Science
Physics
Unit 10: Special Relativity

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	▪ What is the nature of time dilation? ▪ How does the correspondence principle advance the growth of scientific theories? ▪ How do mass and rest mass compare? ▪ How do energy and rest energy compare? ▪ How do the postulates of special relativity explain the behavior of matter at relativistic speeds?
Essential Knowledge	▪ As objects increase their speed they: 1. Increase in mass. 2. Decrease in length in the direction of travel. 3. Increase in kinetic and relativistic energy. 4. Increase their momentum and relativistic momentum. 5. Move through time slower than objects in a slower moving frame of reference. 6. Perceive no difference in any internally measureable quantity including: passage of time, mass, length in any direction, and internal energy.
Vocabulary	▪ <u>Terms</u>: ○ correspondence principle, first postulate of special relativity, length contraction, postulate, relativistic momentum, rest energy, rest mass, second postulate of special relativity, spacetime, special theory of relativity, time dilation
Essential Skills	▪ Use mathematics to calculate time dilation at relativistic speeds. ▪ Use mathematics to calculate momentum at relativistic speeds. ▪ Determine the rest mass of objects. ▪ Utilize the postulates of special relativity to describe relativistic behaviors. ▪ Describe the universe using Einstein's model of spacetime.

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Related Maine Learning Results	Science and Technology A. Unifying Themes A2.Models Students evaluate the effectiveness of a model by comparing its predictions to actual observations from the physical setting, the living environment, and the technological world. D. The Physical Setting D4.Force and Motion Students understand that the laws of force and motion are the same across the universe. b. Explain and apply the ideas of relative motion and frame of reference. 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 ▪ Lectures ▪ Relativity demonstrations ▪ Relativity videos
Sample Classroom Assessment Methods	▪ Chapter Tests ▪ Quizzes ▪ Laboratory Reports
Sample Resources	▪ Publications: o Physical Science - Glencoe o MARVEL Data bases o GALE Resource Data bases ▪ Videos: o The Mechanical Universe