

Heat & Temperature

Major Topic and SOL Temperature Scales, Heat, and Thermal Energy Transfer
Science SOL PS.1d,j PS.7a,b,c,d

Length of Unit **2-90 minute class periods**

Major Understanding

Students will understand

- The three methods of heat transfer and describe examples of each.
- The three temperature scales and recall important point temperatures.
- And use inquiry-based strategies to develop theories about heat transfer.

Essential Questions

- How could you describe the three ways that heat is transferred?
- In what ways could you determine how heat is transferred?
- How could you describe the evolution of the different temperature scales and their differences in measuring common temperatures?

Student Objectives

Students will be able to

- Understand that heat differs from temperature.
- Investigate and understand heat is transferred from warmer substances to cooler substances.
- Understand the importance of using inquiry to develop theories about heat.

Bloom's Taxonomy Skills	21 st Century Learning Skills
<ul style="list-style-type: none"> • Creating • Evaluating • Analyzing • Applying • Understanding • Remembering 	<ul style="list-style-type: none"> • Critical Thinking • Problem Solving • Communication • Collaboration • Information & Media

Assessment Evidence

Performance Tasks

Students will

- Sketch illustrations to describe the different methods of heat transfer.
- Students will explore the evolution of the different temperature scales.
- Students will investigate the temperatures of water in different phases and the heat of fusion.

Other Evidence

- Cornell Notes/Notebooks
- Lab assignments
- Class participation
- Teacher observations
- Group Work

Technology

computers, Internet connection, projection system, document camera, temperature probes, Logger Lite software

Internet Resources

- www.wordle.net
- <http://www.pickens.k12.ga.us/Instructional%20Technology/Heat%20and%20Temperature%20Webquest%5B1%5D.pdf> (also attached)
- www.polleverywhere.com
- [Mixing Warm and Cold Water](#) Vernier Physical Science Lab
- [Heat of Fusion](#) Vernier Physical Science Lab

Supplies/Materials*

- styrofoam cups
- beakers

- balance
 - water (cold and warm)
 - graduated cylinders
 - ice cubes
 - paper towels
 - teacher guides notes (made individually to meet classroom needs)
 - notebooks or lined paper
- * See lab worksheets for exact supplies for each lab

Lesson 1: Mixin' It Up (1 – 90 minute period)

Engage:

- Students will complete the “[Mixing Warm and Cold Water](#)” laboratory activity from the Vernier with Physical Science lab manuals in groups of 4.

Explore:

- Students will use the [website](#) to complete the interactive web quest activity (also attached).

Explain:

- Teacher will review the types of heat transfer by using teacher guided notes.

Elaborate:

- Teacher will discuss convection, conduction, and radiation while students write [Cornell Notes](#) .

Evaluate:

- Students will be assessed on their lab activity and recordings.
- Students will be assessed on their web quest worksheet and discussion with their peers.
- Students will be assessed during verbal review of the difference between heat and temperature and discussion of the 3 types of heat transfer.

Lesson 2: Hot and Cold (1 – 90 minute period)

Engage:

- Students will complete the “[Heat of Fusion](#)” laboratory activity from the Vernier with Physical Science laboratory manuals in groups of 4.

Explore:

- The teacher will do a poll with students using an account from [PollEverywhere](#) on the important vocabulary words for this unit. The teacher will use [www.wordle.net](#) to create a word cloud of the classroom answers to review.

Explain:

- Teacher will review the importance of the creation of the different temperature scales by early scientist.

Elaborate:

- Teacher will use guided notes (attached) and students will write [Cornell Notes](#) to discuss different temperature scales.

Evaluate:

- Students will be assessed on their laboratory data and recordings.
- Students will be assessed on the objectives concerning temperature and temperature scales using their Cornell Notes.
- Students will be assessed on the review of 3 different temperature scales and various point temperatures.

Note: *Depending on the longevity of the notes and laboratory activities the lesson above may require two additional 90 minute blocks.

Heat, Temperature, and Temperature Scales

Heat is the average kinetic energy of particles within a substance.

Temperature is a measure of the degree of heat. Temperature can be measured using different scales. The scales were created by early scientists and are named for them. Common temperatures for each scale are listed in the table below:

<u>Temperature Scales</u>			
Temperatures	Fahrenheit	Celsius	Absolute Zero
Boiling Point	212 °F	100 °C	373K
Freezing Point	32 °F	0 °C	273K
Absolute Zero	-460 °F	-273 °C	0K
Average Room Temperature		Between 20-25 °C	
Body Temperature		37 °C	

*Note that Kelvin temperatures are not represented with a (°) degree symbol and they do not contain negatives.

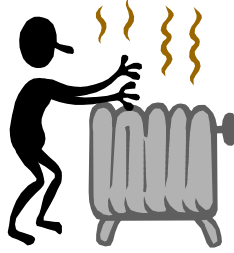
To figure out the temperatures that belong in the empty boxes of the table above, perform the temperature scale conversions below:

From Celsius to Fahrenheit: $9/5x\text{ }^{\circ}\text{C}+32^{\circ} = \text{ }^{\circ}\text{F}$

From Fahrenheit to Celsius: $5/9(\text{ }^{\circ}\text{F}-32^{\circ}) = \text{ }^{\circ}\text{C}$

From Celsius to Kelvin: $\text{ }^{\circ}\text{C}+273=\text{K}$

Heat and Temperature Webquest



Introduction:

Heat is created in different forms. Exploring the production of heat is important in understanding the transfer of heat to and from different objects.

Task:

Find examples of, conduction, convection, and radiation.

Process:

1. Click on the link below. On the right side, under the "green" box labeled "simulations" click on the **Kinetic energy and temperature** link. Read the text, operate the animations, and answer the questions for #1 on your worksheet.

http://www.classzone.com/books/ml_science_physical/page_build.cfm?id=resour_ch4&u=1

2. Go back to this website:

http://www.classzone.com/books/ml_science_physical/page_build.cfm?id=resour_ch4&u=1

3. Now click on the "**Conduction, Convection, or Radiation**" link under the same "green" box labeled "simulations."

4. Once you've finished dragging the pictures to the correct boxes, draw a picture for one example on the table on #2 on your worksheet.

http://www.classzone.com/books/ml_science_physical/page_build.cfm?id=resour_ch4&u=1

5. Now go back to the website above and click on the link marked "**Solar Cells**", under the "green" box heading *Visualizations*..

6. Play the movie.

7. Which heat transfer method is used to capture the sun's energy?



8. Take a look at the link below to look at these "bite - sized" conduction, convection, and radiation animations.

http://www.wisc-online.com/objects/index_tj.asp?objid=SC304

9. Answer the questions below:

In what three ways can heat be transferred?

True or False: Heat is always transferred from a warm object to a cooler one.

Give your own example of the following:

Conduction-

Convection-

Radiation-

Resources:

http://www.classzone.com/books/ml_science_physical/page_build.cfm?id=resour_ch4&u=1

http://www.wisc-online.com/objects/index_tj.asp?objid=SCE304

Evaluation: You will share your answers with a partner before turning them in to me. Decide if you or your partner needs to look back at the websites to correct any answers.

Conclusion: Please share with others the form of heat you found to be the most interesting to learn about.

Created by Hilary Tatum, November 2009

Name _____

Date _____

Heat and Temperature Worksheet

1. What happens to the speed of the particles if the temperature goes up?

What happens to the speed of the particles if the size of the object gets bigger?

What do you have to do to give the particles of the matter the most kinetic energy?

2.

Conduction	Convection	Radiation