

Black Body Radiation Lesson Plan

SIOP Lesson Plan Template

Class & Lesson Information

Date: Day 3 - Friday	Grade/Class/Subject: Astronomy - mostly 11 and 12		
Class setting (# of students & MLs, WIDA level if applicable, lesson duration, etc.): 18 Students total 3 MLs - average composite score is about 4 - Given the language skills of my students I feel comfortable giving them the same materials as my native speakers, but they will need more frequent check-ins and supports than other students might not need. 57 minutes per class period			
Grouping explanation: The past two lessons they have been working in small groups or pairs for the majority of the day, so I wanted to give students a day where they work primarily on their own before ending the day sharing in groups. I think the different grouping types are all helpful, but find that students can tire of being in the same groups or same types of groups each day.			
whole class Students will only share across the whole class two times: shortly during bellwork at the beginning of the hour, and at the end when the whiteboard groups share out.	small group Students will share in small groups during the bellwork and at the end of the lesson when they are in small groups to collaborate and confirm their responses to free response questions. Oh and during the demonstrations because of how hard it is to show the whole class at once.	partners Students won't really work in pairs today.	independent For the majority of the assignment today, students will be working individually to try to use radiation to learn about stars. (That said, most of my students worked with nearby neighbors during this task, so it wasn't as independent as I predicted. I think it's okay for students to work together during tasks like these; I simply didn't create the task with small groups needed by design.)
Unit/Theme: Modern Tools of Astronomy - Light / Spectra	Standards: NA		

Content Objective(s):

Students will explore the connection between temperature, color, and spectra of stars

Language Objective(s):

Students will read Black Body Radiation graphs to learn about stars.

Key Vocabulary:

Black Body Radiation

Thermal Spectrum

Peak Wavelength

Spectrum

Absorption

Wavelength

Redshift

Blueshift

Materials (supplementary & adapted):

Calculator

Black Body Radiation HO

Black Body Data HO (I gave this digitally to save color printing)

(Demonstration)

Hotplate

Ice and Water

(I also used a toaster)

IR thermometer

Higher-order questions/tasks:

- How should redshift and blueshift affect the measured temperature of a star?
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- Draw these three star's thermal spectrum all on one set of axes.

Lesson Sequence (Pre-/Opening activities):

Time allotted	Activities (Teacher talk, action, etc.)	Other notes
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~5 min	Bellwork Students will perform a think-pair-share about this warm up question to get their attention to the main focus for today. Today I have selected: <i>As stars get hotter, how does...</i> • <i>Their brightness change?</i> • <i>Their color change?</i> After we talk through how each of these are connected, which should be review from Earth Science class, we'll then extend into the main assignment for today about using spectra to visualize and connect these ideas.	This part should be review from Earth Science class, so I am using it as a gauge to determine how well they remember these concepts from the class. This gives me an idea of who will need more of my attention today to be successful and who will need less.
~2 min	Review the Daily Objectives As a class we will review the daily objectives to draw their attention to the importance of black body radiation and how they help us see the connection between temperature, color, and brightness of stars.	

Lesson Sequence (Main activities):

Time allotted	Activities (Teacher talk, action, etc.)	Other notes
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~30 min	Black Body Radiation Assignment -and- BBR Demonstration Students will mostly work individually to use the data from BBR Data to complete the assignment. Students will be guided to use data to find each star's peak wavelength, use that to find the temperature, and then decide each star's class. After that students will extend their findings to making connections to other ideas, like the last two questions which are higher order questions. I would recommend modelling how to find the peak wavelength, temperature, and class of the first star as an example before students start. That way they have seen it once, instructions on the page, and an example on the front board. <i>As students are working on their individual assignment, I would bring small groups of students to try out the demonstration of Black Body Radiation and IR thermometers.</i> The demonstrations let students experience an IR thermometer and see how it measures the temperatures using light indirectly of touching objects. I like to give students the opportunity to see it measure the temperature of objects without touching them in real time. Students get to see ice cool objects and they get to see the hotplate warm. I added in a toaster this year at the last second because I wanted them to see the heating element light up red, and have them think about why it turns red as it heats up. BBR should help them explain the color change.	There is not a lot of new vocab for today. Walking through the data at the beginning of the lesson and helping with small groups during the demonstration in the back, is a great way for me to model and explain these new words. So I'll be intentionally introducing and re-enforcing these new words during those times explicitly.
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Lesson Sequence (Post-activities):

Time allotted	Activities (Teacher talk, action, etc.)	Other notes
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~15 min	Whiteboarding and Sharing out Answers Students will be placed into random small groups to confer about their answers to different parts of the assignment. Students will then create a whiteboard in their small groups to share what their consensus landed on for their assigned questions. I think it makes sense to split them into four groups. ● 1-3 first half of the table ● 4-6 about brightness ● 7-8 about redshift and more complex ● 9 assembling the spectra onto on graph After students confer with each other and write their decision on their whiteboards, small groups will then share what they chose on their whiteboards. Other students who are not presenting should compare what groups are saying with what they found on their own.	
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