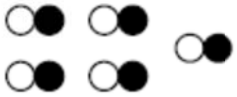
2.2 Review Questions, p. 83

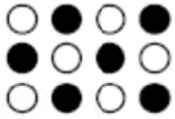
1. For example: copper (in wires), water, milk

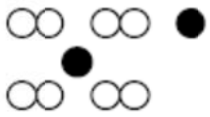
2. A compound. It's easy to demonstrate that you can decompose a substance but difficult to prove that you can't.

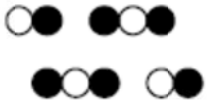
3. a. properties
   b. composition
   c. properties (the particle sizes are only rough guidelines)

4. For example: element 

   molecular compound 

   ionic compound 

   a mixture of elements 

   a mixture of compounds 

5. a. compound
   b. mixture
   c. compound
   d. mixture
   e. element
   f. mixture
   g. element
   h. mixture

6. a. metalloid
   b. metal
   c. non-metal
   d. non-metal

7. conduct heat and electricity, malleable, ductile, lustrous

8.

Compound	**Organic** or **Inorganic**	**Binary** or **Non-Binary**	**Molecular** or **Ionic**	**Acid, Base, Salt** or **None of these**
$CaCl_2$	inorganic	binary	ionic	salt
CH_3CH_2OH	organic	non-binary	molecular	none of these
NH_4ClO_3	inorganic	non-binary	ionic	salt
KOH	inorganic	non-binary	ionic	base
C_3H_8	organic	binary	molecular	none of these
H_3PO_4	inorganic	non-binary	molecular	acid
$Ba(NO_3)_2$	inorganic	non-binary	ionic	salt
CO_2	inorganic	binary	molecular	none of these
$Al(OH)_3$	inorganic	non-binary	ionic	base

9. A mixture of metals (alloy). The same components could be mixed in different proportions. Any material having atoms that are not chemically combined in a fixed ratio is a chemical mixture and would be so even if those atoms were organized in a uniform pattern.

10. Atoms are not homogeneous (the same throughout) and therefore nothing composed of atoms is truly homogeneous.

11. Yes. The different allotropes of an element are different substances. Even though they are composed of the same type of atom, the atoms are grouped or arranged differently resulting in the allotropes having different physical and chemical properties.

12. a. molecule
    b. neutral atom
    c. ion
    d. neutral atom
    e. molecule
    f. ion

13.

	Solution	Colloid	Heterogeneous Mixture
All particles are less than 1 nm in size	✓		
Gravel			✓
Does not appear the same throughout			✓
Forms a sediment if left undisturbed			✓
Has a solute and a solvent	✓		
Milk	✓	✓	
Exhibits the Tyndall effect		✓	✓
Homogeneous mixture	✓	✓	
Coarse suspension			✓
Orange juice with pulp	✓		✓
May be separated by centrifugation		✓	✓

14. A suspension will settle out if left undisturbed whereas a colloid will not settle out because it's dispersed particles are smaller.

15. Both. Some dust particles settle and some don't.

16. a. Salt water is a denser solution than fresh water.

(Fresh water is not pure water. It also has substances dissolved in it.)

b. The colloid particles were dispersed in water.

2.3 Review Questions, p. 94

1. Decomposing compounds is a chemical change (new substances are produced) OR Decomposition disassembles substances whereas separation sorts substances.

2. To allow the substances to be identified or to obtain the substances for their useful properties, their intrinsic values or more commonly to use the substances to produce useful mixtures of our own design

3. viscosity

4. Forces such as buoyancy and fluid friction become meaningless when the size of the particle approaches the size of the supporting medium's particles.

5. a. A resistance to change in motion
   b. As the tube changes its direction, the suspended particles initially maintain their linear motion.

6. of their greater inertia

7. For example:
   i. Use a magnet to remove the iron filings.
   ii. Add water to dissolve the sugar and then filter out the sand or decant the liquid.
   iii. Evaporate the water to recover the solid sugar.

8. To filter particulate matter such as dust particles out of the air

9. Each substance travels through the stationary phase at its own characteristic rate, according to its relative affinities for the two phases.

10. Spraying chemicals on a chromatogram that form coloured complexes with the separated substances to reveal their location

11. The process of rinsing the separated substances off the chromatogram. Their recovery is usually necessary so that they can be identified through further analysis.

12. The ink itself might run through the stationary phase and become mixed with the sample substances whereas the graphite in pencils is insoluble in most solvents.

13. $$R_f = \frac{4.9 \text{ cm}}{5.4 \text{ cm}} = 0.91$$

14. Liquids can evaporate long before their boiling point; thus the distillate still contains some of each liquid, although it is now richer in the liquid with the lower boiling point.

15. How far apart their boiling points are and the length of the fractionating column

16. Cool the air until the oxygen condenses out at –183°C. Continued cooling would condense the nitrogen at –196°C if you wished to collect it as a liquid.

17. Distillation because of the heating or cooling required

18. Froth flotations require adding chemicals to the mixture that float the target substance to the surface. In density separations, the substance floats to the surface of its own accord.