neutrons, 118 electrons
B) 118 protons, 118 neutrons, 50 electrons
C) 50 protons, 68 neutrons, 50 electrons
D) 68 protons, 68 neutrons, 50 electrons
E) 50 protons, 50 neutrons, 50 electrons
Answer: C
Objective: 3.5
Global Outcomes: GO2

38) Isotopes are atoms of the same element that have
A) different atomic numbers.
B) the same atomic numbers but different numbers of protons.
C) the same atomic numbers but different numbers of electrons.
D) the same atomic number but different numbers of neutrons.
E) the same atomic mass but different numbers of protons.
Answer: D
Objective: 3.5
Global Outcomes: GO7

39) The correct symbol for the isotope of potassium with 22 neutrons is
A) $^{41}_{19}\text{K}$.

B) $^{19}_{41}\text{K}$.

C) $^{37}_{15}\text{P}$.

D) $^{15}_{37}\text{P}$.

E) $^{22}_{19}\text{K}$.

Answer: A
Objective: 3.5
Global Outcomes: GO2

40) Given the following: $^{41}_{19}X$, $^{39}_{19}X$, $^{41}_{20}X$, and $^{39}_{18}X$. Which are isotopes of each other?

A) $^{41}_{19}X$ and $^{41}_{20}X$ are isotopes of each other; and $^{39}_{19}X$ and $^{39}_{18}X$ are isotopes of each other.

B) $^{41}_{19}X$ and $^{39}_{19}X$ are isotopes of each other.

C) $^{41}_{19}X$, $^{39}_{19}X$, $^{41}_{20}X$, and $^{39}_{18}X$ are isotopes of each other.

D) None are isotopes of each other.
Answer: B
Objective: 3.5
Global Outcomes: GO2

41) The atomic mass of an element is equal to
A) its mass number.
B) its atomic number.
C) one-twelfth of the mass of a carbon-12 atom.
D) a weighted average mass of all of the naturally occurring isotopes of the element.
E) the average mass of all of the naturally occurring isotopes of the element.
Answer: D
Objective: 3.5
Global Outcomes: GO7

42) A sample of chlorine has two naturally occurring isotopes. The isotope Cl-35 (mass 35.0 amu) makes up 75.8% of the sample, and the isotope Cl-37 (mass = 37.0 amu) makes up 24.3% of the sample. What is the average atomic mass for chlorine?
A) 36.0 amu
B) 35 amu
C) 36.6 amu
D) 35.5 amu
E) 35.521 amu
Answer: D
Objective: 3.5
Global Outcomes: GO4

43) A sample of silicon has three naturally occurring isotopes: Si-28 (mass 28.0 amu); Si-29 (mass 29.0 amu) and Si-30 (mass = 30.0 amu). If the average atomic mass of silicon is 28.1 amu, which isotope is the most abundant?
A) Si-28
B) Si-29
C) Si-30
D) All isotopes have the same natural abundance.
Answer: A
Objective: 3.5
Global Outcomes: GO4

44) Which of the following is NOT true for the atoms ^{13}N, ^{14}N, and ^{15}N?
A) They all have the same mass number.
B) They are isotopes.
C) They all have the same atomic number.
D) They all have 7 protons.
E) They all have 7 electrons.
Answer: A
Objective: 3.5
Global Outcomes: GO2

45) The elements lithium, sodium, and potassium
A) are isotopes of each other.
B) are in the same period of elements.
C) have the same number of neutrons.
D) are in the same group.
E) have the same mass number.
Answer: D
Objective: 3.2, 3.5
Global Outcomes: GO7

46) The elements sodium, magnesium, and silicon
A) are isotopes of each other.
B) are in the same period of elements.
C) have the same number of neutrons.
D) are in the same group.
E) have the same mass number.
Answer: B
Objective: 3.2, 3.5
Global Outcomes: GO7

47) The electron arrangement of any particular atom shows
A) the number of isotopes possible.
B) a description of the shape of each energy level.
C) the number of electrons in each energy level.
D) a diagram of an atomic nucleus.
E) the maximum number of electrons each energy level can hold.
Answer: C
Objective: 3.6
Global Outcomes: GO7

48) The number of electron levels in a magnesium atom is
A) 1.
B) 2.
C) 3.
D) 4.
E) 5.
Answer: C
Objective: 3.6
Global Outcomes: GO2

49) The maximum number of electrons that may occupy the third energy level is
A) 2.
B) 8.
C) 10.
D) 18.
E) 32.
Answer: D
Objective: 3.6
Global Outcomes: GO4

50) What is the element with the electron configuration $1s^2 2s^2 2p^6 3s^2 {}_3p^5$?
A) Be
B) Cl
C) F
D) S
E) Ar
Answer: B
Objective: 3.7
Global Outcomes: GO2

51) What is the electron configuration for aluminum?
A) 1 $s^2 2s^2 2\ p^6 3s^2 3p^1$
B) 1 $s^2 2s^2 2p^6 3s^2 3p^3$
C) 1 $s^2 2s^2 2p^6 3s^2 3p^5$
D) 1 $s^2 2s^2 2p^6 3s^2 3p^6$
E) 1 $s^2 2\ ^2 2p^6 3s^2 3p^8$
Answer: A
Objective: 3.7
Global Outcomes: GO2

52) Which of the following electron configurations is impossible?
A) $1s^2 2s^2 2p^6 3s^2 3p^1$
B) $1s^2 2\ s^4 2p^6 3s^2 3p^3$
C) $1s^2 2s^2 2p^6 3s^2 3\ p^5$
D) $1s^2 2s^2 2p^6 3s^2 3p^6$
E) $1s^2 2s^2 2p^6 3s^2 3p^3$
Answer: B
Objective: 3.7
Global Outcomes: GO2

53) What is the electron configuration for potassium (atomic number 19)?
A) $1s^2 2s^2 2p^6 3s^2 3p^7$
B) $1s^2 2s^2 2p^6 3s^2 3p^5 3d^2$
C) $1s^2 2s^2 2p^8 3s^2 3p^5$
D) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$
E) $1s^2 2s^2 2p^6 3s^2 3p^5 4s^1$
Answer: D
Objective: 3.7
Global Outcomes: GO2

54) What element has the electron configuration $1s^2 2s^2 2p^6 3s^2 3p^2$?
A) carbon
B) oxygen
C) sulfur
D) iron
E) silicon
Answer: E
Objective: 3.7
Global Outcomes: GO2

55) The number of electrons in the outer energy level of a neutral atom of boron (atomic number 5) is
A) 2.
B) 3.
C) 5.
D) 8.
E) 10.
Answer: B
Objective: 3.7
Global Outcomes: GO2

56) What is the correct electron configuration for the lithium atom?
A) $1s^3$
B) $2s^1$
C) $1s^1 2s^2$
D) $1s^2 2s^1$
E) $1s^2 2s^5$
Answer: D
Objective: 3.7
Global Outcomes: GO2

57) What is the abbreviated electron configuration for nickel (atomic number 28)?
A) $[He]2s^2 2p^3$
B) $[Ar]4s^2 3d^8$
C) $[Kr]4s^2 3d^8$
D) $[Ar]4s^2 4p^4$
E) $[Ar]3d^8$
Answer: B
Objective: 3.7
Global Outcomes: GO2

58) What is the element with the abbreviated electron configuration $[Kr]5s^2 4d^8$?
A) Ni
B) Pd
C) Pt
D) Kr
E) Xe
Answer: B
Objective: 3.7
Global Outcomes: GO2

59) The number of valence electrons found in an atom of a Group A element is equal to
A) its atomic number.
B) its mass number.
C) its group number.
D) eight.
E) eight minus the group number.
Answer: C
Objective: 3.8
Global Outcomes: GO2

60) Valence electrons are electrons located
A) in the outermost energy level of an atom.
B) in the nucleus of an atom.
C) in the innermost energy level of an atom.
D) throughout the atom.
E) in the first three shells of an atom.
Answer: A
Objective: 3.8
Global Outcomes: GO2

61) In an electron-dot structure of an element, the dots are used to represent
A) all of the electrons in the atom.
B) the valence electrons.
C) the electron arrangement.
D) only the electrons that will participate in bond formation.
E) the electrons that the element will gain when it forms a compound.
Answer: B
Objective: 3.8
Global Outcomes: GO7

62) How many valence electrons are in the electron-dot structures for the elements in group 3A(13)?
A) 1
B) 2
C) 3
D) 4
E) 6
Answer: C
Objective: 3.8
Global Outcomes: GO4

63) The number of dots in the electron dot structure of nitrogen is
A) one.
B) two.
C) three.
D) four.
E) five.
Answer: E
Objective: 3.8
Global Outcomes: GO4

64) The number of dots in the electron dot structure of carbon is
A) one.
B) two.
C) three.
D) four.
E) five.
Answer: D
Objective: 3.8
Global Outcomes: GO4

65) Which of the following is the correct electron-dot structure for carbon?
A) 

B) 

C) 

D) 

E) 

Answer: C
Objective: 3.8
Global Outcomes: GO2

66) The atomic size of atoms
A) increases going across a period.
B) decreases going across a period.
C) decreases going down within a group.
D) does not change going across a period.
E) None of the above.
Answer: B
Objective: 3.8
Global Outcomes: GO7

67) The ionization energy of atoms
A) decreases going across a period.
B) decreases going down within a group.
C) increases going down within a group.
D) does not change going down within a group.
E) None of the above.
Answer: B
Objective: 3.8
Global Outcomes: GO7

68) Of the elements: B, C, F, Li, and Na., the element with the largest atomic radius is
A) B.
B) C.
C) F.
D) Li.
E) Na.
Answer: E
Objective: 3.8
Global Outcomes: GO2

69) Of the elements: B, C, F, Li, and Na, the element with the smallest atomic radius is
A) B.
B) C.
C) F.
D) Li.
E) Na.
Answer: C
Objective: 3.8
Global Outcomes: GO2

70) Of the elements: B, C, F, Li, and Na. The element with the highest ionization energy is
A) B.
B) C.
C) F.
D) Li.
E) Na.
Answer: C
Objective: 3.8
Global Outcomes: GO2

71) Ionization energy is
A) the energy an ion acquires from an electron.
B) the energy needed to remove the least tightly bound electron.
C) highest for metals in Group 1A (1).
D) higher for potassium than for lithium.
E) None of the above.
Answer: B
Objective: 3.8
Global Outcomes: GO2

72) Of the elements: B, C, F, Li, and Na. The element with the smallest ionization energy is
A) B.
B) C.
C) F.
D) Li.
E) Na.
Answer: E
Objective: 3.8
Global Outcomes: GO7

73) Of the elements: B, C, F, Li, and Na. The element with the most metallic character is
A) B.
B) C.
C) F.
D) Li.
E) Na.
Answer: E
Objective: 3.8
Global Outcomes: GO7

74) Of the elements: B, C, F, Li, and Na. The element with the least metallic character is
A) B.
B) C.
C) F.
D) Li.
E) Na.
Answer: C
Objective: 3.8
Global Outcomes: GO6

3.2 Short Answer Questions

Write in the electronic configuration for the atom shown.

1) Sodium
Answer: $1s^2 2s^2 2p^6 3s^1$
Objective: 3.7
Global Outcomes: GO7

2) Chlorine
Answer: $1s^2 2s^2 2p^6 3s^2 3p^5$
Objective: 3.7
Global Outcomes: GO7

3) Argon
Answer: $1s^2 2s^2 2p^6 3s^2 3p^6$
Objective: 3.7
Global Outcomes: GO7

4) Sulfur
Answer: $1s^2 2s^2 2p^6 3s^2 3p^4$
Objective: 3.7
Global Outcomes: GO7

5) Magnesium
Answer: $1s^2 2s^2 2p^6 3s^2$
Objective: 3.7
Global Outcomes: GO7

6) Phosphorus
Answer: $1s^2 2s^2 2p^6 3s^2 3p^3$
Objective: 3.7
Global Outcomes: GO7

3.3 True/False Questions

1) The symbol for potassium is P.
Answer: FALSE
Objective: 3.1
Global Outcomes: GO2

2) The symbol for gold is Au.
Answer: TRUE
Objective: 3.1
Global Outcomes: GO2

3) Sulfur is a nonmetal.
Answer: TRUE
Objective: 3.2
Global Outcomes: GO2

4) Chromium is a metal.
Answer: TRUE
Objective: 3.2
Global Outcomes: GO2

5) Radon is a metal.
Answer: FALSE
Objective: 3.2
Global Outcomes: GO2

6) Mercury is a metal.
Answer: TRUE
Objective: 3.2
Global Outcomes: GO3

7) Iodine is a metal.
Answer: FALSE
Objective: 3.2
Global Outcomes: GO2

8) An electron has a positive charge.
Answer: FALSE
Objective: 3.3
Global Outcomes: GO2

9) Protons and neutrons are located in the nucleus of an atom.
Answer: TRUE
Objective: 3.3
Global Outcomes: GO2

10) Sulfur has 16 valence electrons.
Answer: FALSE
Objective: 3.4
Global Outcomes: GO2

11) Isotopes have the same atomic number but different mass numbers.
Answer: TRUE
Objective: 3.5
Global Outcomes: GO2

12) Potassium has one valence electron.
Answer: TRUE
Objective: 3.6
Global Outcomes: GO2

13) The electron configuration of potassium is $1s^2 2s^2 2 p^6 3s^1$.
Answer: FALSE
Objective: 3.7
Global Outcomes: GO2

14) A lithium atom is larger than a potassium atom.
Answer: FALSE
Objective: 3.8
Global Outcomes: GO2

15) A sodium atom is larger than a silicon atom.
Answer: TRUE
Objective: 3.8
Global Outcomes: GO2

16) Chlorine has a higher ionization energy than aluminum.
Answer: TRUE
Objective: 3.8
Global Outcomes: GO2

17) Chlorine has a higher ionization energy than fluorine.
Answer: FALSE
Objective: 3.8
Global Outcomes: GO2

18) Ionization energy increases going down a group.
Answer: FALSE
Objective: 3.8
Global Outcomes: GO2

19) Atomic size decreases going from left to right within a period.
Answer: TRUE
Objective: 3.8
Global Outcomes: GO2

20) Chlorine has more metallic character than fluorine.
Answer: TRUE
Objective: 3.8
Global Outcomes: GO2

3.4 Matching Questions

Do the following represent elements in a group, a period, or neither?

A) period
B) neither
C) group

1) Li, C, F
Objective: 3.2
Global Outcomes: GO2

2) F, S, P
Objective: 3.2

3) O, S, Se
Objective: 3.2
Global Outcomes: GO2

4) He, H, I
Objective: 3.2
Global Outcomes: GO2

Answers: 1) A 2) B 3) C 4) B

Match the correct symbols with the names of elements.

A) C
B) Co
C) Cu
D) Cl
E) Ca

5) calcium
Objective: 3.1
Global Outcomes: GO2

6) copper
Objective: 3.1
Global Outcomes: GO2

7) carbon
Objective: 3.1
Global Outcomes: GO2

8) chlorine
Objective: 3.1
Global Outcomes: GO2

9) cobalt
Objective: 3.1
Global Outcomes: GO2

Answers: 5) E 6) C 7) A 8) D 9) B

Give the correct number of electrons.

A) one
B) seven
C) two
D) eight
E) five

10) in the second energy level of magnesium
Objective: 3.6
Global Outcomes: GO2

11) in the highest occupied energy level of chlorine
Objective: 3.6
Global Outcomes: GO2

12) in the outer energy level of nitrogen
Objective: 3.6
Global Outcomes: GO2

13) in the first energy level of chlorine
Objective: 3.6
Global Outcomes: GO2

14) in the third energy level of sodium
Objective: 3.6
Global Outcomes: GO2

Answers: 10) D 11) B 12) E 13) C 14) A

Classify the following elements.

A) noble gas
B) alkali metal
C) nonmetal
D) alkaline earth metal
E) transition element
F) halogen

15) sodium
Objective: 3.2
Global Outcomes: GO2

16) argon
Objective: 3.2
Global Outcomes: GO2

17) bromine
Objective: 3.2
Global Outcomes: GO2

18) copper
Objective: 3.2
Global Outcomes: GO2

19) magnesium
Objective: 3.2
Global Outcomes: GO2

20) phosphorus
Objective: 3.2
Global Outcomes: GO2

Answers: 15) B 16) A 17) F 18) E 19) D 20) C

Classify the following elements as metals, nonmetals or metalloids.

A) nonmetal
B) metal
C) metalloid

21) chlorine
Objective: 3.2
Global Outcomes: GO2

22) cobalt
Objective: 3.2
Global Outcomes: GO2

23) sulfur
Objective: 3.2
Global Outcomes: GO2

24) silicon
Objective: 3.2
Global Outcomes: GO2

25) nickel
Objective: 3.2
Global Outcomes: GO2

Answers: 21) A 22) B 23) A 24) C 25) B