

## Structure of Matter

3. Each of the more than 100 elements of matter has distinct properties and a distinct atomic structure. All forms of matter are composed of one or more of the elements. As a basis for understanding this concept:
- Students know* the structure of the atom and know it is composed of protons, neutrons, and electrons.
  - Students know* that compounds are formed by combining two or more different elements and that compounds have properties that are different from their constituent elements.
  - Students know* atoms and molecules form solids by building up repeating patterns, such as the crystal structure of NaCl or long-chain polymers.
  - Students know* the states of matter (solid, liquid, gas) depend on molecular motion.
  - Students know* that in solids the atoms are closely locked in position and can only vibrate; in liquids the atoms and molecules are more loosely connected and can collide with and move past one another; and in gases the atoms and molecules are free to move independently, colliding frequently.
  - Students know* how to use the periodic table to identify elements in simple compounds.

1. Draw the general structure of an atom. Draw a structure of a compound. Chp 12/sect 2

2. Define proton, neutron, electron, compound. element.

3. Draw a "cube of each": solid, liquid, gas and show how their atomic structure is different.

4. Complete "Math in Science" work sheet/

5. Complete: ALL definitions under the matter review notes

6. Complete "Atomic Math Challenge"

## Matter Review

### Notes

Read the following section highlights. Then, in your own words, write the highlights in your ScienceLog.

- The states of matter are the physical forms in which a substance can exist. The four most familiar states are solid, liquid, gas, and plasma.
- All matter is made of tiny particles called atoms and molecules that attract each other and move constantly.
- A solid has a definite shape and volume.
- A liquid has a definite volume but not a definite shape.
- A gas does not have a definite shape or volume. A gas takes the shape and volume of its container.
- Pressure is a force per unit area. Gas pressure increases as the number of collisions of gas particles increases.
- Boyle's law states that the volume of a gas increases as the pressure decreases if the temperature does not change.
- Charles's law states that the volume of a gas increases as the temperature increases if the pressure does not change.
- Plasmas are composed of particles that have broken apart. Plasmas do not have a definite shape or volume.

### Notes

Read the following section highlights. Then, in your own words, write the highlights in your ScienceLog.

- A change of state is the conversion of a substance from one physical form to another. All changes of state are physical changes.
- Exothermic changes release energy. Endothermic changes absorb energy.
- Melting changes a solid to a liquid. Freezing changes a liquid to a solid. The freezing point and melting point of a substance are the same temperature.
- Vaporization changes a liquid to a gas. Boiling occurs throughout a liquid at the boiling point. Evaporation occurs at the surface of a liquid, at a temperature below the boiling point.
- Condensation changes a gas to a liquid.
- Sublimation changes a solid directly to a gas.
- Temperature does not change during a change of state.

Define:	8. freezing	For each pair, explain the differences in their meanings: 1. exothermic/endothermic 2. Boyle's Law / Charles's Law 3. Evaporation/boiling
1. States of matter	9. endothermic	
2. solid	10. exothermic	
3. liquid	11. vaporization	
4. gas	12. boiling	
5. plasma	13. evaporation	
6. change of state	14. condensation	
7. melting	15. sublimation	

### MATH IN SCIENCE

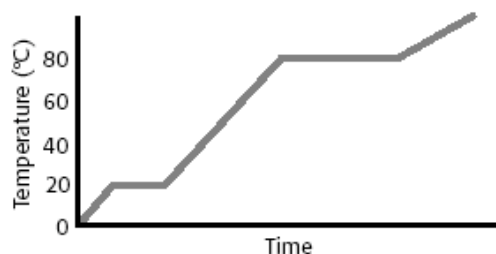
22. Kate placed 100 mL of water in five different pans, placed the pans on a windowsill for a week, and measured how much water evaporated. Draw a graph of her data, shown below, with surface area on the  $x$ -axis. Is the graph linear or non-linear? What does this tell you?

Pan number	1	2	3	4	5
Surface area (cm <sup>2</sup> )	44	82	20	30	65
Volume evaporated (mL)	42	79	19	29	62

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23. Examine the graph below, and answer the following questions:



a. What is the boiling point of the substance? What is the melting point?

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b. Which state is present at 30°C?

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c. How will the substance change if energy is added to the liquid at 20°C?

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The Atoms Family  
Atomic Math Challenge

Name \_\_\_\_\_

8
O
Oxygen
15.999

← \_\_\_\_\_

← \_\_\_\_\_

← \_\_\_\_\_

← \_\_\_\_\_

Atomic number equals  
the number of  
\_\_\_\_\_ or \_\_\_\_\_

Atomic mass equals  
the number of  
\_\_\_\_\_ + \_\_\_\_\_

8
O
_____
15.999

Atomic # = \_\_\_\_\_

Atomic Mass = \_\_\_\_\_

# of Protons = \_\_\_\_\_

# of Neutrons = \_\_\_\_\_

# of Electrons = \_\_\_\_\_

30
_____
Zinc
65.39

Atomic # = \_\_\_\_\_

Atomic Mass = \_\_\_\_\_

# of Protons = \_\_\_\_\_

# of Neutrons = \_\_\_\_\_

# of Electrons = \_\_\_\_\_

3
Li
_____
6.941

Atomic # = \_\_\_\_\_

Atomic Mass = \_\_\_\_\_

# of Protons = \_\_\_\_\_

# of Neutrons = \_\_\_\_\_

# of Electrons = \_\_\_\_\_

14
_____
Silicon
28.086

Atomic # = \_\_\_\_\_

Atomic Mass = \_\_\_\_\_

# of Protons = \_\_\_\_\_

# of Neutrons = \_\_\_\_\_

# of Electrons = \_\_\_\_\_

5
B
_____
10.81

Atomic # = \_\_\_\_\_

Atomic Mass = \_\_\_\_\_

# of Protons = \_\_\_\_\_

# of Neutrons = \_\_\_\_\_

# of Electrons = \_\_\_\_\_

35
_____
Bromine
79.904

Atomic # = \_\_\_\_\_

Atomic Mass = \_\_\_\_\_

# of Protons = \_\_\_\_\_

# of Neutrons = \_\_\_\_\_

# of Electrons = \_\_\_\_\_