

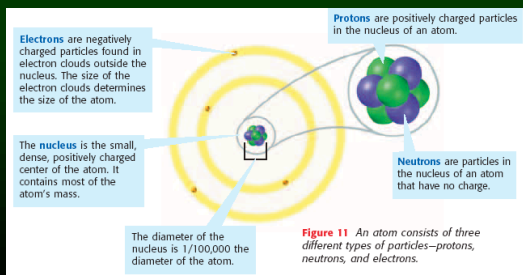
# Matter Review

California State Standards

## 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.



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

- Proton: positively charged particles in the nucleus
- Neutron: neutral (no charge) particles in the nucleus
- Electron: negatively charged particles found in the electron cloud
- Compound: a pure substance composed of 2 or more elements that are chemically combined
- Element: a pure substance that can't be separated or broken down into a simpler substance by chemical or physical means

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



## 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.

## Definitions

- ❑ 1. States of matter: the physical forms in which a substance can exist
- ❑ 2. Solid: state in which matter has a definite shape & volume
- ❑ 3. Liquid: state in which matter takes the shape of its container but has a definite volume
- ❑ 4. Gas: state in which matter changes and has NO definite shape or volume
- ❑ 5. Plasma: the state in which matter doesn't have a definite shape/volume and particles are broken apart

## Definitions

- ❑ 6. change of state: the conversion of a substance from one physical form to another
- ❑ 7. Melting: the change of state from a solid to a liquid
- ❑ 8. Freezing: the change of state from a liquid to a solid
- ❑ 9. Endothermic: term used to describe a change in which energy is absorbed
- ❑ 10. Exothermic: term used to describe a change in which energy is released or removed

## Definitions

- ❑ 11. Vaporization: the change of state from a liquid to a gas; includes boiling and evaporation
- ❑ 12. Boiling: vaporization that occurs throughout a liquid
- ❑ 13. Evaporation: vaporization that occurs at the surface of a liquid below its boiling point
- ❑ 14. Condensation: the change of state from a gas to a liquid
- ❑ 15. Sublimation: the change of state from a solid directly into a gas

For each pair, explain the differences in their meanings:

- ❑ 1. exothermic/endothermic:
- ❑ Exothermic changes release energy/ endothermic changes absorb energy

For each pair, explain the differences in their meanings:

- ❑ 2. Boyle's Law / Charles's Law:
- ❑ Boyle's law states that when the pressure of a gas increases, its volume decreases. Charles's law states that when the temperature of a gas increases, its volume increases

For each pair, explain the differences in their meanings:

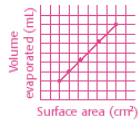
- 3. Evaporation/boiling:
- Evaporation is the change of a liquid to a gas at the surface of a liquid. Boiling is the change of a liquid to a gas throughout a liquid.

**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?

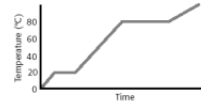
Pan number	1	2	3	4	5
Surface area (cm <sup>2</sup> )	44	82	20	30	65
Volume evaporated (mL)	42	79	19	29	62

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



The graph is linear, which tells you that both variables (surface area and volume evaporated) increase together.

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



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

\_\_\_\_\_

\_\_\_\_\_

b. Which state is present at 30°C?

\_\_\_\_\_

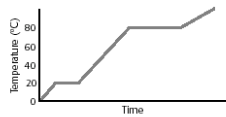
\_\_\_\_\_

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

\_\_\_\_\_

\_\_\_\_\_

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



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

The boiling point is 80°C. The melting point is 20°C.

b. Which state is present at 30°C?

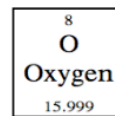
Liquid is present.

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

The temperature of the liquid will rise.

**The Atoms Family**  
**Atomic Math Challenge**

Name \_\_\_\_\_



Atomic number	6
Chemical symbol	C
Element name	Carbon
Atomic mass	12.0

<table border="1"> <tr><td>8</td></tr> <tr><td>O</td></tr> <tr><td>15.999</td></tr> </table> <p>Atomic # = _____          Atomic Mass = _____          # of Protons = _____          # of Neutrons = _____          # of Electrons = _____</p>	8	O	15.999	<table border="1"> <tr><td>30</td></tr> <tr><td>Zinc</td></tr> <tr><td>65.39</td></tr> </table> <p>Atomic # = _____          Atomic Mass = _____          # of Protons = _____          # of Neutrons = _____          # of Electrons = _____</p>	30	Zinc	65.39	<table border="1"> <tr><td>3</td></tr> <tr><td>Li</td></tr> <tr><td>6.941</td></tr> </table> <p>Atomic # = _____          Atomic Mass = _____          # of Protons = _____          # of Neutrons = _____          # of Electrons = _____</p>	3	Li	6.941
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65.39											
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