

Cosmic Colors:
Applicable State Content Standards
(2016 Montana Science Standards)

<p>Lesson: NASA's <i>Space Based Astronomy</i> Unit 1: The Atmospheric Filter</p>	<p>Science Content Standards:</p> <p>Grade 4:</p> <ul style="list-style-type: none">● make observations to provide evidence of transfer of energy from place to place by sound, light, heat, and electric currents● develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move● develop a model communicating that light reflected from objects into the eye allows objects to be seen <p>Grades 9-12:</p> <ul style="list-style-type: none">● use mathematical representations to support a claim regarding relationships among the frequency, amplitude, wavelength, and speed of waves traveling in various media● communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy
<p>NASA's <i>Space Based Astronomy</i> Unit 2: The Electromagnetic Spectrum</p>	<p>Science Content Standards:</p> <p>Grade 4:</p> <ul style="list-style-type: none">● make observations to provide evidence of transfer of energy from place to place by sound, light, heat, and electric currents● develop a model communicating that light reflected from objects into the eye allows objects to be seen <p>Grade 5:</p> <ul style="list-style-type: none">● use evidence or models to support the claim that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth <p>Grades 6-8:</p> <ul style="list-style-type: none">● use mathematical representations to describe a simple model for waves that includes how the

	<p>amplitude and wavelength of a wave is related to the energy in a wave develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials</p> <p>Grades 9-12:</p> <ul style="list-style-type: none"> ● use mathematical representations to support a claim regarding relationships among the frequency, amplitude, wavelength, and speed of waves traveling in various media ● evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other ● communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy <p>Mathematics Theme Groups (adjustable by grade): Measurement Connections Data analysis, statistics, and probability Patterns, functions, and algebra Geometry and spatial sense</p>
<p>NASA’s <i>Space Based Astronomy</i> Unit 3: Collecting Electromagnetic Radiation</p>	<p>Science Content Standards:</p> <p>Grade 4:</p> <ul style="list-style-type: none"> ● make observations to provide evidence of transfer of energy from place to place by sound, light, heat, and electric currents ● develop a model communicating that light reflected from objects into the eye allows objects to be seen ● generate and compare multiple solutions that use patterns to transfer information <p>Grades 6-8:</p> <ul style="list-style-type: none"> ● use mathematical representations to describe a simple model for waves that includes how the amplitude and wavelength of a wave is related to the energy in a wave develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials <p>Grades 9-12:</p>

	<ul style="list-style-type: none"> ● communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy <p>Mathematics theme groups (adjustable by grade): Measurement Connections Problem solving Patterns, functions, and algebra Geometry and spatial sense</p>
<p>NASA’s <i>Space Based Astronomy</i> Unit 4: Down to Earth</p>	<p>Science Content Standards:</p> <p>Grade 4:</p> <ul style="list-style-type: none"> ● make observations to provide evidence of transfer of energy from place to place by sound, light, heat, and electric currents ● use mathematical representations to support a claim regarding relationships among the frequency, amplitude, wavelength, and speed of waves traveling in various media ● communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy <p>Mathematics theme groups (adjustable by grade): Number & operation Patterns, function, & algebra Measurement Data analysis, statistics, & probability Communication Connections Representations</p>
<p>How Light Moves</p>	<p>Science Content Standards:</p> <p>Grade 4:</p> <ul style="list-style-type: none"> ● make observations to provide evidence of transfer of energy from place to place by sound, light, heat, and electric currents <p>Grade 5:</p>

	<ul style="list-style-type: none"> ● graph the daily changes in the length, shape, and direction of shadows ● use evidence or models to support the claim that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth
Build a Spectroscope	<p>Science Content Standards:</p> <p>Grade 4:</p> <ul style="list-style-type: none"> ● develop a model communicating that light reflected from objects into the eye allows objects to be seen <p>Grades 9-12:</p> <ul style="list-style-type: none"> ● communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy
Discovering Color with a Prism	<p>Science Content Standards:</p> <p>Grade 4:</p> <ul style="list-style-type: none"> ● develop a model communicating that light reflected from objects into the eye allows objects to be seen <p>Grades 9-12:</p> <ul style="list-style-type: none"> ● communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy
Wavelength and Energy	<p>Science Content Standards:</p> <p>Grade 4:</p> <ul style="list-style-type: none"> ● develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move <p>Grade 5:</p> <ul style="list-style-type: none"> ● use evidence or models to support the claim that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth

	<p>Grades 9-12:</p> <ul style="list-style-type: none"> ● use mathematical representations to support a claim regarding relationships among the frequency, amplitude, wavelength, and speed of waves traveling in various media
<p>Lesson: NASA's <i>Electromagnetic Math</i></p>	<p>Grades 9-12:</p> <ul style="list-style-type: none"> ● use mathematical representations to support a claim regarding relationships among the frequency, amplitude, wavelength, and speed of waves traveling in various media ● communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy <p>Mathematical theme groups: (note: a detailed topic matrix is available on page 8 of the instructional guide)</p> <p>Grades 6-8:</p> <ul style="list-style-type: none"> ● work flexibly with fractions, decimals, and percents to solve problems; ● understand and use ratios and proportions to represent quantitative relationships; ● develop an understanding of large numbers and recognize and appropriately use exponential, scientific, and calculator notation; . ● understand the meaning and effects of arithmetic operations with fractions, decimals, and integers; ● develop, analyze, and explain methods for solving problems involving proportions, such as scaling and finding equivalent ratios. ● represent, analyze, and generalize a variety of patterns with tables, graphs, words, and, when possible, symbolic rules; ● model and solve contextualized problems using various representations, such as graphs, tables, and equations. ● use graphs to analyze the nature of changes in quantities in linear relationships. ● understand both metric and customary systems of measurement; ● understand relationships among units and convert from one unit to another within the same system;

Grades 9-12:

- judge the reasonableness of numerical computations and their results.
- generalize patterns using explicitly defined and recursively defined functions;
- analyze functions of one variable by investigating rates of change, intercepts, zeros, asymptotes, and local and global behavior;
- understand and compare the properties of classes of functions, including exponential, polynomial, rational, logarithmic, and periodic functions;
- draw reasonable conclusions about a situation being modeled.