

CHAPTER 3

1. Which combination of individual and contribution is **not** correct?
 - a. Antoine Lavoisier - clarified confusion over cause of burning
 - b. John Dalton - proposed atomic theory
 - c. Marie Curie - discovered radium and polonium
 - d. Robert Millikan - discovered the neutron

ANS: d

2. John Dalton did his research work in which of the following countries?
 - a. France
 - b. Greece
 - c. Russia
 - d. England

ANS: d

3. In a neutral atom there is an equal number of
 - a. protons and electrons
 - b. neutrons and protons
 - c. electrons and neutrons
 - d. protons, electrons, and neutrons

ANS: a

4. Which radiation type has no detectable charge?
 - a. alpha
 - b. beta
 - c. gamma
 - d. both alpha and beta

ANS: c

5. Which radiation type was shown to be identical with the electron?
 - a. alpha
 - b. beta
 - c. gamma
 - d. none are identical with the electron

ANS: b

6. Rutherford's foil experiment provided evidence for what atomic feature?
- a. nucleus
 - b. electron
 - c. proton
 - d. neutron

ANS: a

7. Which sub-atomic particle has the incorrect charge indicated?
- a. proton - positive
 - b. electron - negative
 - c. neutron - neutral
 - d. nucleus - neutral

ANS: d

8. In the atom represented by the symbol ^{23}Na , there are
- a. 11 protons, 11 electrons, 23 neutrons
 - b. 12 protons, 12 electrons, 23 neutrons
 - c. 11 protons, 11 electrons, 12 neutrons
 - d. 12 protons, 12 electrons, 34 neutrons

ANS: c

9. What is the symbol for a neutral atom with 7 protons, 7 electrons, and 8 neutrons?
- a. Si
 - b. P
 - c. Ne
 - d. N

ANS: d

10. Which of the following is not included with a periodic table entry?
- a. atomic number
 - b. mass number
 - c. atomic weight
 - d. symbol

ANS: b

11. What element is used to define the atomic mass unit scale?
- hydrogen
 - oxygen
 - neon
 - carbon

ANS: d

12. What is the main color of visible light emitted by neon?
- yellow
 - orange-red
 - blue
 - green

ANS: b

13. Sunburn and some forms of skin cancer are caused by what kind of light?
- infrared, IR
 - gamma, g
 - microwave
 - ultraviolet, UV

ANS: d

14. Which statement is true about the speed of photons and light waves?
- red light is slower than blue light
 - each color travels at a different speed
 - all travel at the same speed
 - the longer the wavelength, the lower the speed

ANS: c

15. Which of the following has the longest wavelength?
- radio waves
 - X-rays
 - visible light
 - ultraviolet

ANS: a

16. Which relationship is correct?
- a. lower wavelength, small energy
 - b. lower frequency, lower wavelength
 - c. higher wavelength, higher frequency
 - d. higher frequency, larger energy

ANS: d

17. The third energy level can hold a maximum of how many electrons?
- a. 0
 - b. 3
 - c. 9
 - d. 18

ANS: d

18. What is the number of valence electrons in phosphorus (P) with an electron configuration of 2-8-5?
- a. 13
 - b. 8
 - c. 5
 - d. 15

ANS: c

19. Which electron configuration is inconsistent with the Bohr model?
- a. 2-8-1
 - b. 2-6
 - c. 2-8-9
 - d. 2-8-8

ANS: c

20. Which color of light carries the most energy per photon?
- a. blue
 - b. green
 - c. orange
 - d. red

ANS: a

21. The term *atom* was first used by
- Dalton
 - Rutherford
 - Democritus
 - Lavoisier

ANS: c

22. Who was the first person to propose a consistent modern atomic theory?
- Democritus
 - Lavoisier
 - Proust
 - Dalton

ANS: d

23. Carbon dioxide (CO₂) always has the same formula. What principle does this illustrate?
- the law of electric neutrality
 - the law of conservation of matter
 - the law of definite proportions
 - no particular law

ANS: c

24. Which statement was not part of Dalton's atomic theory?
- matter is composed of indestructible particles called atoms
 - all atoms of a given element are alike
 - elements and compounds are composed of definite arrays of atoms
 - some atoms may emit nuclear radiation

ANS: d

25. Which wavelength of visible light is red?
- 400 nm
 - 500 nm
 - 700 nm
 - 300 nm

ANS: c

26. Who proposed the law of definite proportions?
- Thomson
 - Rutherford
 - Dalton
 - Proust

ANS: d

27. How will a stream of electrons behave in an electric field?
- be unchanged
 - be stopped
 - be deflected toward the positive pole
 - be deflected toward the negative pole

ANS: c

28. The STM, scanning tunneling microscope, shows
- the outer boundary surface of the electrons in an atom
 - number of excited electrons in an atom
 - the charge on the nucleus
 - the mass of the nucleus

ANS: a

29. Which of the following ground state configurations matches represents an atom with 3 valence electrons?
- 2-8-3
 - 2-1
 - 2-3-5
 - 2-8-8

ANS: a

30. What metal was used as the foil in Rutherford's famous scattering experiment?
- tin
 - aluminum
 - gold
 - silver

ANS: c

31. The name given to the number of protons in an atom's nucleus is
- atomic number
 - family number
 - electron number
 - mass number

ANS: a

32. Two atoms which have the same atomic number but different mass numbers are called
- sisters
 - neutrinos
 - allotropes
 - isotopes

ANS: d

33. What name is given to the sum of neutrons and protons in an atom's nucleus?
- atomic number
 - mass number
 - isotope number
 - atomic mole mass

ANS: b

34. An electric field can deflect a beam of beta, alpha and gamma rays. Which ray will be deflected the least?
- alpha
 - beta
 - gamma
 - all are deflected by the same amount

ANS: c

35. What experimental evidence served as a basis of Bohr's atomic theory?
- magnetic measurements
 - behavior of atoms at low temperatures
 - atomic mass
 - atomic spectra

ANS: d

36. Which is the ground state of a hydrogen atom?
- three electrons in the $n = 1$ level
 - one electron in the $n = 2$ level
 - one electron in the $n = 1$ level
 - one electron in the $n = 1$ level and one electron in the $n = 2$ level

ANS: c

37. Which of the following ground state configuration matches Ar, argon?
- 2-8-1
 - 2-2-6-2-6
 - 2-2-6-8
 - 2-8-8

ANS: d

38. The modern periodic table is based on arranging elements in the order of their
- atomic weight
 - atomic number
 - mass number
 - isotope number

ANS: b

39. What elements make up the A group of elements?
- representative or main-group
 - transition
 - lanthanide
 - actinide

ANS: a

40. The majority of the elements are
- gases
 - nonmetals
 - radioactive
 - metals

ANS: d

41. Which element is found in Group IIA - in Period 4?
- magnesium, Mg
 - zinc, Zn
 - calcium, Ca
 - potassium, K

ANS: c

42. Which is **not** a property of nonmetals?
- malleable
 - insulator
 - gain electrons to form negative ions
 - poor conductor of electricity

ANS: a

43. Which element is a noble gas?
- Ni
 - Ne
 - Si
 - B

ANS: b

44. Which sequence lists a nonmetal, metalloid, and a transition metal, respectively?
- Al, As, Ag
 - Co, Pb, P
 - O, Ge, Cs
 - N, Si, Fe

ANS: d

45. Which element would most likely have the Lewis dot symbol, :X: ?
- oxygen
 - nitrogen
 - carbon
 - fluorine

ANS: c

46. How many valence electrons are in boron, B?
- a. 5
 - b. 3
 - c. 2
 - d. 0

ANS: b

47. Which is not true about metals?
- a. good conductors of heat
 - b. form positive ions
 - c. can be stretched or drawn into wires
 - d. many are liquids

ANS: d

48. In the following set, which atom is the smallest?
- a. Ar
 - b. Mg
 - c. Cl
 - d. Si

ANS: a

49. Which of the following halogens has the smallest atomic radius?
- a. iodine
 - b. fluorine
 - c. bromine
 - d. chlorine

ANS: b

50. What element (X) is a metal that forms +1 ions?
- a. sodium (Na)
 - b. aluminum (Al)
 - c. calcium (Ca)
 - d. nitrogen (N)

ANS: a

51. Which element is a metal?
- Cl
 - Na
 - Ar
 - S

ANS: b

52. Which element conducts electricity well?
- arsenic
 - boron
 - sulfur
 - silver

ANS: d

53. If the compound formed by radium and bromine has the formula RaBr_2 , what is the formula of the compound formed by strontium (Sr) and iodine (I)?
- SrI
 - Sr_2I
 - SrI_2
 - no correlation between radium and strontium

ANS: c

54. Sodium has chemical properties most like
- cesium, Cs
 - magnesium, Mg
 - chlorine, Cl
 - mercury, Hg

ANS: a

55. The reason for your answer in the previous question is that both cesium and sodium
- have about the same atomic weight
 - have about the same atomic number
 - are both metals
 - are in the same group of the periodic table

ANS: d

56. Who was the Russian who was a pioneer in the development of the periodic law?
- Meyerovick
 - Mendeleev
 - Dobereiner
 - Newlands

ANS: b

57. The periodic law of the elements states that the properties of the elements are a periodic function of
- atomic weights
 - atomic numbers
 - both atomic weights and atomic numbers
 - neither atomic weights nor atomic numbers

ANS: b

58. Which of the following is a transition element in the periodic table?
- sodium
 - sulfur
 - boron
 - chromium

ANS: d

59. A noble gas is
- Al
 - Ar
 - H
 - O

ANS: b

60. Which of the following is an atom in Group IVA?
- C
 - Cu
 - Cs
 - Cl

ANS: a

61. Elements that conduct heat and electricity well are
- nonmetals
 - noble gases
 - metals
 - metalloids

ANS: c

62. Which group of elements is all alkaline earths?
- Mg, Cl, Na, As
 - Ca, Mg, Ba, Ra
 - Ba, Al, Na, As
 - Na, K, Li, Rb

ANS: b

63. Group IIA elements, M, react with oxygen, O, to form oxides with the formula
- MO
 - M₂O
 - MO₂
 - M₂O₃

ANS: a

64. If an element in a group in the periodic table has a combining power (valence) of two, another element in the same group likely has a combining power of _____
- two
 - one or three
 - an unpredictable number
 - four or five, depending on the element's position in the group

ANS: a

65. Why are atoms at the bottom of a group in the periodic table larger than atoms at the top of the group?
- larger atoms have more electrons and more occupied energy levels
 - larger atoms have more protons
 - larger atoms have more energy levels occupied by electrons
 - larger atoms have less screening effect by inner electrons

ANS: a

66. Which atom in the following series is the largest?
- K
 - Rb
 - Cs
 - Na

ANS: c

67. How many electrons in the valence shell of a calcium atom?
- 20
 - 8
 - 2
 - 1

ANS: c

68. According to the periodic table all the elements in Group IIA are
- a noble gas
 - metals
 - metalloids
 - nonmetals

ANS: b

69. The periodic table is helpful in all the following endeavors but one. Which is the exception?
- predicting the number of isotopes of elements
 - predicting chemical reactivity of elements
 - predicting physical properties of elements
 - predicting formula of compounds

ANS: a

70. An element with electronic structure of 2-8-3 is in which of the following groups of the periodic table?
- IA
 - IIA
 - IIIA
 - IVA

ANS: c

71. What general electronic arrangement is characteristic to chemical inactivity?
- a total of eight electrons per atom
 - filled *s* and *p* orbitals
 - all electrons paired
 - 2-8-8

ANS: d

72. An element with electronic structure of 2-8-8 is in which of the following groups of the periodic table?
- IIA
 - IVA
 - VIA
 - VIIIA

ANS: d

73. An element with two valence (bonding, or outer shell) electrons is
- Mg
 - Na
 - Cl
 - Al

ANS: a

74. Which of the following reacts most violently with water?
- Ne, neon
 - Na, sodium
 - Li, lithium
 - K, potassium

ANS: d

75. Which of the following elements has five valence electrons?
- Be
 - F
 - P
 - Xe

ANS: c

76. Which law states that matter is neither lost nor gained during a chemical reaction?
- Law of multiple proportions
 - Law of definite proportions
 - Law of chemical reactions
 - Law of conservation of mass

ANS: d

77. Which subatomic particles are found in the nucleus of ^{32}P atom?
- 15 protons, 15 electrons, 17 neutrons
 - 15 protons, 15 electrons, 32 neutrons
 - 15 protons, 32 neutrons
 - 15 protons, 17 neutrons

ANS: d

78. What is the symbol for a neutral atom with 35 protons, 35 electrons, and 46 neutrons?
- Se
 - Br
 - Cl
 - Ti

ANS: b

79. Which type of electromagnetic radiation has the least amount of energy per photon?
- infrared
 - gamma
 - radio waves
 - ultraviolet

ANS: c

80. Which element has 8 valence electrons?
- Be
 - F
 - Na
 - Ne

ANS: d

81. The fourth energy level can hold a maximum of how many electrons?
- 2
 - 8
 - 18
 - 32

ANS: d

82. How many core electrons (innermost) are found in a nitrogen atom?
- 2
 - 5
 - 7
 - 14

ANS: a

83. Which element has the following ground state electron configuration $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$?
- Ar
 - Na
 - K
 - Cl

ANS: c

84. Which of the following ground state configurations matches represents an atom with 7 valence electrons?
- $1s^2 2s^2 2p^6 3s^2 3p^6$
 - $1s^2 2s^2 2p^6 3s^2 3p^4$
 - $1s^2 2s^2 2p^6 3s^2$
 - $1s^2 2s^2 2p^6 3s^2 3p^5$

ANS: d

85. What is the ground state configuration for an argon atom?
- $1s^2 2s^2 2p^6 3s^2 3p^6$
 - $1s^2 2s^2 2p^6 3s^2 3p^8$
 - $1s^2 2s^2 2p^6$
 - $1s^2 2s^2 2p^6 3s^2$

ANS: a

86. Which element is found in Group VIA - in Period 3?
- phosphorus, P
 - chromium, Cr
 - sulfur, S
 - oxygen, O

ANS: c

87. Which is a property of metals?
- malleable
 - conductor
 - lose electrons to form positive ions
 - all of the above

ANS: d

88. Which element is a nonmetal?
- potassium
 - copper
 - sulfur
 - lithium

ANS: c

89. Which element is a halogen?
- O
 - F
 - Na
 - Ne

ANS: b

90. How many valence electrons are in aluminum?
- 1
 - 2
 - 3
 - 5

ANS: c

91. Which element would most likely have the Lewis dot symbol, $\cdot X \cdot$?
- sodium
 - magnesium
 - oxygen
 - silicon

ANS: b

92. In the following set, which atom is the largest?
- Ar
 - Mg
 - Cl
 - Si

ANS: b

93. An element with 4 valence (bonding, or outer shell) electrons is
- N
 - Al
 - Cl
 - C

ANS: d