# 6th grade Science Packet #2

# The March 2 Packet

Name: _____ Period: _____

| Day of the Week | Lesson Details |
|---|---|
| Monday | **Complete the Climate Change Worksheet #3**<br>Vocab<br>• climate change<br>• adaptation<br>• effect<br>I can Statement<br>• I can explain some of the effects of climate change<br>Standard<br>• MS-ES3-5 Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century<br>• ESS3.D: Global Climate Change: Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). |
| Tuesday | **Complete the Thermal Energy Vocab Boxes for the following words:**<br>Vocab<br>• Model, systems, collection, solid, liquid, gas, and plasma. Particle, kinetic energy, temperature, thermal energy<br>I can Statement<br>• I can determine if something is a model, system, or collection<br>Standard<br>PS3.A: Temperature is a measurement of energy (Average Kinetic Energy) of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. |
| Wednesday | **Complete the States of Matter Reading**<br>Vocab<br>• solid, liquid, gas, plasma<br>I can Statement<br>• I can differentiate between the states of matter<br>Standard<br>• PS3.A: Temperature is a measurement of energy (Average Kinetic Energy) of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. |
| Thursday | **Watch Bill Nye States of Matter and take notes**<br>https://www.youtube.com/watch?v=k3SJuozgbfU or search up Bill Nye States of Matter on Youtube<br>Vocab<br>• solid, liquid, gas, plasma<br>I can Statement<br>• I can differentiate between the states of matter<br>Standard<br>• PS3.A: Temperature is a measurement of energy (Average Kinetic Energy) of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. |
| Friday | **Complete the What is Thermodynamics? Reading**<br>Vocab<br>• solid, liquid, gas, plasma<br>I can Statement<br>• I can differentiate between the states of matter<br>Standard<br>• PS3.A: Temperature is a measurement of energy (Average Kinetic Energy) of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. |

**Climate Change Worksheet #3** Name: _____ Period: ___

_____ /40

**Part 1: Vocabulary (___/7 points)**

1. ____ Greenhouse Effect
2. ____ Greenhouse Gases
3. ____ Fossil Fuels
4. ____ Climate Change
5. ____ Biosphere
6. ____ Global Warming
7. ____ Human Impact

A. Parts of the earth that are inhabited by living organisms
B. Gases in the atmosphere that absorb and trap solar radiation
C. The increase in the Earth's temperature due to the increase in the greenhouse gas levels in the atmosphere.
D. The process of keeping the Earth's atmosphere warm
E. Actions that humans do that affect (impact) the Earth.
F. Fuels that are created from that is left over from organisms that were once alive.
G. A change in global or regional climate patterns due to the increased levels of atmospheric Carbon Dioxide

**Part 2: Greenhouse Effect and Gases ( ___/ 11)**

8. Draw and label a molecule of one greenhouse gas

| Picture of Greenhouse Gas | Name of Greenhouse gas: _____ |
|---|---|
| | |

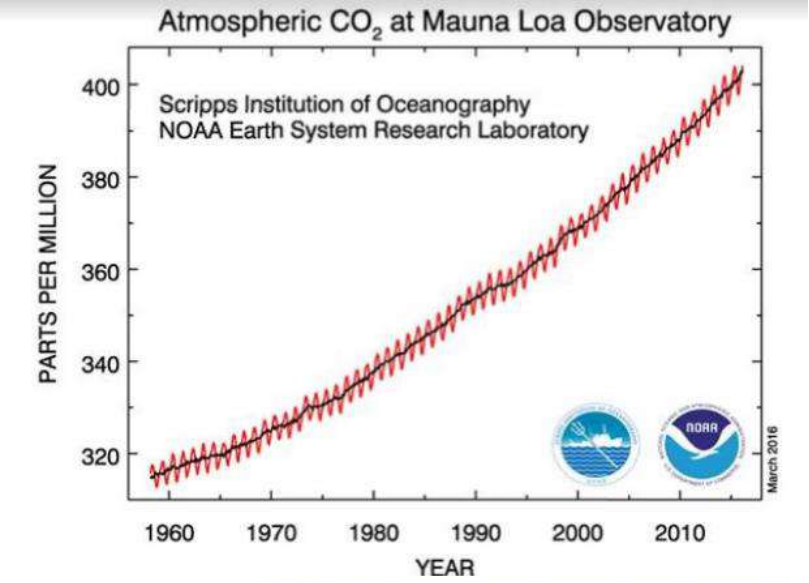
9. Number the steps of the Greenhouse Effect in order in which they happen

___ Greenhouse gases build up in the atmosphere
___ The Earth's atmosphere heats up
___ Greenhouse gases trap heat in the atmosphere
___ Greenhouse gases are emitted from natural and human causes

10. What is the most important Greenhouse gas? _____
11. What is one natural source of Greenhouse gas emission? _____
12. What is one human source of Greenhouse gas emission? _____
13. The Earth will be _____ if there was no Greenhouse Effect.

**Part 3: Data Analysis (__/9)**

For questions #14-18 use the graph to the right




14. What is the x-axis labeled as?

_____

15. What does "$CO_2$" stand for?

_____

16. What is happening to atmospheric $CO_2$ over time? _____ _

17. What is the atmospheric $CO_2$ level in 1995? _____

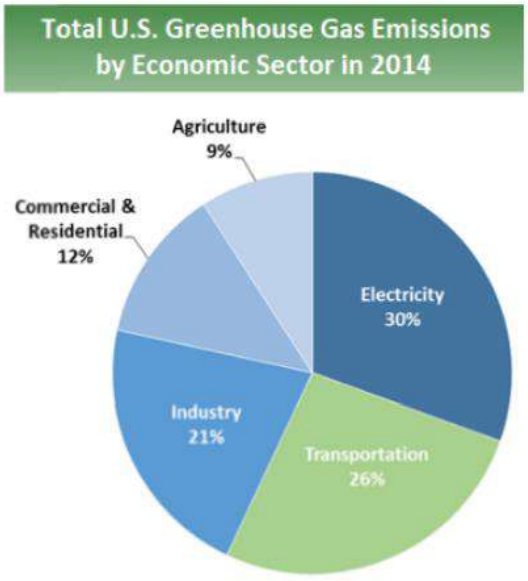
18. What do you predict $CO_2$ levels will be in 2020? _____

19. Why do you think $CO_2$ levels are changing?

_____

_____

For questions #19- 20 use the pie chart on the right




20. What sector is contributing the **most** to US Greenhouse Gas Emissions? _____

21. What sector is contributing the **least** to US Greenhouse Gas Emissions? _____

**Part 4: Climate Change and Living Organisms (___/6)**

22. Pick one animal and explain how it is affected by climate change.

_____

_____

_____

23. What is happening to the Coral Reefs? _____

24. Give an example of how an animal has adapted to climate change.

_____

_____

**Part 5: Weather and Climate (__/7)**

25. What do we call the process of liquid water turning into water vapor? _____

26. Which climate zone is warm year round? _____

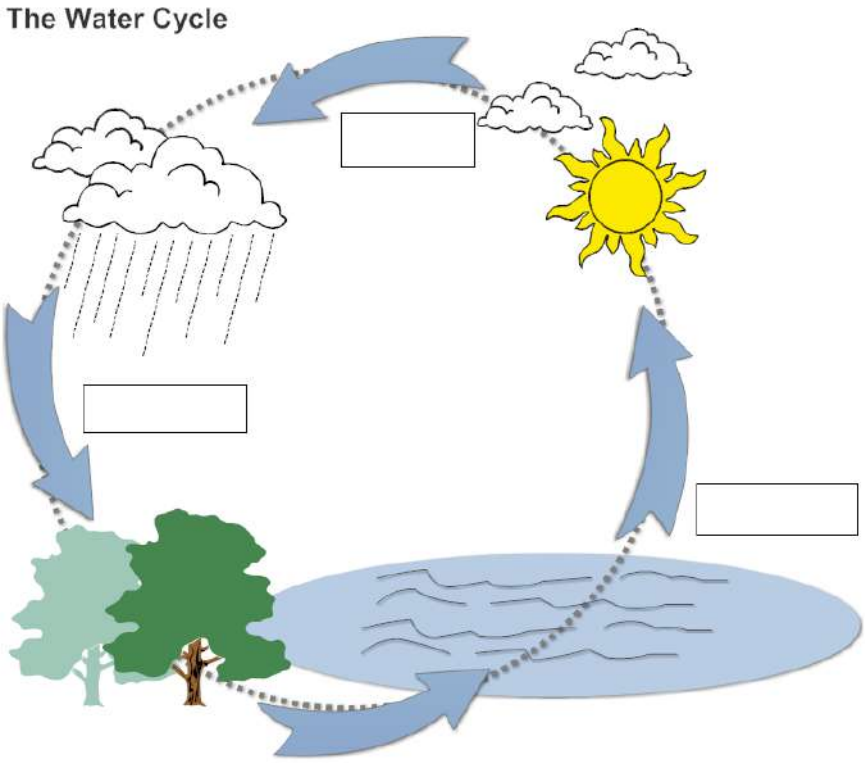
27. What is the difference between weather and climate?

_____

_____

_____

28. On the diagram label condensation, precipitation, and evaporation.




**Extra Credit Questions (__/0)**

1. What is the name of the principal at Hillview?

   _____

2. What color is the science notebook supposed to be?

   _____

3. What is the school mascot? _____
4. Name 4 different Greenhouse gases.
   a. _____
   b. _____
   c. _____
   d. _____
5. Draw me a picture of an animal.

# Use this page to get the definitions to complete the vocab boxes on the following pages:

***System:*** A group of things working together

***Collection***: a group of things.

***Model:*** A tool that makes a part of the world easier to understand

***Solid:*** A firm and stable object that always keeps its shape

***Liquid***: A substance that flows freely but is of constant volume, and takes the shape of its container

***Gas:*** An air like fluid substance that expands to fill any space available

***Plasma:*** An ionized gas that has positive ions and free electrons. It is super-heated gas in stars, the sun, and in lightning.

***Particle:*** A small piece of matter

***Kinetic Energy:*** Energy due to mass and speed of the object

***Temperature:*** A measure of the average kinetic energy of the particles in a system

***Thermal Energy***: The energy responsible for something's temperature.

Example of how to fill out the Vocab Boxes

| Precipitation | |
|---|---|
| Definition:<br><br>The process of water falling from the sky. It can be rain, hail, snow, or sleet. | Draw or use the word in a sentence<br><br>Sentence: Precipitation is when some kind of water falls from the sky.<br><br>Drawing:  |

Now it's your turn to fill out the vocab boxes. Remember to check the definitions on the previous page.

| System | |
|---|---|
| Definition: | Draw or use the word in a sentence |

| Collection | |
|---|---|
| Definition: | Draw or use the word in a sentence |

| Model | |
|---|---|
| Definition: | Draw or use the word in a sentence |

| Solid | |
|---|---|
| Definition: | Draw or use the word in a sentence |

| Liquid | |
|---|---|
| Definition: | Draw or use the word in a sentence |

| Gas | |
|---|---|
| Definition: | Draw or use the word in a sentence |

| Plasma | |
|---|---|
| Definition: | Draw or use the word in a sentence |

| Particle | |
|---|---|
| Definition: | Draw or use the word in a sentence |

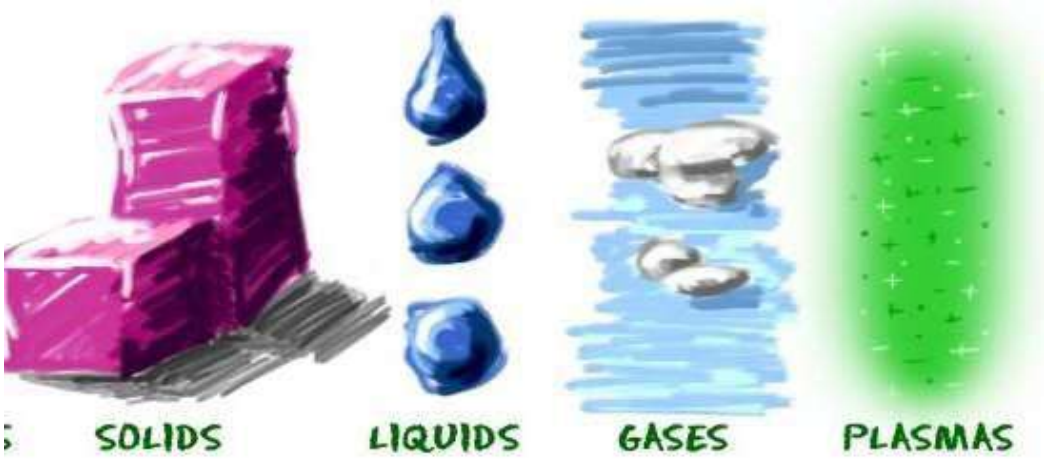
| Kinetic Energy | |
|---|---|
| Definition: | Draw or use the word in a sentence |

| Temperature | |
|---|---|
| Definition: | Draw or use the word in a sentence |

| Thermal Energy | |
|---|---|
| Definition: | Draw or use the word in a sentence |

**Name: _____ Period: _____**

## States of Matter Reading



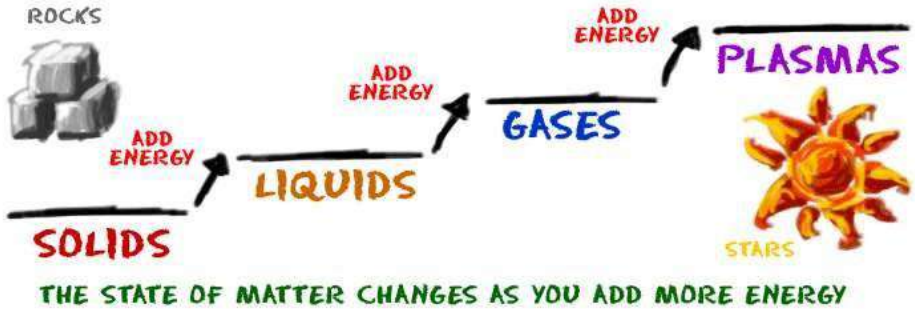

We look at four **states** of matter on the site. Solids, liquids, gases, and plasmas are different states that have different physical properties. Each of these states is also known as a **phase**. Elements and compounds can move from one phase to another when specific physical conditions change. For example, when the temperature of a system goes up, the matter in the system becomes more excited and active. If enough **energy** is placed in a system, a phase change may occur as the matter moves to a more **active state**.

Think about it this way. Let's say you have a glass of water ($H_2O$). When the temperature of the water goes up, the molecules get more excited and bounce around a lot more. If you give a liquid water molecule enough energy, it escapes the liquid phase and becomes a gas.


Have you ever noticed that you can smell a turkey dinner after it starts to heat up? As the energy of the molecules inside the turkey heat up, they escape as a gas. You are able to smell those **volatile** molecules that are mixed in the air.

## It's About the Physical

"Phase" describes a physical state of matter. The key word to notice is **physical**. Things only move from one phase to another by physical means. If energy is added (like increasing the temperature) or if energy is taken away (like freezing something), you have created a physical change.




When molecules move from one phase to another they are still the same substance. There is water **vapor** above a pot of boiling water. That vapor (or gas) can **condense** and become a drop of water in the cooler air. If you put that liquid drop in the freezer, it would become a solid piece of ice. No matter what physical state it was in, it was always water. It always had the **same chemical properties**.

On the other hand, a chemical change would build or break the chemical **bonds** in the water molecules. If you added a carbon (C) atom, you would have formaldehyde ($H_2CO$). If you added an oxygen (O) atom, you would create hydrogen

peroxide ($H_2O_2$). Neither new compound is anything like the original water molecule. Generally, changes in the physical state do not lead to any chemical change in molecules.

## Going through a phase

Adding energy to matter causes a physical change — matter moves from one state to another. For example, adding thermal energy — heat — to liquid water causes it to become steam or vapor — a gas. Taking away energy also causes physical change, such as when liquid water becomes ice — a solid — when heat is removed. Physical change also can be caused by motion and pressure.

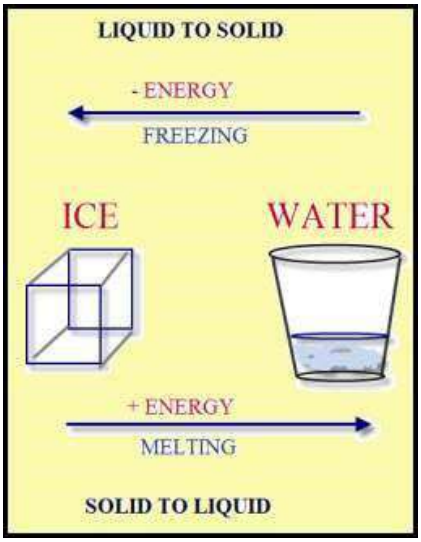

PHASE CHANGES HAPPEN AS THE TEMPERATURE CHANGES


ADDING ENERGY TO A SOLID CAN CREATE A LIQUID

### Melting and freezing

When heat is applied to a solid, its particles begin to vibrate faster and tend to move farther apart. When the substance, at standard pressure, reaches a certain point — called the melting point — the solid will begin to turn into a liquid. The melting point of a pure substance can often be determined to within 0.1 degrees C, the point at which the solid and liquid phases are in equilibrium. If you continue to apply heat to the sample, the temperature will not rise above the melting point until the entire sample has been liquefied. The heat energy is being used to convert the solid into the liquid form. Once the entire sample has become a liquid the temperature will begin to rise again. Compounds that are otherwise very similar can have different melting points, so melting point can be a useful way to distinguish among them. For example, sucrose (a type of sugar) has a melting point of 367 F (186.1 C) while the melting point of glucose (a type of sugar) is 294.8 F (146 C). A solid mixture, such as a metal alloy, can often be separated into its constituent parts by heating the mixture and extracting the liquids as they reach their different melting points.

The freezing point is the temperature at which a liquid substance is cooled enough to form a solid. As the liquid is cooled, particle motion slows. In many substances, the particles align in precise, geometric patterns to form crystalline solids. Most liquids contract as they freeze. One of the important characteristics of water is that it expands when it freezes, so ice floats. If ice didn't float, there would be no liquid water underneath a frozen body of water and many forms of aquatic life would be impossible.

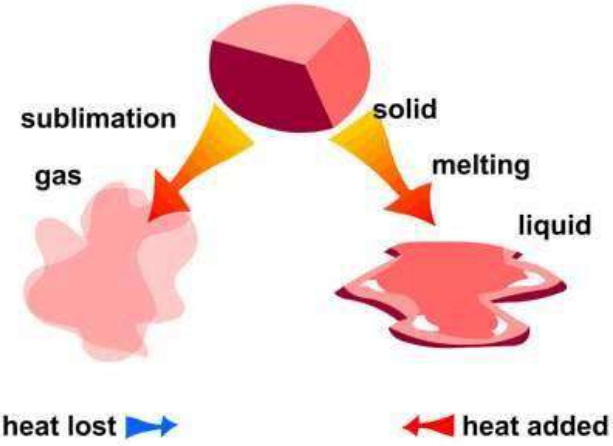


The freezing point is often nearly the same temperature as the melting point, but is not considered to be characteristic of a substance, as several factors can alter it. For example, adding dissolved substances, or solutes, to a liquid will depress the freezing point. An example of this is using salt slurry to lower the temperature at which water freezes on our roads. Other liquids can be cooled to temperatures well below their melting point before they begin to solidify. Such liquids are said to be "super cooled" and often require the presence of a dust particle or "seed crystal" to start the process of crystallization.


Adding a salt to water will lower the temperature at which it freezes.

## Sublimation

When a solid is converted directly into a gas without going through a liquid phase, the process is known as **sublimation**. Sublimation occurs when kinetic energy of the particles is greater than atmospheric pressure surrounding the sample. This may occur when the temperature of the sample is rapidly increased beyond the boiling point (flash vaporization). More commonly, a substance can be "freeze dried" by cooling it under vacuum conditions so that the water in the substance undergoes sublimation and is removed from the sample. A few volatile substances will undergo sublimation at normal temperature and pressure. The best known of these substances is $CO_2$ or "dry ice."




## Vaporization

Vaporization is the change of a liquid to a gas.
Vaporization can occur through either evaporation or boiling.

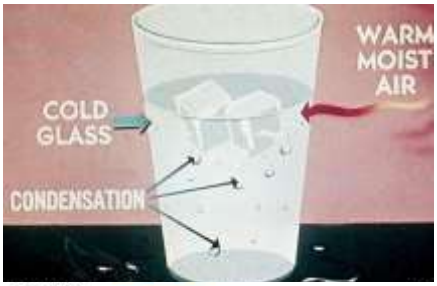
Because the particles of a liquid are in constant motion they frequently collide with each other, transferring energy when they do so. This energy transference has little net effect beneath the surface, but when enough energy is transferred to a particle near the surface; it may gain enough energy to be knocked completely away from the sample as a free gas particle. This process is called evaporation and it continues as long as liquid remains. It is interesting to note that a liquid cools as it evaporates. The energy transferred to surface molecules, which causes their escape, is carried away from the remaining liquid sample.

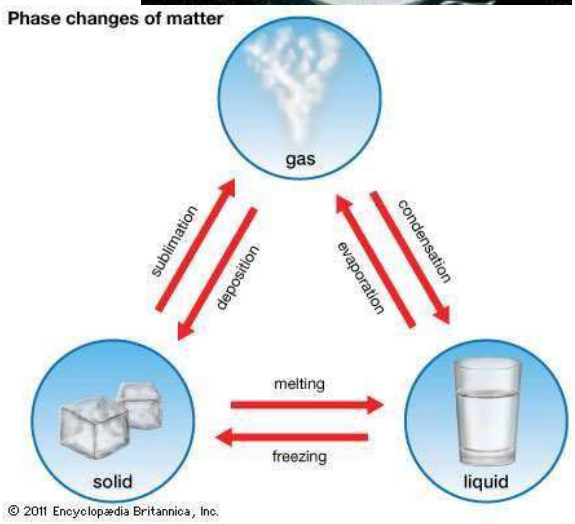

When enough heat is added to a liquid that vapor bubbles form below the surface of the liquid, we say that the liquid is boiling. The temperature at which a liquid boils is variable. Boiling point is dependent upon the pressure the substance is under. A liquid under higher pressure will require more heat before vapor bubbles can form within it. At high altitudes, there is less atmospheric pressure pressing down on the liquid, so it will boil at a lower temperature. The same amount of liquid at sea level is under a greater atmospheric pressure and will boil at a higher temperature.

# Condensation and deposition

Condensation is when a gas transforms into a liquid. Condensation occurs when a gas has been cooled or compressed to the point where kinetic energy of the particles can no longer overcome the intermolecular forces. An initial cluster of particles initiates the process which tends to further cool the gas so that condensation continues.

When the gas transforms directly into a solid, without going through the liquid phase, it is called deposition or desublimation. An example of this occurs when subfreezing temperatures convert water vapor in the atmosphere into frost or ice. Frost tends to outline solid blades of grass and twigs because the air touching these solids cools faster than air that is not touching a solid surface.




Adapted from: "Matter: Definition & the Five States of Matter." LiveScience. Purch, n.d. Web. 11 Feb. 2017. And Studios, Andrew Rader. "States of Matter." Chem4Kids.com: Matter: States of Matter. N.p., n.d. Web. 11 Feb. 2017.

**Topic/Objective:**

States of matter /I can explain how objects change their state of matter

Name: _____
Period: _____
Date: _____

**Essential Question:**

How do objects change their state of matter?

| Questions/titles/pictures | Notes: |
|---|---|
| What are the 4 states of matter? | |
| What do you need to add in order to get an object to change its state of matter? | |
| What is melting? | |
| What is freezing? | |
| What is sublimation? | |
| What is vaporization? | |
| What is condensation? | |
| What is deposition? | |

**Summary: Please write at least 5 sentences explaining what you learned about how objects change their state of matter**

**Drawing: Please draw something that you learned about the change of state in matter during the reading.**

# Bill Nye States of Matter Video

https://www.youtube.com/watch?v=k3SJuozgbfU or search up Bill Nye States of Matter on Youtube

Take 10 notes during the video. You can take more for extra credit if you want.

| |
|---|
| 1. |
| 2. |
| 3. |
| 4. |
| 5. |
| 6. |
| 7. |
| 8. |
| 9. |
| 10. |

# What Is Thermodynamics?

By Jim Lucas, Live Science Contributor | May 7, 2015 08:33pm ET

**Thermodynamics** is the branch of physics that deals with the relationships between heat and other forms of energy. In particular, it describes how thermal energy is converted to and from other forms of energy and how it affects matter.

**Thermal energy** is the energy a substance or system has due to its temperature, i.e., the energy of moving or vibrating molecules, according to the Energy Education website of the Texas Education Agency. Thermodynamics involves measuring this energy, which can be "exceedingly complicated," according to David McKee, a professor of physics at Missouri Southern State University. "The systems that we study in thermodynamics … consist of very large numbers of atoms or molecules interacting in complicated ways. But, if these systems meet the right criteria, which we call equilibrium, they can be described with a very small number of measurements or numbers. Often this is idealized as the mass of the system, the pressure of the system, and the volume of the system, or some other equivalent set of numbers. Three numbers describe $10^{26}$ or $10^{30}$ nominal independent variables."

## Heat

Thermodynamics, then, is concerned with several properties of matter; foremost among these is heat. Heat is energy transferred between substances or systems due to a temperature difference between them, according to Energy Education. As a form of energy, **heat is conserved *(Conservation of Energy)* , i.e., it cannot be created or destroyed. It can, however, be transferred from one place to another. Heat can also be converted to and from other forms of energy**. For example, a steam turbine can convert heat to kinetic energy to run a generator that converts kinetic energy to electrical energy. A light bulb can convert this electrical energy to electromagnetic radiation (light), which, when absorbed by a surface, is converted back into heat.

## Temperature

The amount of heat transferred by a substance depends on the speed and number of atoms or molecules in motion, according to Energy Education. The faster the atoms or molecules move, the higher the temperature, and the more atoms or molecules that are in motion, the greater the quantity of heat they transfer.

**Temperature** is "a measure of the average kinetic energy of the particles in a sample of matter, expressed in terms of units or degrees designated on a standard scale," according to the American Heritage Dictionary. The most commonly used temperature scale is Celsius, which is based on the freezing and boiling points of water, assigning respective values of 0 degrees C and 100 degrees C. The Fahrenheit scale is also based on the freezing and boiling points of water which have assigned values of 32 F and 212 F, respectively.
Scientists worldwide, however, use the **Kelvin** (K with no degree sign) scale, named after William Thomson, 1st Baron Kelvin, because it works in calculations. This scale uses the same increment as the **Celsius** scale, i.e., a temperature change of 1 C is equal to 1 K. However, the Kelvin scale starts at absolute zero, the temperature at which there is a total absence of heat energy and all molecular motion stops. A temperature of 0 K is equal to minus 459.67 F or minus 273.15 C.

## Heat transfer

Heat can be transferred from one body to another or between a body and the environment by three different means: conduction, convection and radiation.
**Conduction** is the transfer of energy *through* a solid material. Conduction between bodies occurs when they are in direct contact, and molecules transfer their energy across the interface.

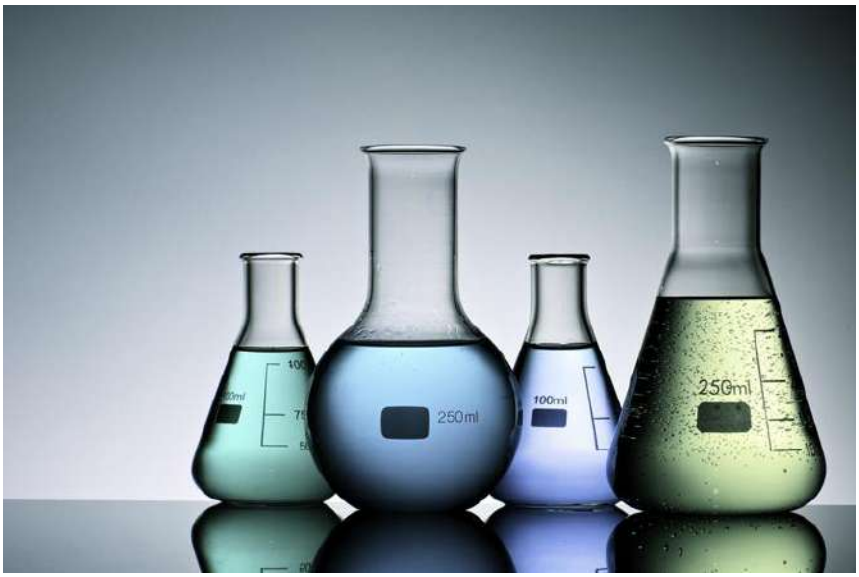
**Convection** is the transfer of heat to or from a fluid medium. Molecules in a gas or liquid in contact with a solid body transmit or absorb heat to or from that body and then move away, allowing other molecules to move into place and repeat the process. Efficiency can be improved by increasing the surface area to be heated or cooled, as with a radiator, and by forcing the fluid to move over the surface, as with a fan.

**Radiation** is the emission of electromagnetic (EM) energy, particularly infrared photons that carry heat energy. All matter emits and absorbs some EM radiation, the net amount of which determines whether this causes a loss or gain in heat. [1]

[1] Lucas, Jim. "What Is Thermodynamics?" *LiveScience*. Purch, 07 May 2015. Web. 27 Feb. 2017.

# Properties of Matter: Liquids

By Mary Bagley, Live Science Contributor | July 23, 2014 07:58pm ET




**The liquid state of matter** is an intermediate phase between solid and gas. Like the particles of a solid, particles in a liquid are subject to intermolecular attraction; however, liquid particles have more space between them, so they are not fixed in position. The attraction between the particles in a liquid keeps the volume of the liquid constant.

The movement of the particles causes the liquid to be variable in shape. Liquids will flow and fill the lowest portion of a container, taking on the shape of the container but not changing in volume. The limited amount of space between particles means that liquids have only very limited compressibility.

## Cohesion and adhesion

**Cohesion** is the tendency for the same kind of particles to be attracted to one another. This What cohesive "stickiness" accounts for the surface tension of a liquid. Surface tension can be thought of as a very thin "skin" of particles that are more strongly attracted to each other than they are to the particles surrounding them. As long as these forces of attraction are undisturbed, they can be surprisingly strong. For example, the surface tension of water is great enough to support the weight of an insect such as a water skipper. Water is the most cohesive nonmetallic liquid, according to the U.S. Geological Survey.

Cohesive forces are greatest beneath the surface of the liquid, where the particles are attracted to each other on all sides. Particles at the surface are more strongly attracted to the identical particles within the liquid than they are to the surrounding air. This accounts for the tendency of liquids to form spheres, the shape with the least amount of surface area. When these liquid spheres are distorted by gravity, they form the classic raindrop shape.

**Adhesion** is when forces of attraction exist between different types of particles. Particles of a liquid will not only be attracted to one another, but they are generally attracted to the particles that make up the container holding the liquid. Particles of the liquid are drawn up above the surface level of the liquid at the edges where they are in contact with the sides of the container.

The combination of cohesive and adhesive forces means that a slight concave curve, known as the meniscus, exists at the surface of most liquids. The most accurate measurement of the volume of a liquid in a graduated cylinder will be observed by looking at the volume marks closest to the bottom of this meniscus.

Adhesion also accounts for capillary action when a liquid is drawn up into a very narrow tube. One example of capillary action is when someone collects a sample of blood by touching a tiny glass tube to the blood droplet on the tip of a pricked finger.

## Viscosity

**Viscosity** is a measure of how much a liquid resists flowing freely. A liquid that flows very slowly is said to be more viscous than a liquid that flows easily and quickly. A substance with low viscosity is considered to be thinner than a substance with higher viscosity, which is usually thought of as being thicker. For example, honey is more viscous than water. Honey is thicker than water and flows more slowly. Viscosity can usually be reduced by heating the liquid. When heated, the particles of the liquid move faster, allowing the liquid to flow more easily.

## Evaporation

Because the particles of a liquid are in constant motion, they will collide with one another, and with the sides of the container. Such collisions transfer energy from one particle to another. When enough energy is transferred to a particle at the surface of the liquid, it will eventually overcome the surface tension holding it to the rest of the liquid. Evaporation occurs when surface particles gain enough kinetic energy to escape the system. As the faster particles escape, the remaining particles have lower average kinetic energy, and the temperature of the liquid cools. This phenomenon is known as evaporative cooling.

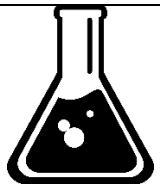
## Volatility

**Volatility** can be thought of as how likely a substance will be to vaporize at normal temperatures. Volatility is more often a property of liquids, but some highly volatile solids may sublime at normal room temperature. Sublimation happens when a substance passes directly from solid to gas without passing through the liquid state.

When a liquid evaporates inside a closed container, the particles cannot escape the system. Some of the evaporated particles will eventually come into contact with the remaining liquid and lose enough of their energy to condense back into the liquid. When the rate of evaporation and the rate of condensation are the same, there will be no net decrease in the amount of liquid.

The pressure exerted by the vapor/liquid equilibrium in the closed container is called the **vapor pressure**. Increasing the temperature of the closed system will increase the vapor pressure, according to Purdue University's department of chemistry. Substances with high vapor pressures can form a high concentration of gas particles above the liquid in a closed system. This can be a fire hazard if the vapor is flammable. Any small spark, even one occurring from the friction between the gas particles themselves, can be enough to cause a catastrophic fire or even an explosion. The U.S. Occupational Safety and Health Administration (OSHA) requires Material Safety and Data Sheets to give information about the volatility and flammability of liquids in order to help prevent accidents from occurring.[2]

[2] Bagley, Mary. "Properties of Matter: Liquids." *LiveScience*. Purch, 23 July 2014. Web. 27 Feb. 2017.



**Topic/Objective:**

__Thermodynamics and the properties of liquids_____

Name: _____

Period: _____

Date: _____

**Essential Question:**

What is Thermodynamics? What are the properties of liquids?

| Questions/titles/pictures | Notes: |
|---|---|
| ***What is Thermodynamics?*** | |
| 1. What is thermodynamics? | |
| 2. What is thermal energy? | |
| 3. What is the conservation of energy? | |
| 4. What is temperature? | |
| 5. What letter do we use for kelvin? | |
| 6. What letter do we use for Celsius? | |
| 7. What is conduction? | |
| 8. What is convection? | |
| 9. What is radiation? | |

| Questions/titles/pictures | Notes: |
| --- | --- |
| ***Properties of Matter: Liquids*** | |
| 10. What is the liquid state of matter? | |
| 11. What is cohesion? | |
| 12.What is adhesion? | |
| 13.What is capillary action? | |
| 14.What is viscosity? | |
| 15.What is evaporation? | |
| 16.What is volatility? | |

***Summary: Please write a 6 sentence summary about what you learned about thermodynamics and liquids.***