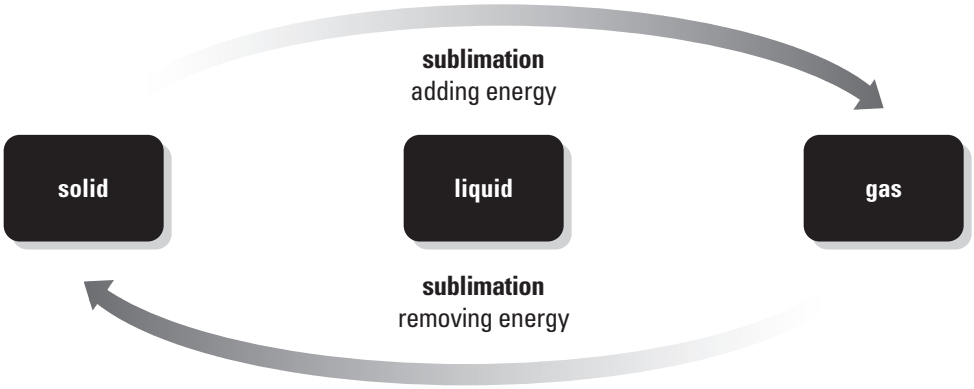


3. Students should be able to assess their answers based on the definition of a mixture (i.e., components retaining their own identity). Similarly, their classifications of heterogeneous and homogeneous mixtures should be based on whether the components are visible or not.
4. Students should know that water is a pure substance (because electrolysis is required to separate its component elements). How they *know* that other substances such as carbon dioxide, and glucose, are pure substances may be more difficult for them to explain. Chances are, they know because they have learned that these substances are made up of elements and that they are not easily separated into their component elements.
5. Students will likely suggest one or several series of filtering, as well as distillation. Some students may suggest that a chemical could be added to clean the water (by precipitation, for example), even if they do not know what chemical that might be. Accept any reasonable answer.
6. This question provides a good "snapshot" of students' prior knowledge and critical thinking skills.
   **(a)** Focus on students' reasoning here, rather than the correctness of their answers. Filtering and chemical purifying, for example, are reasonable ideas.
   **(b)** The water likely will not be drinkable. However, some students may know of chemical products available to campers for making water potable.
   **(c)** Again, the emphasis here should be on reasoning.

## Chapter 1 Review Answers

**Student Textbook pages 29–31**

### Answers to Knowledge/Understanding Questions

1. **(a)** chemical **(b)** physical **(c)** physical **(d)** chemical
2. Physical changes do not alter the composition of a substance, whereas chemical changes do.
3. **(a)** dissolving; physical **(b)** reactivity; chemical **(c)** magnetism; physical **(d)** freezing point; physical **(e)** evaporation; physical **(f)** decomposition or reactivity; chemical
4. Exp. I: low accuracy, fair precision; Exp. II: low accuracy, low precision; Exp. III: low accuracy, high precision; Exp. IV: high accuracy, high precision

**5. (a)** Students' answers will vary, but should not be more precise than to a single decimal place for all three containers because none is finely calibrated. Typical answers could be 125 mL (for A), 3.8 mL (for B), and 40 mL (for C)

**(b)** Assuming the previous values, approximately 170 mL.

**(c)** the graduated cylinder, because it is more finely calibrated

**6. (a)** $1.0 \times 10^4$ g **(b)** $2.23 \times 10^{-1}$ m

**(c)** 52 $cm^3$ **(d)** $1.0 \times 10^3$ $cm^3$

**7. (a)** 1 **(b)** 4

**(c)** 1 **(d)** 2

**(e)** 5 **(f)** 4

**(g)** 5

**8. (a)** If the value 5700 km were measured accurately, all four digits could be significant. If rewritten in scientific notation as $5.7 \times 10^3$, only two digits would be significant. The value could have three significant digits if you consider the fact that the measured value could be 5769 or 5701.

**(b)** $5.7 \times 10^3$ km

**(c)** $5.700 \times 10^3$ km

**9. (a)** 8.73 mL **(b)** $1.1 \times 10^5$ $m^2$

**(c)** $2.2 \times 10^2$ kg/L **(d)** 0.7

**(e)** $1.225 \times 10^4$ L **(f)** $1.8 \times 10^1$ g/mL

**10. (a)** $6.21 \times 10^3$ **(b)** $3 \times 10^1$

**(c)** $6 \times 10^2$ **(d)** $1.73 \times 10^1$

**11.** $1.9 \times 10^4$ $cm^3$

**12. (a)** 24°C

**(b)** the tenths digit, to the right of the decimal

**13. (a)** chemical **(b)** physical

**(c)** chemical **(d)** physical

## Answers to Inquiry Questions

**14. (b)** Student A

**(c)** Student D

**(d)** Student D

**15.** Pure hydrogen peroxide is a colourless, syrup-like liquid. Exposure to heat, light, and chemical contaminants cause it to decompose, forming oxygen and water and releasing heat. In concentrated form, this heat may cause a violent explosion. This property makes hydrogen peroxide (as a 90% solution) useful as a source of propulsion in rocket fuel. Pharmacy-available hydrogen peroxide is typically a 3% solution, which is adequate for safe handling. Nevertheless, any students wishing to experiment with hydrogen peroxide should observe proper safety precautions. All used solutions should be returned to you for safe disposal.

Students must recognize that they will be investigating the properties of a solution of hydrogen peroxide and water. Knowing the physical and chemical properties of water gives students a control against which they can compare their findings. For example, students could investigate and compare pharmaceutical hydrogen peroxide with water in terms of boiling point and freezing point. They can contrast its appearance, viscosity, "feel", and (properly) smell with that of water. Chemically, students could examine questions like: Does hydrogen peroxide react if it is left in sunlight? (It should bubble.) or Added to a piece of potato? (It does—oxygen bubbles form slowly on the potato, just as what happens with an open wound, due to the presence of an enzyme called catalase.)