

**Virden Collegiate Institute**

# **30S**

# **Chemistry**

**Physical Properties of Matter:**  
**States of Matter**  
**Student Study Guide**

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# States of Matter

## Section 13.1 Gases

### Main Idea

### Details

**Scan Section 1, using the checklist below as a guide.**

- Read all section titles.
- Read all boldfaced words.
- Read all tables and graphs.
- Look at all pictures and read the captions.
- Think about what you already know about this subject.

### New Vocabulary

*Use your text to define each term.*

*kinetic-molecular theory*

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*elastic collision*

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*temperature*

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*diffusion*

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*Graham's law  
of effusion*

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*pressure*

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*barometer*

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*pascal*

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*atmosphere*

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*Dalton's law of  
partial pressures*

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## Section 13.1 Gases (continued)

### Main Idea

#### The Kinetic-Molecular Theory

Use with pages 385–386.

### Details

**Distinguish** between the three main physical properties of gas particles by completing the passages below.

1. Size is very \_\_\_\_\_. It is assumed that there are \_\_\_\_ significant \_\_\_\_\_ or \_\_\_\_\_ forces among gas particles.
2. Motion is \_\_\_\_\_ moving in a \_\_\_\_\_ pattern. It is assumed that gas particles move in a \_\_\_\_\_ path until they \_\_\_\_\_.
3. Energy is \_\_\_\_\_. It is assumed that \_\_\_\_\_ and \_\_\_\_\_ impact the \_\_\_\_\_ level of a gas \_\_\_\_\_.

**Describe** kinetic energy in equation form by completing the table below.

$KE = 1/2mv^2$	Variable	Definition
$KE$		
$m$		
$v$		

#### Explaining the Behavior of Gases

Use with pages 386–387.

**Describe** the following concepts as they relate to the behaviors of gases by completing the passages below.

**low density**—Gases have low density (\_\_\_\_\_ per \_\_\_\_\_) in comparison to \_\_\_\_\_. The difference in density is partly due to the mass of the \_\_\_\_\_ and also because there is a great deal of \_\_\_\_\_ between gas particles.

**compression and expansion**—The large amount of \_\_\_\_\_ between gas particles allows them to be \_\_\_\_\_, or pushed, into a \_\_\_\_\_ volume. Once the pressure is \_\_\_\_\_, the particles \_\_\_\_\_ to the original \_\_\_\_\_.

**diffusion and effusion**—Because there are no \_\_\_\_\_ forces of \_\_\_\_\_ between gas particles, gases \_\_\_\_\_ past one another. This \_\_\_\_\_ motion allows gases to mix until they are \_\_\_\_\_. The movement of \_\_\_\_\_ past one another is called \_\_\_\_\_. The process of allowing a gas to escape from a more concentrated container is called \_\_\_\_\_.

**Section 13.1 Gases (continued)**

**Main Idea**

**Details**

**Gas Pressure**

*Use with pages 388–392.*

**Write Graham's law of effusion as a proportional statement.**

**Write the proportional statement based on Graham's law of effusion that allows you to compare the diffusion rate of two different gases.**

**Describe pressure as it relates to the behaviors of gases.**

**Distinguish between a barometer and a manometer.**

**Explore the relationship between different units of pressure by filling in the table below.**

Unit Name (unit symbol)	Conversion Ratio: 1 atm = _____	Conversion Ratio: 1 kPa = _____
kilopascal ( )		
millimeters of mercury ( )		
torr		
pounds per square inch ( or )		
atmosphere ( )		

# States of Matter

## Section 13.2 Forces of Attraction

### Main Idea

### Details

**Skim** Section 2 of your text. Write three questions that come to mind from reading the headings and the illustration captions.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

### New Vocabulary

Use your text to define each term.

*dispersion forces*

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*dipole-dipole force*

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*hydrogen bond*

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### Academic Vocabulary

Define the following term.

*distribute*

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## Section 13.2 Forces of Attraction (continued)

### Main Idea

#### Intermolecular Forces

Use with pages 393–395.

### Details

**Describe** the difference between an intramolecular and an intermolecular force.

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**Compare and contrast** intramolecular forces by completing the table below.

Force	Basis of Attraction	Example
Ionic		
Covalent		
Metallic		

**Compare** intermolecular forces by completing the table below.

Force	Basis of Attraction	Example
Dispersion		
Dipole-dipole		
Hydrogen bond		

# States of Matter

## Section 13.3 Liquids and Solids

### Main Idea

### Details

**Scan** Section 3, using the checklist below as a guide.

- Read all section titles.
- Read all boldfaced words.
- Read all tables and graphs.
- Look at all pictures and read the captions.
- Think about what you already know about this subject.

### New Vocabulary

Use your text to define each term.

*viscosity*

*surface tension*

*surfactant*

*crystalline solid*

*unit cell*

*amorphous solid*

### Academic Vocabulary

Define the following term.

*predict*



## Section 13.3 Liquids and Solids (continued)

### Main Idea

#### Liquids

Use with pages 396–398.

### Details

**Compare and contrast** the following paired concepts as they relate to the properties of liquids by completing the following statements.

**Density and compression:** A liquid can take the \_\_\_\_\_, but its volume is \_\_\_\_\_. The density of a liquid is \_\_\_\_\_ than the density of the same substance as a \_\_\_\_\_.

Liquids cannot usually be \_\_\_\_\_ except under \_\_\_\_\_ pressure.

**Fluidity and viscosity:** Fluidity is the ability to \_\_\_\_\_. Liquids flow through each other but at a \_\_\_\_\_ than \_\_\_\_\_ do. Viscosity is the measure of the \_\_\_\_\_ of a liquid to \_\_\_\_\_. The stronger \_\_\_\_\_ slow down the ability to flow, which \_\_\_\_\_ resistance (viscosity).

**Viscosity and temperature:** Temperature affects the \_\_\_\_\_ of a \_\_\_\_\_. Viscosity \_\_\_\_\_ with temperature.

**Analyze** the relationship between viscosity, temperature, and change in kinetic energy by completing the table.

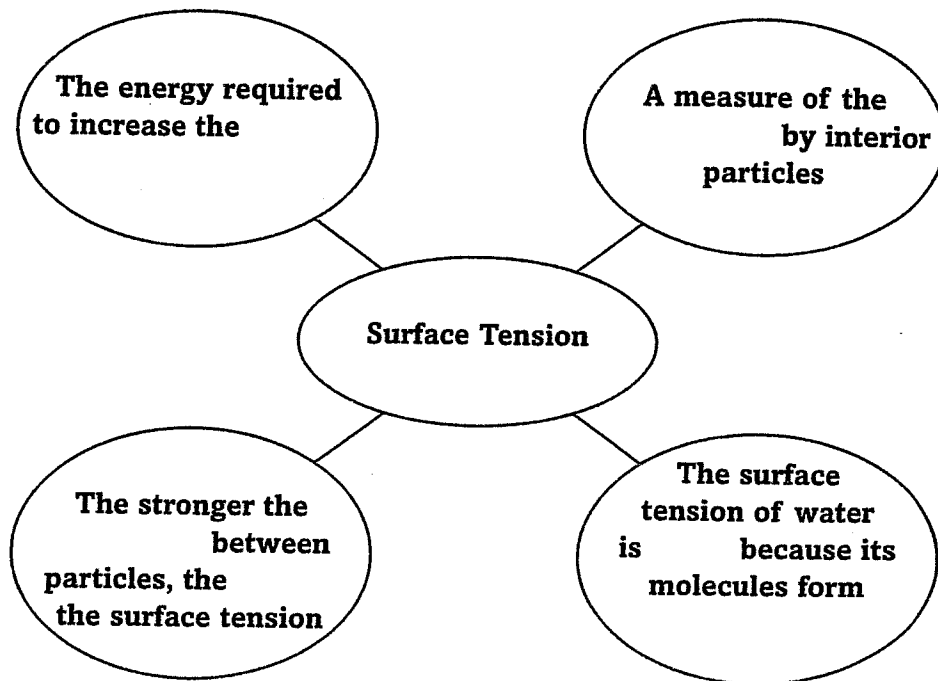
Temperature	$\Delta$ KE	Viscosity	Effect in Liquid
increases			flows faster
decreases		increases	
stays the same	no change		

## Section 13.3 Liquids and Solids (continued)

### Main Idea

### Details

**Explain** surface tension by completing the web diagram below.



Use with page 399.

**Describe** the following concepts as they relate to the properties of liquids by completing the following passages.

Capillary action is \_\_\_\_\_

Cohesion is \_\_\_\_\_

Adhesion is \_\_\_\_\_

## Section 13.3 Liquids and Solids (continued)

### Main Idea

#### Solids

Use with pages 399–400.

### Details

**Contrast** the density of solids and liquids by completing the following paragraph.

In general, the \_\_\_\_\_ in a solid are more \_\_\_\_\_ that is, more dense—than those in a \_\_\_\_\_. When liquid and solid states of the same substance exist at the same time, the \_\_\_\_\_ usually \_\_\_\_\_ in the \_\_\_\_\_. One familiar exception is \_\_\_\_\_. When water is in its solid state as ice, it \_\_\_\_\_, such as \_\_\_\_\_ or a(n) \_\_\_\_\_. This is because there is \_\_\_\_\_ space between the \_\_\_\_\_ in ice than in liquid water.

Use with pages 400–403.

**Compare** the different types of crystalline solids by completing the following table.

Type	Unit Particles	Characteristics	Examples
Atomic			
Molecular			
Covalent network			
Ionic			
Metallic			

# States of Matter

## Section 13.4 Phase Changes

**Main Idea**

**Details**

**Skim** Section 4 of your text. Write a brief summary of the main topics covered.

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**New Vocabulary**

Use your text to define each term.

*sublimation*

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*condensation*

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*deposition*

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*phase diagram*

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**Compare and contrast** the following terms using your text as a guide.

*melting point, freezing point, and triple point*

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*vaporization and evaporation*

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## Section 13.4 Phase Changes (continued)

### Main Idea

#### Phase Changes That Require Energy

Use with page 404.

Use with pages 404–407.

### Details

Classify the types of phase changes by completing the table below. Use Figure 13–22 in your text for reference.

Phase Transition	Type of Transition
gas to solid	
solid to liquid	
liquid to gas	
liquid to solid	
	condensation
solid to gas	

Describe the phase changes that require energy by completing the following outline.

#### I. Melting

- A. Heat energy disrupts \_\_\_\_\_.
- B. The amount of energy required depends on \_\_\_\_\_.
- C. The melting point is the temperature at which \_\_\_\_\_.
- D. The melting point of \_\_\_\_\_ may be unspecified.

#### II. Vaporization

- A. In liquid water, some particles have more \_\_\_\_\_.
- B. Particles that escape from liquid enter the \_\_\_\_\_.
- C. When vaporization occurs only at a surface it is called \_\_\_\_\_.
- D. The pressure exerted by a vapor over liquid is called \_\_\_\_\_.
- E. The temperature at which vapor pressure equals atmospheric pressure is called the \_\_\_\_\_.

#### III. Sublimation

- A. Many solids can become gases without \_\_\_\_\_.
- B. Some solids sublime at \_\_\_\_\_.
- C. The process of \_\_\_\_\_ is an example of sublimation.

## Section 13.4 Phase Changes (continued)

### Main Idea

#### Phase Changes That Release Energy

Use with pages 407–408.

#### Phase Diagrams

Use with pages 408–409.

### Details

Organize the phase changes that release energy. Identify the phase, describe the process, and identify the reverse process by completing the table below.

Phase Change	Process Description	Reverse Process
condensation		vaporization
	process in which a liquid becomes a solid	
deposition		sublimation

Explain how the critical point affects water.

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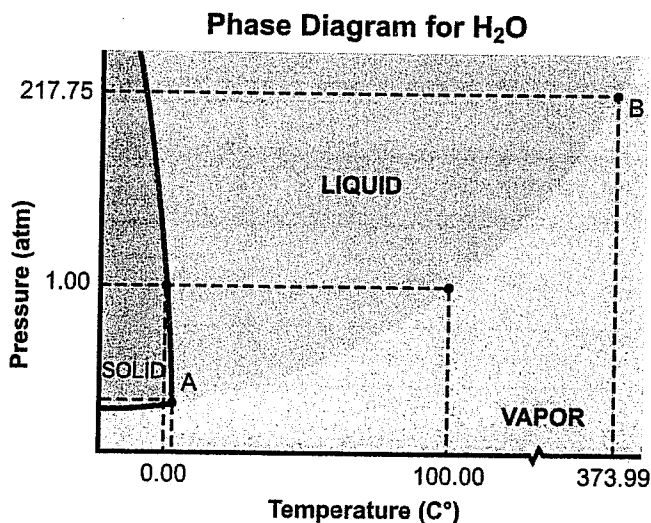


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Identify normal freezing point, normal boiling point, critical point, and triple point in the phase diagram for  $H_2O$  below. Use Figure 13–28 in your text for reference.



# States of Matter Chapter Wrap-Up

After reading this chapter, list three key equations and relationships.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

## Review

Use this checklist to help you study.

- Study your Science Notebook for this chapter.
- Study the definitions of vocabulary words.
- Review daily homework assignments.
- Reread the chapter and review the tables, graphs, and illustrations.
- Review the Section Assessment questions at the end of each section.
- Look over the Study Guide at the end of the chapter.

## REAL-WORLD CONNECTION

You see examples of phase changes every day. Use your text to identify which phase change each of the following transitions demonstrates. The first one has been done for you.

frost forms on a windowpane

deposition

ice becomes water

steam rises from a cup of coffee

a water pipe bursts on a very cold day

drops of water cover the mirror after a shower

snow melts without leaving a puddle

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\_\_\_\_\_