Chapter Project Worksheet 1

1. The object to be massed is placed on one side of the balance. Objects with known masses are placed on the other side of the arm until the balance arm is level.

2. Sample answer: Balance arm, center pivot point, containers to hold objects at each end of the balance arm, indicator scale to show when the balance arm is level

3. Sample answer: Volume; I can measure the mass of the substance in the same container that I will use to measure volume.

4. Sample answer: Each substance will have its own container. I will use identical containers for each substance.

5. Sample answer: I will measure an exact volume of water, such as 20 ml, in a graduated cylinder, pour it into my container, and draw a line at the water level. I will test the accuracy by filling the container with water to the line and measuring the volume of the water in the graduated cylinder. If it doesn't measure 20 ml, then I will readjust the line on my container.

Worksheet 2

1. Most students will have the same volume for each material, but the mass for each will differ depending on the density of the material.

2. Density = [Mass (g) / Volume (cm^3)]

3. In most cases, students will measure mass in grams and volume in milliliters. 1 mL = 1 cm^3

4. Check student calculations for accuracy.

Describing Matter Guided Reading and Study

Use Target Reading Skills

matter Matter is anything that has mass and takes up space.

chemistry Chemistry is the study of the properties of matter and how matter changes.

substance A substance is a single kind of matter that is pure and has a specific set of properties.

physical property A physical property can be observed without changing a substance into another substance.

chemical property A chemical property describes the ability of a substance to change into a different substance.

element An element is a pure substance that cannot be broken down into any other substance by chemical or physical means.

atom An atom is the basic particle of an element.

chemical bond A chemical bond is a force of attraction between two atoms.

molecule A molecule is a particle formed when two or more atoms are held together by chemical bonds.

compound A compound is a pure substance made of two or more elements chemically combined in a set ratio.

chemical formula A chemical formula shows the elements in the compound and the ratio of atoms.

mixture A mixture is two or more substances that are together in the same place but are not chemically combined.

heterogeneous mixture The different parts in a heterogeneous mixture can be seen.

homogeneous mixture The substances in a homogeneous mixture are so evenly mixed that the different parts cannot be seen.

solution A solution is an example of a homogenous mixture.

1. chemistry

2. true

3. physical

4. **a.** chemical **b.** physical **c.** physical **d.** chemical **e.** physical **f.** chemical

5. element

6. false

7. chemical bond

8. two

9. A pure substance made of two or more elements chemically combined in a set ratio

10. 1 carbon atom to 2 oxygen atoms

11. CO

12. false

13. mixture

14. **a.** Each substance in a mixture keeps its individual properties. **b.** The parts of a mixture are not combined in a set ratio.

15. a, d

16. true

17. Each substance in a mixture keeps its own properties. The parts of a mixture are not combined in a set ratio.

Describing Matter
Review and Reinforce

1. physical
2. chemical
3. physical
4. physical
5. chemical
6. physical
7. A compound is made of two or more elements that are chemically combined. Compounds have properties that are different from those of the uncombined elements.
8. Each substance in a mixture keeps its individual properties. The parts of a mixture are not combined in a set ratio.
9. c
10. g
11. e
12. a
13. j
14. d
15. i
16. b
17. h
18. f

Describing Matter
Enrich

1. The wood chips floated on the surface of the water and were removed from the mixture using either the strainer or the slotted spoon.
2. Once the wood chips were separated from the mixture, the sand could be removed by carefully pouring the mixture through the strainer lined with a coffee filter.
3. The sugar can be separated from the water by allowing the water to evaporate.
4. Yes. The water and sugar formed a solution because the two parts were so evenly mixed that you could not see them.

Measuring Matter
Guided Reading and Study

Use Target Reading Skills
Sample questions and answers:
How are weight and mass different? (Weight is a measure of the force of gravity on an object. Mass is a measure of the amount of matter in an object.
What is volume? (Volume is the amount of space that matter occupies.)
How is density determined? (Density is determined by dividing the mass of a sample of matter by its volume.)

1. weight
2. false
3. Mass is the measurement of the amount of matter in an object.
4. Unlike weight, mass does not change with location, even when the force of gravity changes.
5. the International System of Units
6. kilogram
7. volume
8. liter (L), milliliter (mL), cubic centimeter (cm^3)
9. volume = length × width × height
10. Sand and feathers have different densities, and therefore, different volumes.
11. Density = [Mass/Volume]
12. Since wood floats, its density is less than the density of water, 1 g/cm^3. Since iron sinks, its density is greater than the density of water.
13. false

Measuring Matter
Review and Reinforce

1. volume = 5 cm × 3 cm × 10 cm = 150 cm^3
2. density = 180 g ÷ 150 cm^3 = 1.2 g/cm^3
3. The mass of the solid would be the same on the moon, but the weight would change. Weight is based on the force of gravity. Weight changes from planet to planet, because the force of gravity changes. Mass stays the same no matter where it is measured.
4. The solid has a density greater than that of water (1.0 g/cm^3).
5. No. Density is mass divided by volume. The same dimensions will always result in the same volume, but the mass depends on the material that makes up the solid.
6. the amount of matter in an object
7. the amount of space that matter occupies
8. an object's mass divided by its volume
9. Sample answer: Mass: grams (g), kilograms (kg); Volume: liters (L), cubic centimeters (cm^3); Density: grams per cubic centimeter (g/cm^3), grams per milliliter (g/mL)

Measuring Matter
Enrich

1. The units of measurement that are used on Earth are based on familiar objects. These objects may not be familiar to extraterrestrial civilizations.
2. Sample answer: A unit of time, what a human looks like
3. It would be easier to communicate information about mass. The mass of an object would be the same on Earth as on other planets. However, the weight of an object on Earth could be more or less than its weight on another planet depending on that planet's force of gravity.
4. The drawing represents where the spacecraft was launched from Earth and its path through the solar system.

Making Sense of Density
Skills Lab

For answers, see Teacher's Edition.

Changes in Matter
Guided Reading and Study

Use Target Reading Skills
Sample effects:
One or more new substances are produced.
Energy is either absorbed or released.
1. Any change that changes the form or appearance of matter but does not make any substance in the matter into a different substance
2. false
3. a, c, d
4. A chemical change is a change in matter that produces one or more new substances.
5. Unlike a physical change, a chemical change produces new substances with properties different from those of the original substances.
6. c, d
7. law of conservation of mass
8. energy
9. true
10. Temperature is the average energy of motion of the particles in matter. Thermal energy is the total energy of all the particles in an object.
11. **a.** exothermic **b.** endothermic

Changes in Matter
Review and Reinforce

1. physical and chemical
2. chemical
3. physical
4. physical
5. chemical
6. Yes. This is called an exothermic change. Yes. This is an endothermic change. No. Every chemical or physical change in matter includes a change in energy.
7. matter
8. true
9. true
10. true
11. exothermic change
12. endothermic change

Changes in Matter
Enrich

1. The milk is a white liquid that flows well. The vinegar is a clear liquid that smells sour. The baking soda is a white powder.
2. The glue is white, sticky, and very thick.
3. Chemical change; the glue had different properties from the materials used to make it.
4. Yes. Every chemical and physical change in matter includes a change in energy.

Energy and Matter
Guided Reading and Study

Use Target Reading Skills
Sample details:
a. Chemical energy is the energy stored in the chemical bonds between atoms.
b. Electromagnetic energy travels through space as waves.
c. Electrical energy is the energy of electrically charged particles moving from one place to another.

1. true
2. Potential, kinetic, chemical, electromagnetic, electrical, and thermal
3. kinetic
4. potential
5. b, c
6. The internal energy stored in the chemical bonds between atoms
7. b
8. Sample answer: Microwaves in a microwave oven can changes a frozen block of spaghetti and sauce into a hot meal, which is a physical change.
9. electrical
10. electrodes
11. b, d
12. false
13. electromagnetic, chemical

Energy and Matter
Review and Reinforce

1. Kinetic
2. Sample answer: Stretched rubber band
3. Chemical
4. Sample answer: Visible light
5. Electrical
6. Sample answer: Heat
7. Chemical energy may be changed to other forms of energy. Other forms of energy may also be changed to chemical energy.
8. b
9. e
10. d
11. a
12. f
13. c

Energy and Matter
Enrich

1. The energy originally comes from the sun.
2. Sample flowchart: Sun → plants → coal → steam → turbine → microwave oven → heated water
3. Sample answer: (Sun) electromagnetic → (plants) chemical → (coal) chemical → (steam) thermal → (turbine) kinetic → (microwave oven) electrical → (water) thermal
4. No. Energy is never lost when it changes form.

Isolating Copper by Electrolysis
Skills Lab

For answers, see Teacher's Edition.

Key Terms

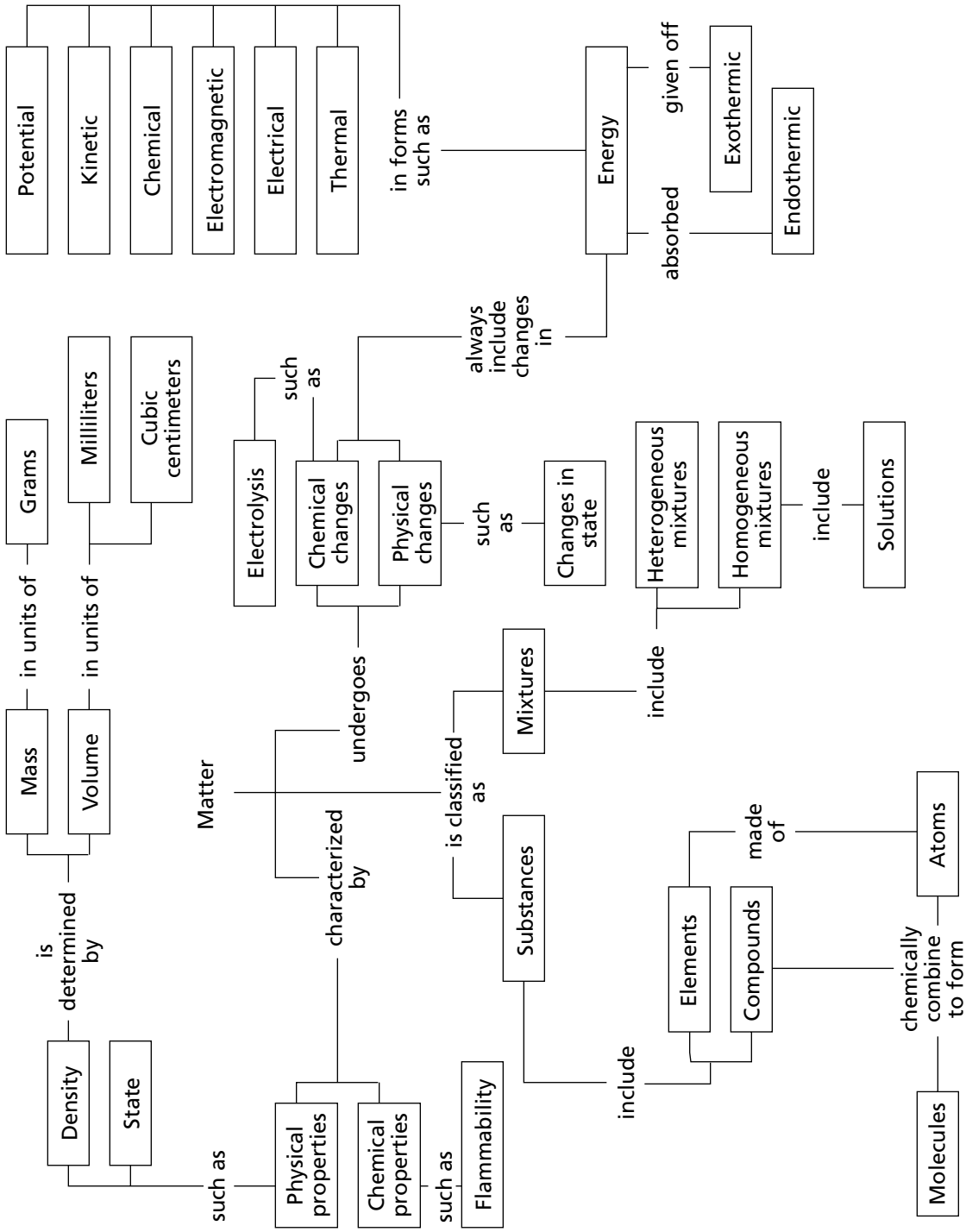
1. chemistry
2. Matter
3. substance
4. physical
5. chemical
6. elements
7. compound
8. mixture
9. heterogeneous
10. homogeneous
11. atom
12. chemical bond
13. molecule
14. weight
15. mass
16. volume
17. density

Math Skills

1. $300\ cm^3$
2. Volume = $25\ cm \times 8\ cm \times 12\ cm = 2{,}400\ cm^3$
3. $3\ g/cm^3$
4. Density $= \frac{13\ g}{13\ mL} = 1\ g/mL$
5. Density $= \frac{94.5\ g}{7\ mL} = 13.5\ g/cm^3$
6. Density $= \frac{26\ g}{20\ mL} = 1.3\ g/mL$

Connecting Concepts

This concept map is only one way to represent the main ideas and relationships in this chapter. Accept other logical answers from students.



Laboratory Investigation

Changes in a Burning Candle

Pre-Lab Discussion

1. A physical change is any change that alters the form or appearance of matter but does not make any substance in the matter into a different substance.

2. A chemical change is a change in matter that produces one or more new substances.

Observations

Procedure	Observations
Candle burning (Step 2)	The candle wax melts. The vapor burns. The inner part of the flame is blue and the outer part is yellow. The flame looks hollow at the bottom.
Beaker above flame (Step 3)	Water condenses on the beaker. The beaker is blackened.
Flask over candle (Step 4)	The flame goes out, and water rises inside the flask.
Limewater in flask (Step 5)	The limewater solution becomes cloudy.

Analyze and Conclude

1. Physical changes include melting of the candle wax and the condensation of water vapor on the beaker.

2. The burning of the candle wax and the clouding of the limewater were chemical changes.

3. Air (oxygen) and heat are also needed for combustion. The flame went out when it was cut off from the air. A match (heat) was needed to start the candle burning.

4. Carbon dioxide and water vapor are two chemical products of combustion. Limewater turned cloudy, showing that carbon dioxide was present. Water condensed on the beaker above the flame.

Critical Thinking and Applications

1. The carbon dioxide gas produced by the combustion of the candle is heavier than air. To make sure the gas is captured, water is used to trap the gas.

2. Candle + Oxygen (air) → Carbon dioxide + Water

More to Explore

Observations

The first candle reignites.

Analyze and Conclude

The vapor from the candle wax burned. This was shown by the fact that the first candle was reignited when the flame from the second candle was placed in the smoke of the first candle even though its flame did not touch the wick of the first candle.

Performance Assessment

1. Sample: At the top of my poster, I wrote a definition of matter. On the upper left, I defined physical and chemical properties. I used a picture of an icicle to show physical state, and a picture of a fire to show flammability. On the lower left, I used words to define physical and chemical changes. I used a picture of butter melting to show a physical change and a picture of wood burning to show a chemical change. On the upper right, I made a concept map to show how mixtures, substances, elements, and compounds are related. I also used a picture of lemonade to show a mixture, one of sugar to show a pure substance, one of water to show a compound, and one of a gold necklace to show an element. On the lower right of my poster, I defined and described atoms.

2. Sample: My poster teaches visitors that matter makes up everything in the universe. Matter has two kinds of properties—physical and chemical. Freezing point is a physical property and combining with oxygen is a chemical property. The melting of ice to water is an example of a physical change, and the burning of wood is an example of a chemical change. A mixture is made of two or more substances. A substance is made of only one type of matter. An element is a pure substance that cannot be broken down by chemical means. A compound is a pure substance that is formed from two or more elements. The basic particles of matter are called atoms. Atoms are very small and can form chemical bonds with other atoms.

3. Sample: I wanted to include more about atoms, but I ran out of room.

Chapter Test

1. a
2. b
3. d
4. c
5. a
6. c
7. d
8. c
9. d
10. a
11. molecule
12. density
13. temperature
14. element
15. energy
16. physical change
17. true
18. true
19. floats
20. solid
21. alcohol = 0.787 g/cm^3; corn syrup = 1.38 g/cm^3; cooking oil = 0.926 g/cm^3
22. **a.** alcohol
b. cooking oil
c. water
d. corn syrup
23. Weight is based on the force of gravity on an object, so it changes based on the object's location. The weight of an object on another planet is different than its weight on Earth because the force of gravity changes from planet to planet.
24. Sample answer: An element is a pure substance that cannot be broken down into any other substances. A compound is a pure substance made of two or more elements chemically combined in a set ratio.
25. Sample answer: According to the law of conservation of mass, matter is not created or destroyed in any chemical or physical change. When a candle burns, the products of burning, carbon dioxide and water, have the same mass as the candle wax and wick that burned away.
26. **a.** pure substance
b. mixture
c. mixture
d. pure substance
27. A compound is represented in figure d. Two different kinds of atoms are shown chemically combined (in molecules) in a set ratio.
28. Sample answer: As a person pushes a bike up the hill, the potential energy stored in the person and bike increases. The potential energy becomes kinetic energy as the person and the bike coast down the hill.
29. Sample answer: Both changes convert the substances from a solid to a liquid. However, melting ice does not change the identity of the substance, water. You can freeze the water again, and it turns back to ice. When table sugar becomes caramel, it becomes a new substance. The sugar crystals cannot be recovered by freezing.
30. Sample answer: Salt water is mixture that is a solution. The salt and water are so well blended that they appear to be one substance. Cereal with milk is a mixture that is not a solution. You can easily see and separate the pieces of cereal from the milk. Cereal with milk is a heterogeneous mixture.