



Blackbody Radiation and Wein's Law

AS-Level Astronomy

Classroom Activity

Overview

Age Range:

16-17

Prep. Time:

0 minutes

Lesson Time:

40 minutes – 1 hour

Cost per activity:

Low (printing costs)

Includes the use of:

Internet Access, calculator

Outline

Students will use a combination of NAAP labs and interactive applications to explore blackbody radiation and spectral classification.

Including use of a Hertzsprung-Russel diagram and graphs. Students will experiment with the applications to find answers to questions and complete tables.

Pupils will Learn:

- Using the Hertzsprung-Russel diagram
- The types and classifications of stars

Lesson Plan:

Overview of the time required to complete lesson.

Description	Time	Notes
Introduction to the subject	10-15 min	
Activity 1	30-45 min	https://astro.unl.edu/naap/blackbody/blackbody.html and https://astro.unl.edu/naap/hr/hr.html

Online Observatory: onlineobservatory.eu

The online observatory collaboration consists of the following partners:

Baldone Observatory, Brorfelde Observatory, Cardiff University, Harestua Solar Observatory, Helsinki Observatory



Introduction to the subject:

Blackbody: An object that absorbs all radiation falling on it, at all wavelengths, is called a black body. When a black body is at a uniform temperature, its emission has a characteristic frequency distribution that depends on the temperature. Its emission is called black-body radiation.

Wien's displacement law: states that the black-body radiation curve for different temperatures will peak at different wavelengths that are inversely proportional to the temperature.

The Stefan–Boltzmann law: describes the power radiated from a black body in terms of its temperature. Specifically, the Stefan–Boltzmann law states that the total energy radiated per unit surface area of a black body across all wavelengths per unit time (also known as the black-body radiant emittance) is directly proportional to the fourth power of the black body's thermodynamic temperature T .

Activity 1:

- Distribute student guide to students and have them setup on computers/laptops, whether this activity is done individually or in pairs/groups will depend on the number of devices available.

Introduce the activity, telling students they will be using tools to help them visualise the concepts and answer the questions in their student guide.

1. Ensure all students have the labs and interactive applications working on their devices, some may need flash enabled and so direct them to the bottom of the 'general overview' page.
2. Give students time to work through the activities on the student guide.