Heat and Temperature

Major Topic and SOL: Heat and Temperature
Science SOL PS.1b,d,k,l PS.7a,b,c,

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

Major Understandings:
Students will…

- be able to name the three methods of heat transfer and describe examples of each.
- be able to name three temperature scales and recall important point temperatures.
- be able to 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	**21st Century Learning Skills**
• Evaluating • Analyzing • Understanding • Remembering • Applying	• Critical Thinking • Problem Solving • Collaboration • Information & Media • Contextual Learning

Assessment Evidence

Performance Tasks

Students will…

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

Other Evidence

- Graphic Organizers
- Discussion (oral/written)
- Class Participation
- Teacher Observations
- Laboratory Assignments/Reports
- Group Work

Technology Computers, Printer, Internet Connection, Projector System, Temperature Probeware, Laptop, Logger Lite, Internet Browser

Internet Resources:

- www.wordle.net
- Web Quest: http://www.pickens.k12.ga.us/Instructional%20Technology/Heat%20and%20Temperature%20Webquest%5B1%5D.pdf (modified and attached)
- www.polleverywhere.com (need account)

Supplies/Materials:

- Styrofoam Cups
- Beakers
- Balance
- Water (cold and warm)
- Graduated cylinders
- Ice Cubes
- Paper Towels
- Teacher Guided Notes (attached)

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

Engage:

- Students will complete the "Mixing Warm and Cold Water" laboratory activity from Vernier with Physical Science lab in groups of 4 (the *Procedure* and *Data* only), then print their graph.

Explore:

- Students will use the modified resource to complete the interactive web quest activity (attached).

Explain:

- Teacher will review with students and discuss their findings for the laboratory activity and web quest activity.

Elaborate:

- Teacher will discuss convection, conduction, and radiation while students write Cornell Notes.

Evaluate:

- Group discussion on lab and graph will be assessed.
- Web quest recordings.
- Students will be assessed concerning heat, heat transfer and temperature through discussing the three types of heat transfer.

Lesson 2: Temperature (1- 90 period)

Engage:

- Students will complete the "Heat of Fusion" laboratory activity from the Vernier with Physical Science lab in groups of 4 (only doing the *Extension* if time permits).

Explore:

- The teacher will do a digital poll with students using an account from PollEverywhere on the important vocabulary words (i.e. heat, temperature, heat of fusion, convection, conduction, radiation, Celsius, Fahrenheit, Kelvin, absolute zero, insulator, transfer, kinetic energy).
- The teacher will use www.wordle.net to create a word cloud to review their answers.

Explain:

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

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Elaborate:

- Teacher will use guided notes and students will write Cornell Notes to discuss different temperature scales.

Evaluate:

- Students will be assessed on their lab reporting sheet.
- Students will be assessed concerning temperature and temperature scales using their Cornell Notes.
- Students will review the three 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.

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Note Suggestions:

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:

Temperature Scales			
Temperatures	Fahrenheit	Celsius	Absolute Zero
Boiling Point	212℉	100℃	373K
Freezing Point	32℉	0℃	273K
Absolute Zero	-460℉	-273℃	0K
Average Room Temperature		Between 20-25℃	
Body Temperature		37℃	

*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: $9/5x℃+32˚=℉$

From Fahrenheit to Celsius: $5/9(℉-32˚)=℃$

From Celsius to Kelvin: $℃+273=K$

Heat and Temperature Webquest

Name _____Date_____

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. Go to the Resource Center (on the right) and click *Chapter 4: Heat and Temperature*. 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 below:

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

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

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

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

2. Use the same website. Go to the Resource Center (on the right) and click *Chapter 4: Heat and Temperature*. Now click on the **"Conduction, Convection, or Radiation"** link under the same "green" box labeled "simulations."

3. Once you've finished dragging the pictures to the correct boxes, draw a picture for one example in the table:

Conduction	Convection	Radiation

4. Now go back to the website. Go to the Resource Center (on the right) and click *Chapter 4: Heat and Temperature*. Click on the link marked **"Solar Cells"**, under the "green" box heading *Visualizations*.

5. Play the movie.

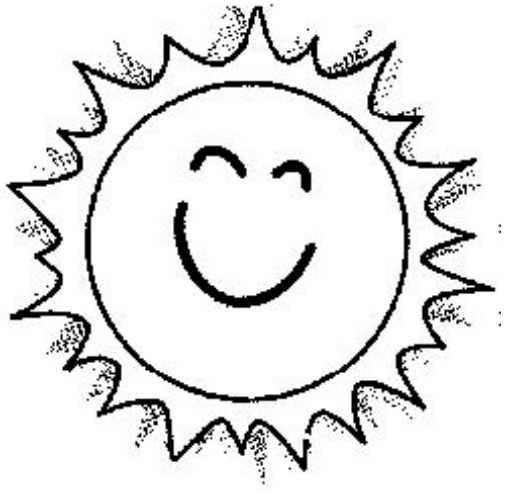
6. Which heat transfer method is used to capture the sun's energy?

7. 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=SCE304

8. 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 the teacher. Decide if you or your partner need 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.

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