Science

Brunswick School Department
Physics
Light and Color

Essential Understandings	▪ Causation: Nothing "just happens." Everything is caused. ▪ Interrelatedness: Everything in the universe is connected to everything else in the universe. ▪ Dynamism: Everything is changing in some way all the time. ▪ Entropy: Change has direction. Generally, simple precedes complex. Generally, order changes toward disorder. ▪ Uniformitarianism: The way the universe works today is the way it worked yesterday and the way it will work tomorrow.
Essential Questions	▪ How is energy transferred through electromagnetic wave motion? ▪ How is light energy perceived and measured? ▪ How do electromagnetic waves interact with the media through which they pass? ▪ How does the behavior of visible light interactions differ from the behavior of pigmentation interactions? ▪ How does the speed of light remain constant in all frames of reference?
Essential Knowledge	▪ Electromagnetic waves transfer energy. ▪ Vibration of subatomic particles are the source of almost all electromagnetic radiation. ▪ The speed of light is a constant in all frames of reference. ▪ $v = f\lambda$
Vocabulary	▪ <u>Terms</u>: o additive primary colors, blue shift, complementary colors, electromagnetic spectrum, electromagnetic wave, infrared, light-year, line spectrum, opaque, penumbra, photon, pigment, polarization, ray, red shift, scatter, shadow, spectroscope, spectrum, subtractive primary colors, transparent, ultraviolet, umbra, white light
Essential Skills	▪ Use mathematics to calculate electromagnetic wave speed, frequency, and wavelength. ▪ Analyze the effects of relative motion between light sources and light observers. ▪ Interpret spectroscopic data to identify substances. ▪ Connect energy contained in an electromagnetic wave to frequency and wavelength of the wave.

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Related Maine Learning Results	Science and Technology D. The Physical Setting D1. Universe and Solar System Students explain the physical formation and changing nature of our universe and solar system, and how our past and present knowledge of the universe and solar system developed. a. Explain why the unit of light years can be used to describe distances to objects in the universe and use light years to describe distances. D3. Matter and Energy Students describe the structure, behavior, and interactions of matter at the atomic level and the relationship between matter and energy. d. Describe how light is emitted and absorbed by atoms' changing energy levels, and how the results can be used to identify a substance. D4. Force and Motion Students understand that the laws of force and motion are the same across the universe. c. Describe the relationship between electric and magnetic fields and forces, and give examples of how this relationship is used in modern technologies. d. Describe and apply characteristics of waves including wavelength, frequency, and amplitude. e. Describe and apply an understanding of how waves interact with other waves and with materials including reflection, refraction, and absorption. f. Describe kinetic energy (the energy of motion), potential energy (dependent on relative position), and energy contained by a field (including electromagnetic waves) and apply these understandings to energy problems.
Sample Lessons And Activities	▪ Word problem worksheets ▪ Light labs ▪ Lectures ▪ Light demonstrations ▪ Light videos
Sample Classroom Assessment Methods	▪ Chapter tests ▪ Quizzes ▪ Laboratory reports

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Sample Resources	▪ Publications: o Physical Science - Glencoe o MARVEL Data bases o GALE Resource Data bases ▪ Videos: o The Mechanical Universe