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Solution Manual

Test Bank

Chapter 2—Atoms and Molecules

MULTIPLE CHOICE

1. **Why is CaO the symbol for calcium oxide instead of CAO?**
   a. both can be the symbols for calcium oxide
   b. both are incorrect; the symbol is cao
   c. a capital letter means a new symbol
   d. both are incorrect as the symbol should be CaO_x

   ANS: C   PTS: 1

2. **What is the meaning of the two (2) in ethyl alcohol, C_2H_5OH?**
   a. all alcohol molecules contain two carbon atoms
   b. there are two carbon atoms per molecule of ethyl alcohol
   c. carbon is diatomic
   d. all of these are correct statements

   ANS: B   PTS: 1

3. **The symbols for elements with accepted names**
   a. consist of a single capital letter.
   b. consist of a capital letter and a small letter.
   c. consist of either a single capital letter or a capital letter and a small letter.
   d. No answer is correct.

   ANS: C   PTS: 1

4. **A molecular formula**
   a. is represented using the symbols of the elements in the formula.
   b. is represented using a system of circles that contain different symbols.
   c. cannot be represented conveniently using symbols for the elements.
   d. is represented using words rather than symbols.

ANS: A   PTS: 1

5. **Which of the following uses the unit of "u" or "amu"?**
    a. atomic weights of atoms   c. molecular weights of molecules
    b. relative masses of atoms   d. more than one response is correct

    ANS: D   PTS: 1

6. **What is meant when the symbol C-12 (or ^{12}C) is used?**
    a. the carbon atom weighs 12 grams   c. the carbon atom weighs 12 amu
    b. the carbon atom weighs 12 pounds   d. the melting point of carbon is 12°C

    ANS: C   PTS: 1

7. **Refer to a periodic table and tell how many helium atoms (He) would be needed to get close to the same mass as an average oxygen atom (O).**
    a. six   b. four   c. twelve   d. one-fourth

    ANS: B   PTS: 1

8. **Determine the molecular weight of hydrogen peroxide, H_2O_2, in u (or amu).**

a. 17.01   b.   18.02   c. 34.02   d. 33.01

ANS: C   PTS: 1

9. **Using whole numbers, determine the molecular weight of calcium hydroxide, Ca(OH)$_2$.**
    a. 56   b.   57   c. 58   d. 74

ANS: D   PTS: 1

10. **The average relative mass of an ozone molecule is 48.0 u. An ozone molecule contains only oxygen atoms. What does this molecular weight indicate about the formula of the ozone molecule?**
    a. It is monoatomic.   c. It is triatomic.
    b. It is diatomic.   d. Impossible to determine

ANS: C   PTS: 1

11. **Which of the following pairs are about equal in mass?**
    a. proton and electron   c. proton and neutron
    b. electron and neutron   d. nucleus and surrounding electrons

ANS: C   PTS: 1

12. **Which of the following particles is the smallest?**
    a. proton   c. neutron
    b. electron   d. they are all the same size

ANS: B   PTS: 1

13. **How many electrons are in a neutral atom of carbon-13 (^{13}C)?**
    a. 6   b.   18   c. 12   d. no way to tell

ANS: A   PTS: 1

14. **Which of the following carries a negative charge?**
    a. a proton   c. an electron
    b. a neutron   d. both proton and neutron

ANS: C   PTS: 1

15. **Which of the following is located in the nucleus of an atom?**
    a. protons   c. electrons
    b. neutrons   d. protons and neutrons

ANS: D   PTS: 1

16. **Atoms are neutral. How can they have no charge?**
    a. equal numbers of protons and neutrons
    b. equal numbers of protons and electrons
    c. equal numbers of neutrons and electrons
    d. any charge has been drained out of the atom

ANS: B   PTS: 1

17. **Isotopes differ from each other in what way?**
    a. They have different numbers of protons in the nucleus.
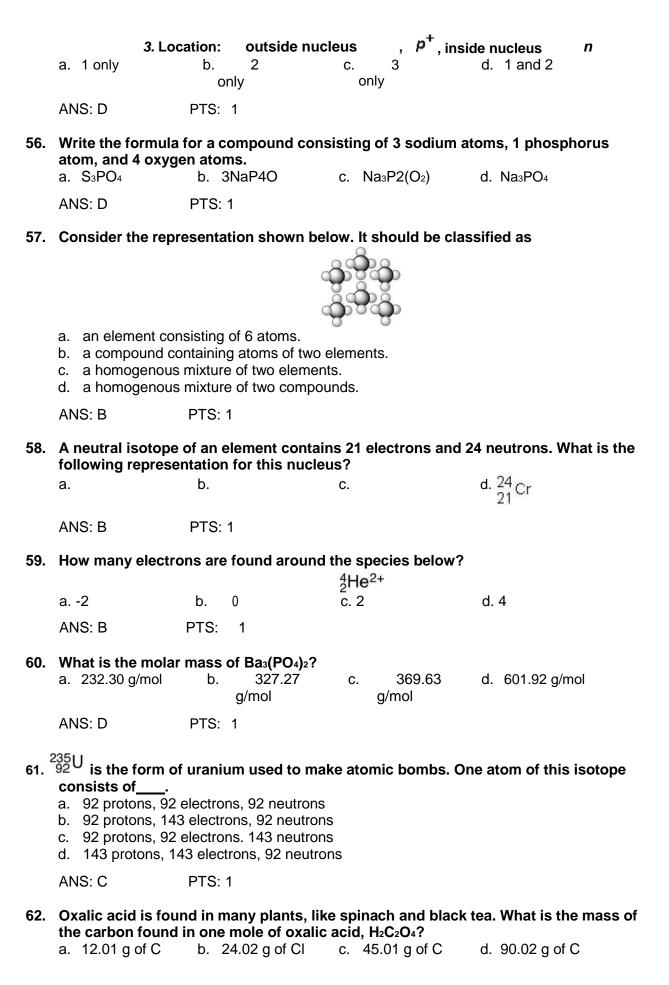   b. They have different numbers of neutrons in the nucleus.

c. They have different numbers of electrons outside the nucleus.
d. More than one response is correct.

ANS: B   PTS: 1

18. **What is the reason that U-238 is different from U-235?**
    a. three more electrons   c. three more neutrons
    b. three more protons   d. there is no difference

ANS: C   PTS: 1

19. **How many protons are found in the nucleus of a boron-11 (^{11}B) atom?**
    a. 11   b.   6   c. 5   d. 4

ANS: C   PTS: 1

20. **How many neutrons are found in the nucleus of a boron-11 (^{11}B) atom?**
    a. 11   b.   6   c. 5   d. 4

ANS: B   PTS: 1

21. **What is the mass number of a carbon-13 (^{13}C) atom?**
    a. 13   b.   12   c. 6   d. 7

ANS: A   PTS: 1

22. **Naturally occurring neon (Ne) has the following isotopic composition (the mass of each isotope is given in parenthesis). Calculate the atomic weight of neon in u from these data: neon-20, 90.92% (19.99 u); neon-21, 0.257% (20.99 u); neon-22, 8.82% (21.99 u)**
    a. 28.97   b.   37.62   c. 2017   d. 20.17

ANS: D   PTS: 1

23. **Naturally occurring lithium (Li) consists of only two isotopes, Li-6 (6.02 u) and Li-7 (7.02 u), where the isotopic masses are given in parentheses. Use the periodic table and determine which isotope is present in the larger percentage in the natural element.**
    a. Li-6
    b. Li-7
    c. each is present at 50%
    d. cannot be determined from the information available

ANS: B   PTS: 1

24. **What mass of arsenic (As) in grams contains the same number of atoms as 39.95 g of argon (Ar)?**
    a. 33.0   b.   74.92   c. 4.16   d. 149.84

ANS: B   PTS: 1

25. **The number of Cr atoms in a 26.0 g sample of chromium is x. How many atoms, expressed in terms of x, would be contained in 26.98 g of aluminum (Al)?**
    a. x   b. x/2   c.   d. x+2
                                    2x

ANS: C   PTS: 1

26. **The mass of mercury (Hg), a liquid at room temperature, is 200.6 amu/mol. A 200.6 gram sample of mercury is heated until it boils. What is the mass of one mole of mercury vapor (gas)?**
   a. <200.6 or it wouldn't be a gas   c. the same as when it is a liquid
   b. the same as Avogadro's number   d. none of the answers are correct

   ANS: C   PTS: 1

27. **The formula for dinitrogen monoxide is N_2O. If a sample of the oxide was found to contain 0.0800 g of oxygen, how many grams of nitrogen would it contain?**
   a. 0.140   b.   0.280   c. 0.560   d. 0.0700

   ANS: A   PTS: 1

28. **One Avogadro's number of iron (Fe) atoms would weigh_____.**
   a. 55.9 g.   c. 55.9 u.

   b. 6.02×10^{23} g.   d. 6.02×10^{23} g.

   ANS: A   PTS: 1

29. **How many atoms are contained in a sample of krypton, Kr, that weighs 8.38 g?**
   a. one Avogadro's number   c. one
   b. one-tenth Avogadro's number   d. one-tenth

   ANS: B   PTS: 1

30. **Which of the following has the largest mass?**
   a. 5.0 mol H_2O b. 3.5 mol NH_3 c. 8.0 mol C   d. 6.0 mol C_2H_2

   ANS: D   PTS: 1

31. **How many silicon atoms (Si) are contained in a 12.5 g sample of silicon?**
   a. 2.68×10^{23} b. 5.83×10^{22} c. 1.35×10^{24} d. 1.71×10^{21}
   ANS: A   PTS: 1

32. **What is the number of hydrogen atoms in a 18.016 gram sample of water?**
   a. 2.000   b. 6.022×10^{23} c. 18.02   d. 1.204×10^{24}
   ANS: D   PTS: 1

33. **How many moles of oxygen atoms are in one mole of CO_2?**
   a. 1   b.   2   c. 6.02×10^{23} d. 12.04×10^{23}
   ANS: B   PTS: 1

34. **How many hydrogen atoms are in 1.00 mole of NH_3?**
   a. 3.00   b. 6.02×10^{23} c. 12.0×10^{23} d. 18.1×10^{23}
   ANS: D   PTS: 1

35. **How many moles of hydrogen molecules (H_2) would be required to produce two moles of hydrogen peroxide (H_2O_2)?**
   a. 1   b.   2   c. 3   d. 4
   ANS: B   PTS: 1

36. **Calculate the weight percentage of hydrogen in water.**
    a. 33.3   b.   66.7   c. 2.00   d. 11.1

    ANS: D   PTS: 1

37. **What is the weight percentage of nitrogen in urea, CN_2H_4O?**
    a. 46.7   b.   30.4   c. 32.6   d. 16.3

    ANS: A   PTS: 1

38. **How many carbon atoms are contained in 5.50 g of ethane, C_2H_6?**

    a. 2.75×10^{22} b. 3.29×10^{24} c. 1.10×10^{23} d. 2.21×10^{23}
    ANS: D   PTS: 1

39. **Which element is approximately 65 percent of sulfuric acid by weight?**
    a. hydrogen   b. sulfur   c. oxygen   d.   any of
                                                                                these

    ANS: C   PTS: 1

40. **How many moles of N_2O contain the same number of nitrogen atoms as 4.60 g of NO_2?**
    a. 0.500   b.   0.0500   c. 0.100   d. 0.200

    ANS: B   PTS: 1

41. **How many grams of iron (Fe) is contained in 15.8 g of $Fe(OH)_3$?**
    a. 12.1   b.   8.26   c. 11.8   d. 5.21

    ANS: B   PTS: 1

42. **The symbol for bromine is_____.**
    a. B   b. Br   c.   d. none of these
                                                  Be

    ANS: B   PTS: 1

43. **The weight % of S in K_2SO_4 is_____.**
    a. 14.2%   b.   18.4%   c. 54.4%   d. 22.4%

    ANS: B   PTS: 1

44. **What is the number of moles of water in one liter of water if one gram of water takes up one milliliter of space?**
    a. 1   b.   18   c. 55.6   d. 1000

    ANS: C   PTS: 1

45. **How many neutrons are in an atom that has a mass number of 75 and contains 35 protons?**
    a. 40   b.   35   c. 75   d. can't tell

    ANS: A   PTS: 1
46. **Atoms that have the same atomic number but differ by mass number are called?**

    a. protons   b. neutrons   c. isotopes   d. positrons

    ANS: C   PTS: 1

47. **If you have 3.011 $\times$ 10^{23} atoms of carbon, what would you expect its mass to be?**
   a. 12.01 g   b.   6.005 g   c. 3.003 g   d. 1.000 g

   ANS: B   PTS: 1

48. **What is wrong with the following molecular formula: SOO (sulfur dioxide)?**
   a. OSO is the correct form   c. OO should be written as O2
   b. SO should be So   d. OO should be written as O_2

   ANS: D   PTS: 1

49. **Determine the number of electrons and protons in the element Tc.**
   a. 43 protons, 43 electrons   c. 56 protons, 43 electrons
   b. 43 protons, 56 electrons   d. 99 protons, 43 electrons

   ANS: A   PTS: 1

50. **The system of atomic mass units is based on**
   a. assigning ^{12}C as weighing exactly 12 u & comparing other elements to it.
   b. measuring the true mass of each subatomic particle.
   c. comparing the differences in protons and electrons.
   d. viewing how atoms are affected by electromagnetic fields.

   ANS: A   PTS: 1

51. **How many moles of $Na_2Cr_2O_7$ contain 14 moles of oxygen atoms?**
   a. 2 mol $Na_2Cr_2O_7$ c. 7 mol $Na_2Cr_2O_7$
   b. 14 mol $Na_2Cr_2O_7$ d. 1 mol $Na_2Cr_2O_7$

   ANS: A   PTS: 1

52. **An isotope of a given element has a mass number equal to twice the atomic number. This neutral isotope contains twelve electrons. This isotope is_____.**
   a. magnesium-12.   c. chromium-24.
   b. magnesium-24.   d. chromium-12.

   ANS: B   PTS: 1

53. **Approximately, how many atoms of beryllium would be required to equal the mass of 10 atoms of aluminum?**
   a. 3 atoms of beryllium   c. 30 atoms of beryllium
   b. 10 atoms of beryllium   d. 4 atoms of beryllium

   ANS: C   PTS: 1

54. **If calcium carbonate found in limestone is 40.0% calcium, how many grams of calcium are in 485 g of calcium carbonate?**
   a. 12.1 g of calcium   c. 19,400 g of calcium
   b. 291 g of calcium   d. 194 g of calcium

   ANS: D   PTS: 1

55. **Which of the following correctly describes subatomic particles?**

   1. **Mass: $e^- < p^+ = n$**

   2. **Magnitude of charge: $n < e^- = p^+$**

3. Location: outside nucleus , p^+, inside nucleus *n*

a. 1 only b. 2 only c. 3 only d. 1 and 2

ANS: D   PTS: 1

56. **Write the formula for a compound consisting of 3 sodium atoms, 1 phosphorus atom, and 4 oxygen atoms.**

a. S_3PO_4 b. $3NaP4O$ c. $Na_3P2(O_2)$ d. Na_3PO_4

ANS: D   PTS: 1

57. **Consider the representation shown below. It should be classified as**

a. an element consisting of 6 atoms.
b. a compound containing atoms of two elements.
c. a homogenous mixture of two elements.
d. a homogenous mixture of two compounds.

ANS: B   PTS: 1

58. **A neutral isotope of an element contains 21 electrons and 24 neutrons. What is the following representation for this nucleus?**

a.   b.   c.   d. $_{21}^{24}Cr$

ANS: B   PTS: 1

59. **How many electrons are found around the species below?**

$$_2^4He^{2+}$$

a. -2   b. 0   c. 2   d. 4

ANS: B   PTS: 1

60. **What is the molar mass of $Ba_3(PO_4)_2$?**

a. 232.30 g/mol   b. 327.27 g/mol   c. 369.63 g/mol   d. 601.92 g/mol

ANS: D   PTS: 1

61. $_{92}^{235}U$ **is the form of uranium used to make atomic bombs. One atom of this isotope consists of___.**

a. 92 protons, 92 electrons, 92 neutrons
b. 92 protons, 143 electrons, 92 neutrons
c. 92 protons, 92 electrons. 143 neutrons
d. 143 protons, 143 electrons, 92 neutrons

ANS: C   PTS: 1

62. **Oxalic acid is found in many plants, like spinach and black tea. What is the mass of the carbon found in one mole of oxalic acid, $H_2C_2O_4$?**

a. 12.01 g of C   b. 24.02 g of Cl   c. 45.01 g of C   d. 90.02 g of C

ANS: B   PTS: 1

63. You discover a new element which consists of two isotopes. The first isotope, ^{243}X (mass = 242.45 u) comprises 40.000% of the total. The second isotope, ^{248}X (mass = 247.11 u) accounts for the rest. What would be the average atomic mass for your new element?

a. 242.45 u   b.   244.32 u   c. 245.25   d. 247.11

ANS: C   PTS: 1

64. Individuals, ages 19-70, should include at least 1000 mg of calcium in their daily diet. What is the minimum number of one-gram calcium supplement tablets you would need to take each day to meet this requirement if a tablet is 40% by mass calcium?

a. 1   b.   2   c. 3   d. 4

ANS: C   PTS: 1

TRUE/FALSE

1. The symbols for all of the elements are derived from the Latin names.

ANS: F   PTS: 1

2. The symbols for all of the elements always begin with a capital letter.

ANS: T   PTS: 1

3. The first letter of the symbol for each of the elements is the first letter of its English name.

ANS: F   PTS: 1

4. The most accurate way to determine atomic mass is with a mass spectrometer.

ANS: T   PTS: 1

5. H_2O_2 contains equal parts by weight of hydrogen and oxygen.

ANS: F   PTS: 1

6. Electrons do not make an important contribution to the mass of an atom.

ANS: T   PTS: 1

7. The charge of the nucleus depends only on the atomic number.

ANS: T   PTS: 1

8. Isotopes of the same element always have the same number of neutrons.

ANS: F   PTS: 1

9. Isotopes of the same element always have the same atomic number.

ANS: T   PTS: 1

10. **Isotopes of the same element always have the same atomic mass.**

ANS: F   PTS: 1

11. **A mole of copper contains the same number of atoms as a mole of zinc.**

ANS: T   PTS: 1

12. **One mole of an element would weigh the same as a mole of an isotope of the same element.**

ANS: F   PTS: 1

13. **One mole of silver would contain the same number of atoms as a mole of gold.**

ANS: T   PTS: 1

14. **One mole of an element would weigh the same as a mole of an isotope of the same element.**

ANS: T   PTS: 1

15. **One mole of H_2O contains 2.0 grams of hydrogen.**

ANS: T   PTS: 1

16. **One mole of O_3 weighs 16 grams.**

ANS: F   PTS: 1

17. **The pure substance, water, contains both hydrogen molecules and oxygen molecules.**

ANS: F   PTS: 1

18. **A diet is planned for a trip on a space ship and is lacking in milk, but is rich in turnips and broccoli. Such a diet could provide a sufficient amount of calcium for adults.**

ANS: T   PTS: 1

19. **Calcium supplements can be taken in 1,000 mg increments.**

ANS: F   PTS: 1

20. **Protons and neutrons have approximately the same mass.**

ANS: T   PTS: 1

21. **Neutral isotopes of the same element have the same number of electrons.**

ANS: T   PTS: 1

22. **An isotope of gallium consisting of 31 protons and 37 neutrons can be represented using the symbol shown below.**

$$^{37}_{31}\text{Ga}$$

ANS: F   PTS: 1

23. **The atomic mass number is a whole number and indicates a specific isotope of an element.**

ANS: T   PTS: 1

24. **In naturally occurring samples, all elements exist as a mixture of isotopes.**

ANS: F   PTS: 1

25. **One mole of any substance will contain one Avogadro's number of atoms of that substance.**

ANS: F   PTS: 1

26. **A scanning tunneling microscope (STM) relies on a very strong light source to help see atoms.**

ANS: F   PTS: 1

27. **An MRI instrument cause the hydrogens in your body to line up because they are exposed to a very strong magnetic field.**

ANS: T   PTS: 1