A. Multiple Choice

Select the word, number, or phrase that best completes each statement and write its letter in the answer space at the left.

1. The properties of a substance that relate to its ability to form new substances are labeled
   a. intensive.    c. chemical.
   b. extensive.    d. physical.

2. The percentage of oxygen by mass in water is
   a. greatest when water is a solid.
   b. greatest when water is a liquid.
   c. greatest when water is a vapor.
   d. the same in all phases.

3. Generally, when a solid substance is heated its volume increases. The effect of increased temperature on the density of the substance then is
   a. to leave the density unchanged.
   b. to increase the density.
   c. to decrease the density.
   d. impossible to predict.

4. The ratio of the mass of a sample of matter to its volume is its
   a. buoyancy.    c. density.
   b. weight.      d. specific gravity.

5. All of the following are examples of extensive properties except
   a. temperature.    c. weight.
   b. volume.        d. mass.

6. Properties used to identify substances are usually those that are
   a. associated with the general properties of all matter.
   b. dependent on the amount of the substance.
   c. independent of the state of matter of the substance.
   d. recognized by direct observation.

7. Which of the following groups would include more than one substance?
   a. elements    c. mixtures
   b. compounds   d. none of the above

8. Any mixture of two substances, such as salt and sugar, would
   a. have the same properties throughout the mixture.
   b. have to be separated by chemical means.
   c. have new properties different from those of salt and sugar.
   d. retain the properties of the original substances.

9. A compound differs from a mixture in all of the following characteristics except
   a. the components are chemically combined.
   b. the ratio of components present is constant.
   c. they can be broken down by chemical means.
   d. the components have different properties than when they are separated.

10. Matter is classified by chemists into three groups—elements, compounds, and mixtures. Which of these categories could be described as including only substances?
    a. elements and compounds    c. elements and mixtures
    b. compounds and mixtures    d. all of the above
4 Matter (continued)

11. The most reliable property used to describe the quantity of a sample of matter is
   a. weight.       c. mass.
   b. volume.       d. density.

12. The heating of sugar produces a chemical change in which two new substances are
   formed. The new substances are
   a. syrup and hydrogen.       c. starch and water.
   b. oxygen and carbon.        d. water and carbon.

13. Chemical changes differ from physical changes because in chemical changes,
   a. new substances are formed.       c. a change in mass occurs.
   b. properties change.       d. less energy change takes place.

14. Two characteristics of all matter are that matter
   a. has mass and a definite shape.
   b. combines with other matter and has mass.
   c. has mass and occupies space.
   d. combines with other matter and occupies space.

15. Chemical symbols for the elements are usually restricted to one or two letters.
   A further restriction is that
   a. both letters are capitalized.
   b. only the first letter is capitalized.
   c. only the second letter is capitalized.
   d. neither letter can be capitalized.

16. The most abundant element in the earth is
   a. oxygen.       b. nitrogen.       c. silicon.       d. hydrogen.

17. The total mass of the substances taking part in a chemical change
   a. always increases.
   b. always decreases.
   c. remains unchanged.
   d. sometimes increases and sometimes decreases.

18. Energy is involved in both physical and chemical changes. The energy in chemical
   changes compared to physical changes is generally
   a. greater.       c. no different.
   b. the same.       d. greater in some but smaller in others.

19. Which of the following changes would be considered a chemical change?
   a. rusting of iron
   b. magnetizing of iron
   c. melting of iron
   d. bending of iron

20. Elements are found in nature
   a. in a free or elemental state.
   b. combined with other elements.
   c. either free or in a combined state.
   d. only in a combined state.

B. Problems
Solve the following problems in the spaces provided. Show all your work.

21. The silver in a piece of jewelry has a volume of 0.25 cm³. If the density of silver is 10.5 g/cm³
    what is the mass of the silver in the piece of jewelry?
22. What is the density of a metal if a 2.00 cm$^3$ sample of the metal has a mass of 15.8 g?

23. The volumes and masses of several different size samples of an unknown mineral are measured. The values are plotted on a mass vs. volume graph as shown below. What is the approximate density of the mineral as shown by the graph?

C. Essay Question

24. What clues could you use to determine whether a change is a physical change or a chemical change?
4 Matter (continued)

A. Multiple Choice
Write the letter of the best answer in the space at the left.

25. Which of the following kinds of matter can be either homogeneous or heterogeneous?
   a. elements
   b. compounds
   c. mixtures
   d. all of the above

26. The variation of the mass with the volume of a substance is
   a. directly proportional to the volume.
   b. inversely proportional to the volume.
   c. equal to the volume.
   d. unrelated to the volume.

27. When magnesium burns in air the magnesium combines with 64 g of oxygen to form
   161.2 g of magnesium oxide. How much magnesium is burned in the reaction?
   a. 40.0 g   b. 48.6 g   c. 64.0 g   d. 97.2 g

B. Problems
Solve the following problems in the spaces provided. Show all your work.

28. What volume of water will a 81.0 g sample of aluminum displace? The density of aluminum is
   2.70 g/cm³.

29. An 8.0 cm³ sample of silver has a mass of 84.0 g. What is the mass of a 164 cm³ sample of
   silver?

C. Essay Question

30. Lavoisier's conclusion "that mass is not created nor destroyed in chemical changes" had a large
    impact on understanding chemical reactions. Give examples of two applications from this that can
    be made to chemical reactions.