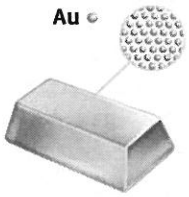
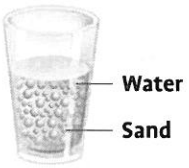
7. Using a particle model, draw a diagram of a pure substance and a mixture. *Various answers*



Pure substance



Mixture

Section 2 • Properties of Matter

Student textbook, pages 250 and 251

Characteristic Physical Properties (*pages 232 to 241*)

1. What is:
   a) The melting point of a substance? *The melting point is the temperature at which a solid becomes liquid.*
   b) The boiling point of a substance? *The boiling point is the temperature at which a liquid becomes a gas.*

2. Which of the materials listed below could be used to make a container to melt gold? Explain your answer.

Melting points of various materials

Material	Melting point (°C)
Aluminum	660
Gold	1064
Carbon	3650
Iron	1535
Magnesium	649
Lead	327

The melting point of the material must be higher than the melting point of gold; iron and carbon would therefore work well for this type of container.

3. *a)* Define density. *Density is a measurement of the amount of mass in a given space.*
   b) Calculate the density of 50 mL of a liquid weighing 63 g. Identify the substance using the density table on page 235.

$$\rho = \frac{m}{V}$$

$$= \frac{63\,g}{50\,mL}$$

$$= 1.26\ g/mL.$$

Therefore, the substance is glycerine.

4. What am I?
   a) A solution that cannot dissolve any more solute *Saturated solution*
   b) A substance dissolved by a solvent *Solute*
   c) A solid that accumulates in a solution that cannot dissolve any more solute *Residue*
   d) A solution in which the solvent is able to dissolve more solute *Unsaturated solution*

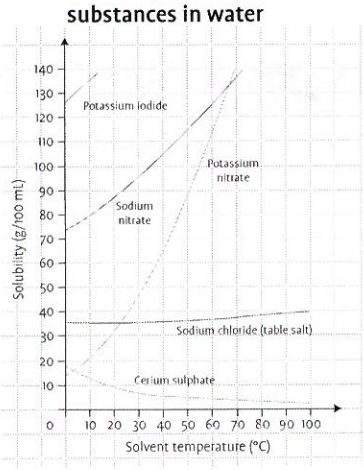
5. *a)* What is solubility? *Solubility is the property that indicates the maximum amount of solute that can be dissolved in a given volume of solvent to make a saturated solution.*
   b) If a maximum of 4 g of solute can be dissolved in 30 mL of water at 25°C, what amount of solute can be dissolved in 150 mL of water at the same temperature?

$$\frac{4\,g}{30\,mL} = \frac{X\,g}{150\,mL}$$

$$4g \times 150\ mL / 30.mL = 20\ g$$

6. Given that solubility of a solute increases with temperature, what will you observe if the temperature of a saturated solution is lowered? *Less solute can remain dissolved in the solution. The excess solute will return to its solid form, and the amount of residue will increase.*

7. **Solubility curves for various substances in water**



a) What is the most soluble solute in water at an ambient temperature of 20°C? *Potassium iodide*

b) What amount of potassium nitrate can be dissolved in 100 mL of water at 70°C? *Approximately 140 g*

c) Find two substances that have the same solubility in water at the same temperature, about 68°C. *Potassium nitrate and sodium nitrate*

Characteristic Chemical Properties (*pages 242 to 244*)

8. Which of the following properties is a chemical property?

a) Helium has a density of 11.4 g/cm^3.

b) Iron rusts when in contact with oxygen.

c) Salt water can conduct electricity.

Iron that rusts when in contact with oxygen is an example of a chemical property.

9. *a)* What is an indicator? *An indicator is a substance that reacts chemically in the presence of a specific substance.*

b) You are taking a urine test using two indicators: cobalt chloride test paper and biuret. The cobalt chloride test paper turns pink and the biuret turns purple. What conclusions can you draw from these results? Refer to Table 8 on pages 243 and 244.

The urine tested contains water and proteins.

Properties of Solutions (*pages 244 to 249*)

10. What information does a solution's concentration provide? *The concentration provides the ratio of the amount of solute to the total quantity of solution.*

11. Find the concentrations of the following solutions in g/L, then arrange the results in ascending order:

a) 4.5 g/45 mL *100 g/L*

b) 7 kg/1000 L *7 g/L*

c) 45 g/350 mL *128.57 g/L*

d) 7% m/V *70 g/L*

Ascending order: b, d, a, c

12. If there are 11 g of fat in a chocolate bar weighing 41 g, express the concentration in % m/m.
11 g / 41 g × 100 = 26.8% m/m of fat

13. Convert the following concentrations to be expressed in the same units of measurement, then arrange them in ascending order:

a) 4 g/100 mL *4% m/V*

b) 0.5 mg/mL *0.05% m/V*

c) 5 g/L *0.5% m/V*

d) 350 mg/L *0.035% m/V*

e) 5% m/V *5% m/V*

Ascending order: d, b, c, a, e