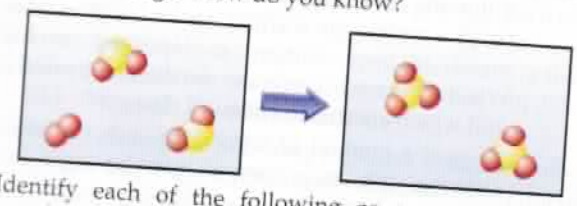
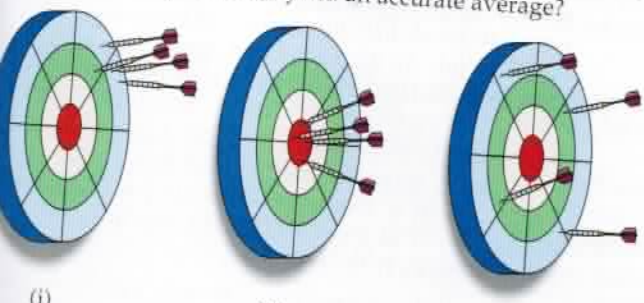
1.2 Does the following diagram represent a chemical or physical change? How do you know?



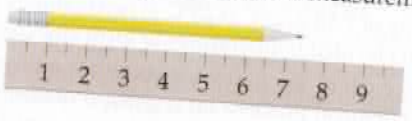
1.3 Identify each of the following as measurements of length, area, volume, mass, density, time, or temperature: **(a)** 5 ns, **(b)** 5.5 kg/m^3, **(c)** 0.88 pm, **(d)** 540 km^2, **(e)** 173 K, **(f)** 2 mm^3, **(g)** 23°C.

1.4 The following dartboards illustrate the types of errors often seen when one measurement is repeated several times. The bull's-eye represents the "true value," and the darts represent the experimental measurements. Which board best represents each of the following scenarios: **(a)** measurements both accurate and precise, **(b)** measurements precise but inaccurate, **(c)** measurements imprecise but yield an accurate average?



(i) (ii) (iii)

1.5 **(a)** What is the length of the pencil in the following figure if the scale reads in centimeters? How many significant figures are there in this measurement? **(b)** An oven thermometer with a circular scale reading degrees Fahrenheit is shown. What temperature does the scale indicate? How many significant figures are in the measurement?



1.6 What is wrong with the following statement? Twenty years ago an ancient artifact was determined to be 1900 years old. It must now be 1920 years old.

1.7 When you convert units, how do you decide which part of the conversion factor is in the numerator and which is in the denominator?

1.8 Draw a logic map indicating the steps you would take to convert miles per hour to kilometers per second. Write down the conversion factor for each step, as done on page 28.

ERCISES

ssification and Properties of Matter

following exercises are divided into sections that deal with ific topics in the chapter. These exercises are grouped in , with the answer given in the back of the book to the odd-bered one, as indicated by the red exercise number. Those ises whose number appears in brackets are more challeng-an the nonbracketed exercises.

Classify each of the following as a pure substance or a mixture; if a mixture, indicate whether it is homogeneous or heterogeneous: **(a)** rice pudding, **(b)** seawater, **(c)** magnesium, **(d)** gasoline.

Classify each of the following as a pure substance or a mixture; if a mixture, indicate whether it is homogeneous or heterogeneous: **(a)** air, **(b)** tomato juice, **(c)** iodine crystals, **(d)** sand.

Give the chemical symbols for the following elements: **(a)** sulfur, **(b)** potassium, **(c)** chlorine, **(d)** copper, **(e)** silicon, **(f)** nitrogen, **(g)** calcium, **(h)** helium.

Give the chemical symbol for the [illegible]

1.14 Name each of the following elements: **(a)** Co, **(b)** I, **(c)** Kr, **(d)** Hg, **(e)** As, **(f)** Ti, **(g)** K, **(h)** Ge.

1.15 A solid white substance A is heated strongly in the absence of air. It decomposes to form a new white substance B and a gas C. The gas has exactly the same properties as the product obtained when carbon is burned in an excess of oxygen. Based on these observations, can we determine whether solids A and B and the gas C are elements or compounds? Explain your conclusions for each substance.

1.16 In 1807 the English chemist Humphry Davy passed an electric current through molten potassium hydroxide and isolated a bright, shiny reactive substance. He claimed the discovery of a new element, which he named potassium. In those days, before the advent of modern instruments, what was the basis on which one could claim that a substance was an element?

1.17 In the process of attempting to characterize a substance, a chemist makes the following observations: The substance is a silvery [illegible]