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Warm-Up | Solids and Plasmas

Lesson Objectives

By the end of this lesson, you should be able to:

- Use kinetic-molecular theory to compare and contrast atomic or _____ motion in solids and plasmas.
- Describe how kinetic-molecular theory explains the properties of solids, including compressibility, shape, and _____.
- Describe how kinetic-molecular theory explains the properties of plasmas.

Science Practice: Give examples of plasmas in nature and technology.

Words to Know

Fill in this table as you work through the lesson. You may also use the glossary to help you.

amorphous solid	a solid matter whose particles are arranged in a _____ pattern
crystal	a solid in which the particles are arranged in a regular, _____ pattern
lattice	a regular arrangement of particles (_____, ions, or molecules)
long-range order	a term for an arrangement of particles in which the particles are ordered over many multiples of the average particle _____

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W2K

Words to Know

plasma	a high-energy state of matter characterized by [ ] particles
solid	a low-energy state of condensed matter characterized by structural rigidity and [ ] to changes of shape or volume
thermal equilibrium	a term describing a [ ] equal to that of the surroundings

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Lesson Question

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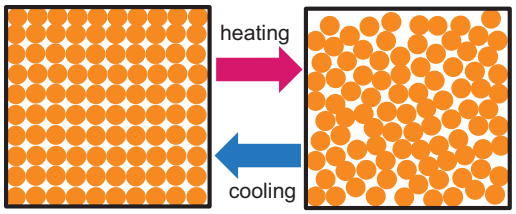
Solids and Kinetic-Molecular Theory

- _____ decreases, kinetic energy decreases, and particle _____ slows.
- _____ : kinetic energy < intermolecular forces

Solids and Kinetic-Molecular Theory

Solid: a _____ state of condensed matter characterized by structural rigidity and _____ to changes in shape or volume



Crystalline Solids

Crystal: solid characterized by an orderly _____ lattice of component particles

- Ordered
- _____ : describes an arrangement of particles in which the particles are ordered over many multiples of the average particle _____

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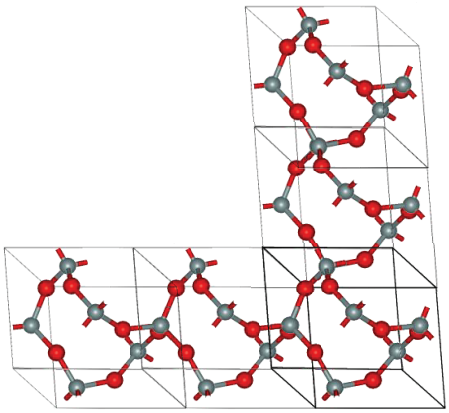
Crystalline Solids, Continued

[ ]: a regular arrangement of atoms, ions, or molecules

- [ ] cell repeated to form crystal
- Incompressible, typically [ ] and hard
- Particles vibrate



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Amorphous Solids

Amorphous solid: solid matter with particles that are arranged in a [ ] pattern

- Rapid cooling doesn't allow for complete assembly of unit [ ]
- Long-range order absent
  - [ ] ordered over many multiples of average particle diameter

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Properties of Plasmas

Plasma: a high-energy state of matter characterized by _____ particles

- _____ may be thousands of degrees
- Conducts _____
- Is compressible
- Has no definite shape or _____

Plasmas in Nature

Plasma will discharge those _____ at temperatures of almost 20,000 degrees _____.

- Lightning
- _____
- Auroras

Human-Made Plasmas

- _____ lights
- _____ thrusters
- Arc welders
- Plasma displays
- Plasma _____

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The Temperature of Plasma

[ ] **equilibrium**: Temperature is equal to the surroundings.

Plasmas can be cold when:

- Light electrons move fast (hot).
- Heavy [ ] are slow (cold).
- Electron [ ] energy is converted to light.
- Fewer than 1% of particles are ionized.
- They are non-thermal plasmas.

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Comparing Solids and Plasmas

Plasma	Solid
• Conducts [ ]	• May or may not conduct electricity
• Has low density	• Has high density
• Fills available space	• Has fixed shape and volume
• Has high kinetic energy	• Has low kinetic energy
• Is made of [ ] and cations	• Is made of neutral particles or [ ] pairs

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Summary | Solids and Plasmas

Lesson Question

How do scientists describe the behavior of particles in solids and plasmas?

Answer

Slide 2

Properties of Solids

- Form at low [ ]
- Have long-range order: particles fixed in place
- Have defined shape and volume
- Are a [ ] state of matter
- Are dense (incompressible)

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Summary | Solids and Plasmas

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Properties of Plasmas

- Form at high temperature
- Have _____ order: particles have little interaction
- Fill all available space; no fixed shape or _____
- Are the highest energy state of matter
- Are highly compressible
- Conduct _____ extremely well

Use this space to write any questions or thoughts about this lesson.

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