

**Chapter 1 Atoms and Elements: The Building Blocks of Chemistry**  
**PRACTICE QUESTIONS**

Multiple Choice

1. A characteristic which distinguishes between a true science and a pseudoscience is:
  - a. one deals with quantitative information only, while the other deals with qualitative information only
  - b. one deals with natural phenomena, while the other deals with artificial phenomena
  - c. one deals with reproducible observations, while the other does not
  - d. one deals with scientific facts, while the other deals with empirical facts
  - e. one is developed in academic research laboratories, while the other is developed in non-academic laboratories
  
5. Which one of the following does not involve a chemical change?
  - a. a fish that is left for some time in an unrefrigerated place decomposes
  - b. apple juice which is left in an open bottle ferments
  - c. a loaf of bread rises and its volume expands when it is baked in an oven
  - d. when a lake starts to freeze in winter, ice is formed on the surface
  - e. when sugar is fermented under certain conditions, alcohol is produced
  
6. Which one of the following is a physical change?
  - a. when ignited with a match in open air, paper burns
  - b. in cold weather, water condenses on the inside surface of single pane windows
  - c. when treated with bleach, some dyed fabrics change color
  - d. when heated strongly, sugar turns dark brown
  - e. grape juice left in an open unrefrigerated container turns sour
  
9. Which one of the following is an extensive property of matter?
  - a. density
  - b. specific gravity
  - c. electrical conductivity
  - d. refractive index
  - e. mass
  
10. All of the following properties of a sample of a pure substance can be used for identification except its
  - a. density
  - b. freezing point temperature
  - c. mass
  - d. melting point temperature
  - e. solubility in 100 g of water (g solute/100 g water at 25 °C)

12. Distillation can readily be used to separate
- the elements in a compound
  - a heterogeneous mixture of two solids
  - a homogeneous solution of two solids
  - iron filings from sugar and salt crystals
  - a liquid solvent from a dissolved solid
13. The two major types of pure substances are
- compounds and elements
  - compounds and solutions
  - elements and mixtures
  - mixtures and solutions
  - solutions and elements
16. The relative number of atoms of each element in a particular compound
- is always 1:1
  - is the same as the density ratio
  - is the same as the weight ratio
  - is definite and constant
  - cannot be determined experimentally
17. A naturally occurring element consists of **three** isotopes. The data on the isotopes:
- isotope #1: 46.972 u, 69.472%  
isotope #2: 48.961 u, 21.667%  
isotope #3: 49.954 u, 8.8610%
- What is the average atomic weight of this naturally occurring element?
- 47.667 u
  - 47.699 u
  - 48.629 u
  - 48.667 u
  - 48.961 u
22. The atomic mass of naturally occurring iron, which is a mixture of isotopes, is listed as 55.847 u. This means that the average mass for the individual iron atoms is
- 55.847 times as great as that of a  $^{12}\text{C}$  atom
  - 55.847 times as great as that of a  $^1\text{H}$  atom
  - $55.847/1.0079$  times as great as that of a  $^1\text{H}$  atom
  - $55.847/12.000$  times as great as that of a  $^{12}\text{C}$  atom
  - $55.847/12.011$  times as great as that of a  $^{12}\text{C}$  atom

29. Which one of the following contributes to the charge but does NOT contribute significantly to the mass of an atom?
- a. electrons
  - b. nuclei
  - c. photons
  - d. neutrons
  - e. protons
30. Uranium exists in nature in the form of several isotopes; the different isotopes have different
- a. atomic numbers
  - b. charges
  - c. numbers of electrons
  - d. numbers of neutrons
  - e. numbers of protons
43. The discovery of the electron, one of the subatomic particles, is credited to
- a. James Chadwick
  - b. Hans Geiger
  - c. Ernest Rutherford
  - d. J. J. Thomson
  - e. Wilbert Montgomery
46. The symbol "Si" is used to represent the element:
- a. silver
  - b. silicon
  - c. sodium
  - d. sulfur
  - e. silicium
47. The symbol "Fe" is used to represent the element:
- a. fermium
  - b. fendium
  - c. copper
  - d. iron
  - e. zinc

48. The symbol "Ca" is used to represent the element:
- cadmium
  - calcium
  - californium
  - carminium
  - carolinium
49. The symbol "Sr" is used to represent the element:
- sulfur
  - seronium
  - serium
  - scandium
  - strontium
51. Which set of elements below are all in the same period?
- Ba, Pb, As, Sn
  - Fr, U, Am, Ca
  - K, Na, Li, Cs
  - Na, Al, P, Ar
  - Nd, Dy, Pu, Os
57. Silver and antimony are an example of two elements which belong to the same
- class
  - generation
  - grade
  - group
  - period
59. Which set of elements below includes mostly non-metals?
- barium, calcium, strontium
  - lanthanum, lutetium, rhodium
  - oxygen, selenium, tellurium
  - silicon, zinc, strontium
  - sodium, lithium, nitrogen
60. The set below featuring one alkali, one alkaline earth, one halogen, one lanthanide and one actinide element is:
- cesium, barium, bromine, erbium, samarium
  - francium, beryllium, iodine, terbium, berkelium
  - lithium, manganese, fluorine, lanthanum, vanadium
  - potassium, radium, iodine, lutetium, platinum
  - rubidium, strontium, chlorine, thorium, plutonium

67. The present form of the periodic table evolved from the pioneering work, in this area, of:
- J. J. Thomson
  - William Ramsey
  - August Kekule
  - Dmitri Mendeleev
  - Gregor Mendel
68. Very accurate measurements of isotopic mass and isotopic mass ratios are carried out using an instrument known as a
- scanning tunneling microscope
  - scanning electron microscope
  - mass electrometer
  - mass spectrometer
  - isotope chromatographer
69. The value listed for the average atomic mass of bromine is 79.909 u. It consists of two isotopes, one with a mass of 78.9183 u and one with a mass of 80.9163 u. What is the percent, by weight, of the more abundant isotope in naturally occurring bromine? \_\_\_\_\_

#### True and False

71. Density is one of the extensive properties of matter. \_\_\_\_
72. The volume of a sample is an example of an extensive property of matter. \_\_\_\_
73. A homogeneous mixture consists of only one chemical substance. \_\_\_\_
74. A sample of a pure compound may contain more than one phase. \_\_\_\_
84. The symbol for the element, potassium, is Po. \_\_\_\_
85. The symbol for the element, tin, is Ti. \_\_\_\_
86. The symbol, Sn, is the symbol for the element named scandium. \_\_\_\_
91. The compound, Cr<sub>2</sub>O<sub>3</sub>, contains chromium and oxygen combined in a ratio of 2.167 grams of chromium to 1.000 gram of oxygen. Another compound containing chromium and oxygen gave a different analysis and properties—a 2.500 g sample of this second compound contains 1.300 grams of chromium. This works out to a different ratio. What is the formula for this compound? \_\_\_\_\_
93. Naturally occurring silver consists of two isotopes  
<sup>107</sup>Ag, 106.905092 u    <sup>109</sup>Ag, 108.904757 u  
 The atomic weight of naturally occurring silver is listed in the Handbook as 107.868 u. From this data, calculate the percent of the <sup>107</sup>Ag isotope in naturally occurring silver. \_\_\_\_\_