

Matter—Properties and Changes

* 22, 23 (D.L.D.P.)

use models kin + show

Section 3.1 Properties of Matter

In your textbook, read about physical properties and chemical properties of matter.

Use each of the terms below just once to complete the passage.

6- chemical	1- mass	4- physical
5- density	3- properties	2- substance

Remember Density
Calcs

Matter is anything with (1) mass and volume. A
(2) substance is a form of matter with a uniform and unchanging composition.
Substances have specific, unchanging (3) properties that can be observed.
Substances have both physical and chemical properties. (4) Physical
properties can be observed without changing a substance's chemical composition. Color,
hardness, and (5) density are examples. Other properties cannot be
observed without changing the composition of a substance. These are called
(6) Chemical properties. An example is the tendency of iron to form
rust when exposed to air.

Label each property as either *physical* or *chemical*.

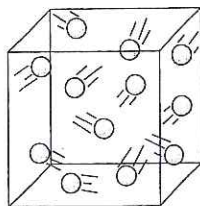
- P - just looking 7. Chemical formula H_2O (not reacting) (If you mean determining formula, then C.)
C - tried to react 8. Forms green carbonate when exposed to moist air
P 9. Remains unchanged when in the presence of nitrogen
P - phases are always 10. Colorless
C 11. Solid at normal temperatures and pressures
P - phase A 12. Ability to combine with another substance
P - phase 13. Melting point
P - phase 14. Liquid at normal temperatures and pressures
P 15. Boiling point is $100^\circ C$
P - mass vol 16. Conducts electricity
17. Density is $\frac{1g}{cm^3}$

Section 3.1 continued

In your textbook, read about states of matter.

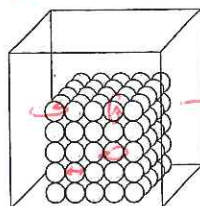
Label each drawing with one of these words: *solid*, *liquid*, *gas*.

18.



gas (plasma - ionized = charged)

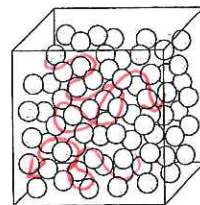
19.



still spin/vibrate... Just much closer.
Fixed in place

Solid

20.



- should show some motion!
slide & roll along side/past each other

liquid

thixotropic - acts like a solid until a shearing (spreading) force

For each statement below, write *true* or *false*.

F 21. All matter that we encounter in everyday life exists in one of three physical forms. (Plasma - in TV's)

T 22. A solid has definite shape and volume.

F 23. A liquid has a definite shape and takes on the volume of its container. *nope*

T 24. A gas has both the shape and the volume of its container.

F 25. The particles in a gas cannot be compressed into a smaller volume.

F 26. Liquids tend to contract when heated. *expand (most do)*

F 27. The particles in a solid are spaced far apart. *locked in place*

F 28. The words gas and vapor can be used interchangeably.

gas form temp
has to be heated (evaporate)

Section 3.2 Changes in Matter

In your textbook, read about physical change and chemical change.

What kinds of changes do these words indicate? Write each word under the correct heading. Use each word only once.

boil -P	crumple -P	crush -P	explode -C
burn -C	ferment -C	freeze -P	grind -P
condense -P	melt -P	oxidize -C	rot -C
corrode -C	rust -C	tarnish -C	vaporize -P

Physical Change

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

Chemical Change

9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____

For each item in Column A, write the letter of the matching item in Column B.

Column A

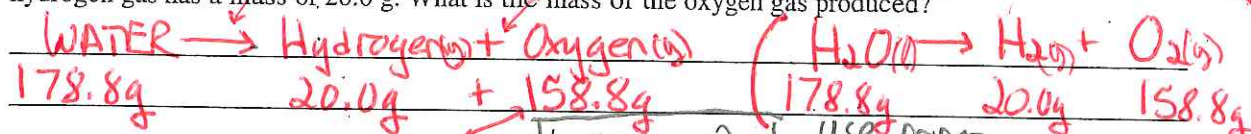
- C 17. The new substances that are formed in a chemical reaction
- A 18. A chemical reaction that involves one or more substances changing into new substances
- D 19. Shows the relationship between the reactants and products in a chemical reaction
- E 20. States that mass is neither created nor destroyed in any process
- B 21. The starting substances in a chemical reaction

Column B

- a. chemical change
- b. reactants
- c. products
- d. chemical equation
- e. law of conservation of mass

Answer the following question. Write an equation showing conservation of mass of reactants and products.

22. In a laboratory, 178.8 g of water is separated into hydrogen gas and oxygen gas. The hydrogen gas has a mass of 20.0 g. What is the mass of the oxygen gas produced?



$$= 1.588 \times 10^2 \text{ g}$$
 use proper Sci notation for test. (15)

$$\begin{array}{r} 178.8 \\ - 20.0 \\ \hline 158.8 \end{array}$$

★ All changes of state are physical

★ All reactivity are chemical

(even if subst. does not end up reacting)

Remember: Physical Δ's
Sublimation: directly from solid to a gas/vapor without ever becoming a liquid.

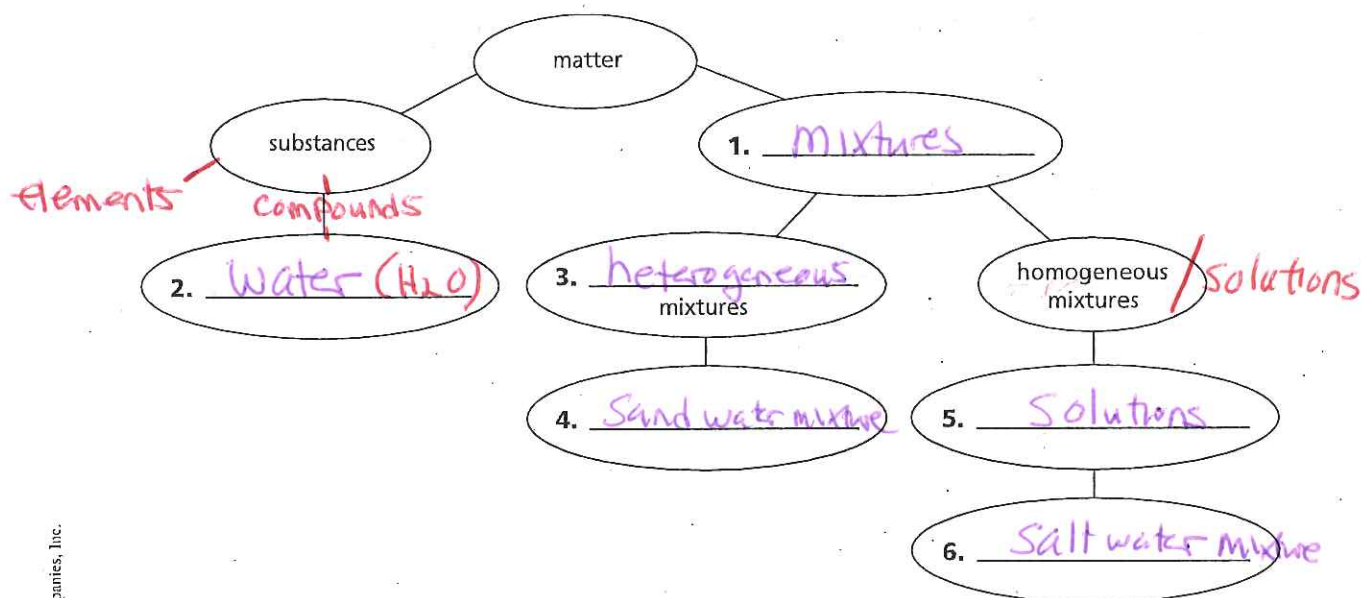
Deposition: directly from gas/vapor to solid without ever becoming a liquid.

Section 3.3 Mixtures of Matter

In your textbook, read about pure substances and mixtures.

Use the words below to complete the concept map.

heterogeneous mixtures	salt-water mixture solutions	sand-water mixture water
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In your textbook, read about separating mixtures.

For each item in Column A, write the letter of the matching item in Column B.

Column A

- B 7. Separates substances on the basis of the boiling points of the substances
- C 8. Separates by formation of solid, pure particles from a solution
- D 9. Separates substances based on their movement through a special paper
- A 10. Separates solids from liquids by using a porous barrier

Column B

- a. filtration
- b. distillation
- c. crystallization
- d. chromatography

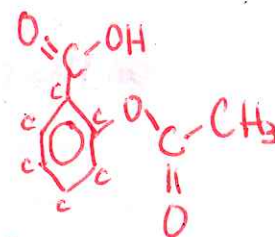
See your notes!

Section 3.4 Elements and Compounds

In your textbook, read about elements and compounds.

Circle the letter of the choice that best completes the statement or answers the question.

- A substance that cannot be separated into simpler substances by physical or chemical means is a(n)
 - compound.
 - mixture.
 - element.
 - period.
- A chemical combination of two or more different elements is a(n)
 - solution.
 - compound.
 - element.
 - period.
- Which of the following is an example of an element?
 - water
 - air
 - sugar
 - oxygen
- Which of the following is an example of a compound?
 - gold
 - silver
 - aspirin $C_9H_8O_4$
 - copper
- What are the horizontal rows in the periodic table called?
 - block elements
 - groups or families
 - grids
 - periods
- What are the vertical columns in the periodic table called?
 - block elements
 - groups or families
 - grids
 - periods



Label each substance as either an element or a compound.

- | | | | |
|----------------|--------------------|---------------------|------------|
| <u>E</u> _____ | 7. silicon | <u>E</u> _____ | 10. nickel |
| <u>C</u> _____ | 8. sodium chloride | <u>C</u> $(H_2O)_3$ | 11. ice |
| <u>E</u> _____ | 9. francium | | |

Write the symbol for each element. Use the periodic table on pages 72-73 in your textbook if you need help.

- | | | | |
|-----------------|-------------|-----------------|--------------|
| <u>Ne</u> _____ | 12. neon | <u>Ti</u> _____ | 15. titanium |
| <u>Ca</u> _____ | 13. calcium | <u>F</u> _____ | 16. fluorine |
| <u>Fe</u> _____ | 14. iron | | |

In your textbook, read about the law of definite proportions.

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Use the law of definite proportions and the equation below to answer the questions.

The law of definite proportions states that regardless of the amount, a compound is always composed of the same elements in the same proportion by mass.

$$\text{Mass percentage of an element (\%)} = \frac{\text{mass of element}}{\text{mass of compound}} \times 100\%$$

17. A 20.0-g sample of sucrose contains 8.4 g of carbon. What is the mass percentage of carbon in sucrose? Show your work.

$$\frac{8.4g}{20.0g} \times 100 = \boxed{42.0\%}$$

3

Section 3.4 continued

$$\text{Per Cent } \% = \frac{\text{Hwt of } O}{\text{Hwt of } S} \times 100 = \frac{1}{2} \times 100 = 50$$

18. Sucrose is 51.50% oxygen. How many grams of oxygen are in 20.0 g of sucrose? Show your work.

$$.515 \times 20.0 = 10.3 \text{ g}$$

Once you convert, % sign disappears

19. A 2-g sample of sucrose is 6.50% hydrogen. What is the mass percentage of hydrogen in 300 g of sucrose? Explain your reasoning.

% stays same. The amount would vary.

20. Two compound samples are found to have the same mass percentages of the same elements. What can you conclude about the two samples?

Mass ratios will be same. (Actual formulae may not be! - Explain)

In your textbook, read about the law of multiple proportions.

Use the law of multiple proportions to answer the questions and complete the table below.

The law of multiple proportions states that if the elements X and Y form two compounds, the different masses of Y that combine with a fixed mass of X can be expressed as a ratio of small whole numbers.

21. Two compound samples are composed of the same elements, but in different proportions. What can you conclude about the two samples?

Diff compds

For each compound in the table, fill in the ratio of the mass of oxygen to the mass of hydrogen.

Law of Def. Proportions

Compound	Mass of Oxygen	Mass of Hydrogen	Mass O/Mass H
H ₂ O	16 g	2 g	22. 16:2 = 8:1
H ₂ O ₂	32 g	2 g	23. 32:2 = 16:1

24. Write a brief statement comparing the two mass ratios from the table.

Diff formulae/ratios \therefore diff mass ratios.

25. Are H₂O and H₂O₂ the same compound? Explain your answer.

No. Both subscript ratios & mass ratios are different.