

## Chapter 2: Atoms and the Periodic Table

1. Which element is a nonmetal?  
A) K B) Co C) Br D) Al  
Ans: C Difficulty: Easy
2. Which element is a metal?  
A) Li  
B) Si  
C) Cl  
D) Ar  
E) More than one of the elements above is a metal.  
Ans: A Difficulty: Easy
3. Which element is a metalloid?  
A) B B) C C) Ar D) Al  
Ans: A Difficulty: Easy
4. What is the mass number of the isotope with the symbol  ${}_{17}^{37}\text{Cl}$ ?  
A) 17 B) 18 C) 35.45 D) 37  
Ans: D Difficulty: Medium
5. What is the atomic number of the isotope with the symbol  ${}_{17}^{37}\text{Cl}$ ?  
A) 17 B) 18 C) 35.45 D) 37  
Ans: A Difficulty: Medium
6. How many protons are in the isotope with the symbol  ${}_{17}^{37}\text{Cl}$ ?  
A) 17 B) 18 C) 35.45 D) 37  
Ans: A Difficulty: Medium
7. Silicon has three naturally occurring isotopes: Si-28, Si-29 and Si-30. If the average atomic mass of silicon is 28.09, which isotope has the highest isotopic abundance?  
A) Si-28  
B) Si-29  
C) Si-30  
D) All isotopes have the same isotopic abundance.  
Ans: A Difficulty: Difficult

8. The active ingredient in the drug Fosamax is a compound with the chemical formula  $C_4H_{18}NNaO_{10}P_2$ . Which statement concerning the chemical formula of this compound is false?

- A) Atoms of six different elements make up this compound.
- B) Carbon, hydrogen, nitrogen, sodium, oxygen, and potassium atoms are present in this compound.
- C) The ratio of carbon atoms to oxygen atoms is 4:10.
- D) There is only one atom of nitrogen present in this compound.

Ans: B Difficulty: Medium

9. Which element is a transition metal in period 4?

- A) K B) Hf C) Sn D) Sc

Ans: D Difficulty: Medium

10. Which element is a noble gas?

- A) H
- B) Ne
- C) Pr
- D) Ra
- E) More than one of the elements listed is a noble gas.

Ans: B Difficulty: Easy

11. Which element is not an alkali metal?

- A) Li B) K C) Rb D) H E) All of the above elements are alkali metals.

Ans: D Difficulty: Medium

12. Which element is not an alkali metal?

- A) Li B) Kr C) Rb D) Na E) All of the above elements are alkali metals.

Ans: B Difficulty: Easy

13. The chemical reactivity of an element is determined by which of the following?

- A) the number of protons in an atom of the element
- B) the number of valence electrons in an atom of the element
- C) the number of neutrons in an atom of the element
- D) the number of protons and neutrons in an atom of the element

Ans: B Difficulty: Easy

14. The element symbol for manganese is

- A) M B) Ma C) Mg D) Mn

Ans: D Difficulty: Medium

15. The element symbol for sulfur is

- A) S B) Su C) Sf D) Sl

Ans: A Difficulty: Easy

16. Which statement is not part of the modern description of the electronic structure of an atom?

- A) Electrons occupy discrete energy levels.
- B) Electrons move freely in space.
- C) The energy of electrons is quantized.
- D) The energy of electrons is restricted to specific values.

Ans: B Difficulty: Difficult

17. What is the maximum number of electrons that can occupy the third ( $n=3$ ) shell?

- A) 2 B) 3 C) 6 D) 8 E) 18

Ans: E Difficulty: Difficult

18. Which of the following properly represents the order of orbital filling based on the relative energy of the orbitals?

- A)  $1s, 2s, 2p, 3s, 3p, 3d, 4s, 4p$
- B)  $1s, 2s, 3s, 4s, 2p, 3p, 4p, 3d$
- C)  $1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p$
- D)  $1s, 2s, 2p, 3s, 3d, 3p, 4s, 4p$

Ans: C Difficulty: Difficult

19. Which atom has the largest atomic radius?

- A) K B) Ga C) Br D) Rb

Ans: D Difficulty: Medium

20. Which atom has the smallest atomic radius?

- A) K B) Ga C) Br D) Rb

Ans: C Difficulty: Medium

21. Which element has the smallest ionization energy?

- A) K B) Ga C) Br D) Rb

Ans: D Difficulty: Medium

22. How many protons are in the isotope  ${}_{92}^{238}\text{U}$ ?

- A) 238 B) 146 C) 92 D) 330

Ans: C Difficulty: Medium

23. How many neutrons are in the isotope  ${}_{92}^{238}\text{U}$ ?

- A) 238 B) 146 C) 92 D) 330

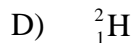
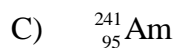
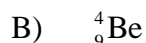
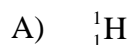
Ans: B Difficulty: Difficult

24. How many electrons are in the isotope  ${}_{92}^{238}\text{U}$ ?

- A) 238 B) 146 C) 92 D) 330

Ans: C Difficulty: Medium

25. Which isotope is not possible?



E) More than one of the above isotopes is not possible.

Ans: B Difficulty: Difficult

26. An atom of the isotope chlorine-37 consists of how many protons, neutrons, and electrons? (p = proton, n = neutron, e = electron)

A) 18 p, 37 n, 18 e

D) 37 p, 37 n, 17 e

B) 17 p, 20 n, 17 e

E) 37 p, 20 n, 37 e

C) 17 p, 20 n, 18 e

Ans: B Difficulty: Medium

27. The elements in a column of the periodic table are collectively referred to as

A) metals B) a period C) a group D) a series E) metalloids

Ans: C Difficulty: Easy

28. Which element is most likely to be a good conductor of electricity?

A) Ar B) N C) F D) Ni E) O

Ans: D Difficulty: Medium

29. Which element is chemically similar to lithium?

A) sulfur B) magnesium C) iron D) lanthanum E) potassium

Ans: E Difficulty: Medium

30. Which element is chemically similar to chlorine?

A) sulfur B) calcium C) oxygen D) bromine E) argon

Ans: D Difficulty: Medium

31. Which element is an *s* block element?

A) S B) Ar C) He D) La E) None of these elements is an *s* block element.

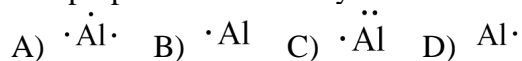
Ans: C Difficulty: Difficult

32. Which element is a *d* block element?

A) S B) Ar C) Ag D) As E) None of these elements is a *d* block element.

Ans: C Difficulty: Medium

33. The proper electron-dot symbol for aluminum is



Ans: A Difficulty: Easy

34. The electron configuration of chlorine is  $1s^2 2s^2 2p^6 3s^2 3p^5$ . Which statement about chlorine is incorrect?

- A) chlorine has five valence electrons
- B) chlorine's valence shell is the third shell
- C) chlorine has five electrons in the 3p subshell
- D) chlorine has 17 total electrons

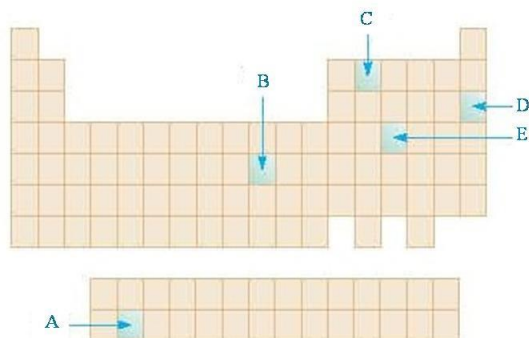
Ans: A Difficulty: Medium

35. What is the symbol for the isotope with  $A = 31$  and  $Z = 15$ ?

- A)  ${}_{31}^{15}\text{P}$
- B)  ${}_{15}^{46}\text{P}$
- C)  ${}_{15}^{31}\text{Ga}$
- D)  ${}_{15}^{31}\text{P}$

Ans: D Difficulty: Medium

36. In the diagram below, which highlighted element is an *f* block element?



- A) A
- B) B
- C) C
- D) D
- E) E

Ans: A Difficulty: Easy

37. Which statement describing atoms is false?

- A) The number of protons in an atom is referred to as the atomic number of the atom.
- B) The total number of protons, neutrons, and electrons in an atom is referred to as the mass number of the atom.
- C) Protons and neutrons are located in the nucleus of an atom.
- D) Electrons are located in the space outside the nucleus called the electron cloud.

Ans: B Difficulty: Easy

38. Antimony is a metalloid containing 51 protons that is alloyed with lead and used in car batteries. What is the element symbol for antimony?

- A) A
- B) An
- C) At
- D) Sb
- E) Cr

Ans: D Difficulty: Medium

39. Which statement concerning the elements fluorine, chlorine, bromine, and iodine is incorrect?

- A) These elements are all halogens.
- B) These elements all have the same valence shell.
- C) These elements are all nonmetals.
- D) These elements all have the same number of valence electrons.

Ans: B Difficulty: Medium

40. A sulfur atom has a larger atomic radius than an oxygen atom. Which statement best explains why?

- A) Sulfur contains more electrons than oxygen does.
- B) Sulfur contains more protons than oxygen does.
- C) The valence shell of sulfur is farther away from the nucleus than the valence shell of oxygen is.
- D) The larger number of protons in an oxygen atom pulls its electrons closer to the nucleus than a sulfur atom.

Ans: C Difficulty: Difficult

41. Zirconium (Zr) is an element classified as a metal. Which property cannot be assumed based on its classification as a metal?

- A) Zr has a relatively high density
- B) Zr is a trace element in the body
- C) Zr is a good conductor of electricity
- D) Zr is a shiny solid

Ans: B Difficulty: Medium

42. Protons and electrons reside in the nucleus of an atom.

Ans: False Difficulty: Easy

43. Electrons are negatively charged and have the smallest mass of the three subatomic particles.

Ans: True Difficulty: Medium

44. The nucleus contains most of the mass of an atom and is positively charged.

Ans: True Difficulty: Medium

45. All atoms of the same element contain the same number of protons.

Ans: True Difficulty: Easy

46. An alloy is a mixture of two or more elements that has metallic properties.

Ans: True Difficulty: Easy

47. Fl is the element symbol for fluorine.

Ans: False Difficulty: Easy

48. The element symbol S represents sodium.

Ans: False Difficulty: Easy

49. Hydrogen is located in group 1A but it is not considered an alkali metal.  
Ans: True Difficulty: Medium
50. The element symbol for iron is Fe.  
Ans: True Difficulty: Easy
51. Helium is an *s* block element.  
Ans: True Difficulty: Difficult
52. Nonmetals have a shiny appearance, and they are generally poor conductors of heat and electricity.  
Ans: False Difficulty: Easy
53. All elements have at least two naturally occurring isotopes.  
Ans: False Difficulty: Medium
54. Oxygen, carbon, hydrogen, and nitrogen are called the building-block elements because they make up the majority of the mass of the human body.  
Ans: True Difficulty: Medium
55. A compound is a pure substance formed by chemically combining two or more elements together.  
Ans: True Difficulty: Medium
56. The farther a shell is from the nucleus, the larger its volume becomes, and the more electrons it can hold.  
Ans: True Difficulty: Medium
57. The mass of a neutron is equal to the mass of a proton plus the mass of an electron.  
Ans: False Difficulty: Easy
58. The *5s* orbital is lower in energy than the *4d* orbital.  
Ans: True Difficulty: Medium
59. The electron-dot symbol for barium is  $\text{Ba}\cdot$ .  
Ans: False Difficulty: Easy
60. All of the elements in group 2A are metals.  
Ans: True Difficulty: Easy
61. All of the elements in group 6A are nonmetals.  
Ans: False Difficulty: Medium
62. All metals are solids at room temperature.  
Ans: False Difficulty: Medium

63. The maximum number of electrons that can occupy the  $3d$  subshell is ten (10).  
Ans: True Difficulty: Medium
64. Phosphorus has 15 valence electrons.  
Ans: False Difficulty: Medium
65. A bromine atom is smaller than a potassium atom.  
Ans: True Difficulty: Medium
66. Iodine has smaller ionization energy than chlorine.  
Ans: True Difficulty: Medium
67. The electron configuration for calcium is  $1s^22s^22p^63s^23p^64s^2$ .  
Ans: True Difficulty: Medium
68. When orbitals are equal in energy, one electron is added to each orbital until the orbitals are half-filled, before any orbital is completely filled.  
Ans: True Difficulty: Medium
69. When two electrons occupy the same orbital they have paired spins—that is, the spins are opposite in direction.  
Ans: True Difficulty: Medium
70. Group 6A elements have the general electron configuration of  $ns^2np^6$ .  
Ans: False Difficulty: Medium
71. The electron cloud contains most of the volume of an atom.  
Ans: True Difficulty: Easy
72. Bromine is abbreviated by the two-letter symbol BR.  
Ans: False Difficulty: Easy
73. A column in the periodic table is called a period.  
Ans: False Difficulty: Easy
74. An atom with  $A = 21$  and  $Z = 10$  is an isotope of an atom with  $A = 20$  and  $Z = 10$ .  
Ans: True Difficulty: Difficult
75. The atomic weight of an element is the sum of the masses of the naturally occurring isotopes of the element.  
Ans: False Difficulty: Medium
76. Strontium and barium have similar chemical properties.  
Ans: True Difficulty: Medium



77. The number of electrons that an orbital can contain depends on the type of orbital.  
Ans: False    Difficulty: Medium
78. Fluorine has higher ionization energy than neon.  
Ans: False    Difficulty: Medium
79. An iodine atom is larger than both a krypton atom and a tellurium atom.  
Ans: False    Difficulty: Difficult
80. Radium is a noble gas.  
Ans: False    Difficulty: Medium
81. The chemical formula  $S_8$  represents a compound.  
Ans: False    Difficulty: Medium
82. The ground state electron configuration for \_\_\_\_\_ is  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$ .  
Ans: potassium or K  
Difficulty: Medium
83. The electron configuration of aluminum using the noble gas notation is \_\_\_\_\_.  
Ans:  $[Ne]3s^2 3p^1$   
Difficulty: Medium
84. The electrons in the outermost shell of an atom are called the \_\_\_\_\_ electrons.  
Ans: valence  
Difficulty: Medium
85. The name of the halogen in period 3 is \_\_\_\_\_.  
Ans: chlorine  
Difficulty: Medium
86. The isotope  ${}^{49}_{22}\text{Ti}$  has  $A =$  \_\_\_\_\_ and  $Z =$  \_\_\_\_\_.  
Ans: 49, 22  
Difficulty: Medium
87. Isotopes of the same element have the same number of \_\_\_\_\_.  
Ans: protons  
Difficulty: Easy
88. Elements in the same group have the same number of \_\_\_\_\_.  
Ans: valence electrons  
Difficulty: Easy

Chapter 2: Atoms and the Periodic Table

89. Iron-56 contains \_\_\_\_\_ neutrons.

Ans: 30 or thirty

Difficulty: Medium

90. Tungsten is a metal containing 74 protons that is widely used in the electronics industry.

What is the elemental symbol for tungsten?

Ans: W

Difficulty: Medium