



Chapter Objectives

2: Special Theory of Relativity

Following your study of this chapter, you should be able to:

- articulate the principle of Galilean invariance
- define a "transformation"
- write down the Galilean transformations for two inertial systems
- explain the motivation behind and results of the Michelson-Morley experiment
- know Einstein's postulates: the Principle of Relativity and the constancy of the speed of light
- discuss the concept of simultaneity
- explain what a Lorentz transformation was trying to accomplish
- know the mathematical form of the Lorentz transformations
- explain in your own words what is meant by "proper time" and "proper length"
- state the mathematical equations for time dilation and length contraction
- calculate relativistic time dilations and length contractions
- calculate relativistic velocity addition
- cite some experimental verification of time dilation
- follow the twin paradox analysis in the text
- interpret Minkowski spacetime diagrams
- state the difference between lightlike, spacelike and timelike intervals with reference to Δs^2
- calculate relativistic Doppler shifts
- discuss relativistic momentum and why the concept is necessary
- understand relativistic kinetic energy and how to use kinetic energy or momentum to express motion
- state the conservation of mass-energy
- write down the mathematical formula for the momentum-energy relation