

1. A beaker contains both alcohol and water. These liquids can be separated by distillation because the liquids have different
- 1) boiling points
  - 2) densities
  - 3) particle sizes
  - 4) solubilities
2. Tetrachloromethane,  $\text{CCl}_4$ , is classified as a
- 1) compound because the atoms of the elements are combined in a fixed proportion
  - 2) compound because the atoms of the elements are combined in a proportion that varies
  - 3) mixture because the atoms of the elements are combined in a fixed proportion
  - 4) mixture because the atoms of the elements are combined in a proportion that varies
3. A sample of an element has a mass of 34.261 grams and a volume of 3.8 cubic centimeters. To which number of significant figures should the calculated density of the sample be expressed?
- 1) 5
  - 2) 2
  - 3) 3
  - 4) 4
4. Which material is a mixture?
- 1) water
  - 2) air
  - 3) methane
  - 4) magnesium
5. When sample  $X$  is passed through a filter paper a white residue,  $Y$ , remains on the paper and a clear liquid,  $Z$ , passes through. When liquid  $Z$  is vaporized, another white residue remains. Sample  $X$  is best classified as
- 1) an element
  - 2) a compound
  - 3) a heterogeneous mixture
  - 4) a homogeneous mixture
6. Which must be a mixture of substances?
- 1) solid
  - 2) liquid
  - 3) gas
  - 4) solution
7. Which statement is an identifying characteristic of a mixture?
- 1) A mixture can consist of a single element.
  - 2) A mixture can be separated by physical means.
  - 3) A mixture must have a definite composition by weight.
  - 4) A mixture must be homogeneous.
8. Which of these terms refers to matter that could be heterogeneous?
- 1) element
  - 2) mixture
  - 3) compound
  - 4) solution
9. A mixture of crystals of salt and sugar is added to water and stirred until all solids have dissolved. Which statement best describes the resulting mixture?
- 1) The mixture is homogeneous and can be separated by filtration.
  - 2) The mixture is homogeneous and cannot be separated by filtration.
  - 3) The mixture is heterogeneous and can be separated by filtration.
  - 4) The mixture is heterogeneous and cannot be separated by filtration.
10. A student in a laboratory determined the boiling point of a substance to be  $71.8^\circ\text{C}$ . The accepted value for the boiling point of this substance is  $70.2^\circ\text{C}$ . What is the percent error of the student's measurement?
- 1) 1.60%
  - 2) 2.28%
  - 3) 2.23%
  - 4) 160.0%
11. Which substance can *not* be decomposed by a chemical change?
- 1) ammonia
  - 2) copper
  - 3) propanol
  - 4) water
12. Which mass measurement contains four significant figures?
- 1) 0.086 g
  - 2) 0.431 g
  - 3) 1003 g
  - 4) 3870 g

13. A chemical formula is an expression used to represent

- 1) mixtures, only
- 2) elements, only
- 3) compounds, only
- 4) compounds and elements

14. One similarity between all mixtures and compounds is that both

- 1) are heterogeneous
- 2) are homogeneous
- 3) combine in a definite ratio
- 4) consist of two or more substances

15. Which quantity expresses the sum of the given masses to the correct number of significant figures?

$$\begin{array}{r} 22.1 \text{ g} \\ 375.66 \text{ g} \\ + 5400.132 \text{ g} \\ \hline \end{array}$$

- 1) 5800 g
- 2) 5798 g
- 3) 5797.9 g
- 4) 5797.892 g

16. The volume of a gas sample is 22.4 liters at STP. The density of the gas is 1.34 grams per liter. What is the mass of the gas sample, expressed to the correct number of significant figures?

- 1) 16.7 g
- 2) 17 g
- 3) 30 g
- 4) 30.0 g

17. Bronze contains 90 to 95 percent copper and 5 to 10 percent tin. Because these percentages can vary, bronze is classified as

- 1) a compound
- 2) an element
- 3) a mixture
- 4) a substance

18. A compound differs from a mixture in that a compound always has a

- 1) homogeneous composition
- 2) maximum of two components
- 3) minimum of three components
- 4) heterogeneous composition

19. Expressed to the correct number of significant figures, the sum of two masses is 445.2 grams. Which two masses produce this answer?

- 1) 210.10 g + 235.100 g
- 2) 210.100 g + 235.10 g
- 3) 210.1 g + 235.1 g
- 4) 210.10 g + 235.10 g

20. When a mixture of water, sand, and salt is filtered, what passes through the filter paper?

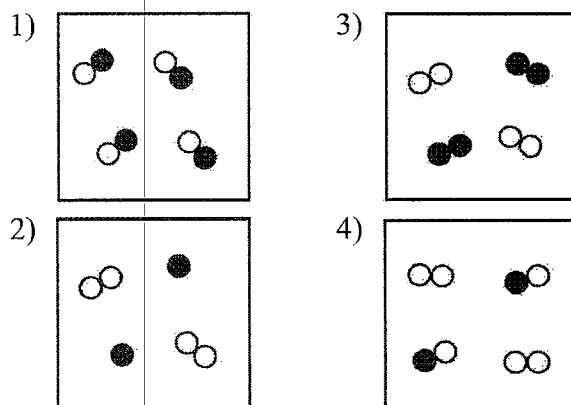
- 1) water, only
- 2) water and sand, only
- 3) water and salt, only
- 4) water, sand, and salt

21. What is the product of  $(2.324 \text{ cm} \times 1.11 \text{ cm})$  expressed to the correct number of significant figures?

- 1) 2.58 cm<sup>2</sup>
- 2) 2.5780 cm<sup>2</sup>
- 3) 2.5796 cm<sup>2</sup>
- 4) 2.57964 cm<sup>2</sup>

22. Which particle diagram represents a mixture of an element and a compound?

| Key |                                  |
|-----|----------------------------------|
| ○   | = an atom of an element          |
| ●   | = an atom of a different element |



23. Which type of matter is composed of two or more elements that are chemically combined in a fixed proportion?

- 1) solution
- 2) compound
- 3) homogeneous mixture
- 4) heterogeneous mixture

24. Which type of change must occur to form a compound?

- 1) chemical
- 2) physical
- 3) nuclear
- 4) phase

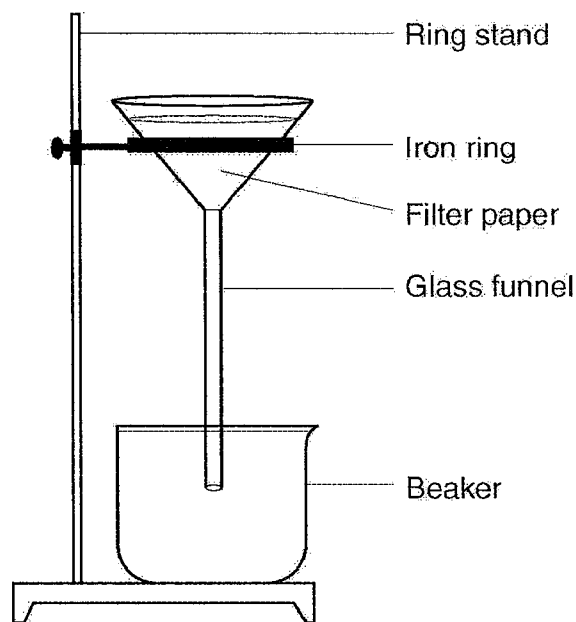
25. Which measurement has the greatest number of significant figures?

- 1) 6.060 mg
- 2) 60.6 mg
- 3) 606 mg
- 4) 60600 mg

26. Matter is classified as a

- 1) substance, only
- 2) substance or as a mixture of substances
- 3) homogenous mixture, only
- 4) homogenous mixture or as a heterogeneous mixture

27. Which mixture can be separated by using the equipment shown below?



- 1)  $\text{NaCl(aq)}$  and  $\text{SiO}_2(\text{s})$
- 2)  $\text{NaCl(aq)}$  and  $\text{C}_6\text{H}_{12}\text{O}_6(\text{aq})$
- 3)  $\text{CO}_2(\text{aq})$  and  $\text{NaCl(aq)}$
- 4)  $\text{CO}_2(\text{aq})$  and  $\text{C}_6\text{H}_{12}\text{O}_6(\text{aq})$

28. Two substances,  $A$  and  $Z$ , are to be identified. Substance  $A$  can *not* be broken down by a chemical change. Substance  $Z$  can be broken down by a chemical change. What can be concluded about these substances?

- 1) Both substances are elements.
- 2) Both substances are compounds.
- 3) Substance  $A$  is an element and substance  $Z$  is a compound.
- 4) Substance  $A$  is a compound and substance  $Z$  is an element.

29. Which terms are used to identify pure substances?

- 1) an element and a mixture
- 2) an element and a compound
- 3) a solution and a mixture
- 4) a solution and a compound

Base your answers to questions 30 through 32 on the information below.

A student prepared two mixtures, each in a labeled beaker. Enough water at 20.°C was used to make 100 milliliters of each mixture.

**Information about Two Mixtures at 20.°C**

|                      | Mixture 1   | Mixture 2   |
|----------------------|---|---|
| Composition          | NaCl in H <sub>2</sub> O  | Fe filings in H <sub>2</sub> O  |
| Student Observations | <ul style="list-style-type: none"><li>• colorless liquid</li><li>• no visible solid on bottom of beaker</li></ul> | <ul style="list-style-type: none"><li>• colorless liquid</li><li>• black solid on bottom of beaker</li></ul>                |
| Other Data           | <ul style="list-style-type: none"><li>• mass of NaCl(s) dissolved = 2.9 g</li></ul>                               | <ul style="list-style-type: none"><li>• mass of Fe(s) = 15.9 g</li><li>• density of Fe(s) = 7.87 g/cm<sup>3</sup></li></ul> |

30. Describe a procedure to physically remove the water from mixture 1.

31. Determine the volume of the Fe filings used to produce mixture 2.

32. Classify *each mixture* using the term “homogeneous” or the term “heterogeneous.”

33. Base your answer to the following question on the information below.

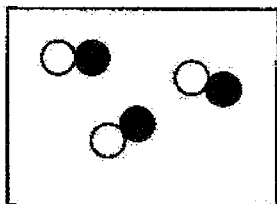
Carbon forms molecular compounds with some elements from Group 16. Two of these compounds are carbon dioxide,  $\text{CO}_2$ , and carbon disulfide,  $\text{CS}_2$ .

Carbon dioxide is a colorless, odorless gas at room temperature. At standard temperature and pressure,  $\text{CO}_2(\text{s})$  changes directly to  $\text{CO}_2(\text{g})$ .

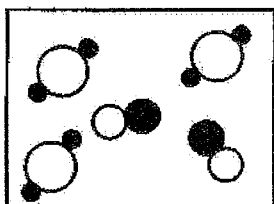
Carbon disulfide is formed by a direct reaction of carbon and sulfur. At room temperature,  $\text{CS}_2$  is a colorless liquid with an offensive odor. Carbon disulfide vapors are flammable.

Identify *one* physical property and *one* chemical property of  $\text{CS}_2$ .

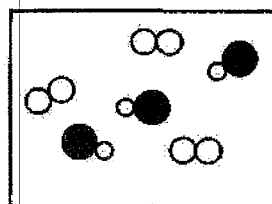
Base your answers to questions 34 and 35 on the pictures below:



A



B



C

34. Explain, in terms of the *composition*, why sample *A* represents a pure substance.

35. Contrast sample *A* and sample *B*, in terms of *compounds* and *mixtures*. Include both sample *A* and sample *B* in your answer.