

Solutions

2.1 A The Lorentz factor is 1 divided by the square root of 1 minus speed squared over light speed squared. Galilean velocity addition is an approximation for speeds much smaller than light speed.

2.2 $\Delta t = \gamma \times \text{proper interval} = 1.25 \times 8 = 10$ microseconds.

2.3 False. Time dilation is not an instrument fault. Proper length is measured in the object rest frame; a contracted length is measured in a frame where it moves.

2.4 proper time. proper time means Time between events measured at one location in a frame.

3.1 $\gamma = 1.25$; proper lifetime = 8 microseconds. Lab distance = $0.60 \times 3 \times 10^8 \times 10^{-5} = 1,800$ m. Birth and decay occur at the same particle-frame location.