

Galilean and special relativity · supported focus

Supported focus · HL

Supported scope

- Supported HL focus. First assessment 2025; full Physics guide acquired (84 PDF pages). Remaining guide, assessment and practical requirements retain their recorded holds.
- State model conditions and distinguish fictional data from measurements.

Relativity · 1.1

Reasoning

Two observers can assign different times between the same events. A clock reading has meaning only when the frame and events are specified. Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.

Relativity · 2.1

Reasoning

In special relativity, inertial observers measure the same vacuum light speed. Time dilation compares proper time measured where two events occur at one place with the interval in another inertial frame. proper time: Time between events measured at one location in a frame; inertial frame: A frame in which a free body moves at constant velocity.

Relativity · 3.1

Reasoning

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. Label which frame measures proper time or proper length before substituting. Use event coordinates consistently. Do not combine lengths from one frame with time intervals from another without transformation.

Relativity · 4.1

Reasoning

State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution. Known: $v = 0.60c$ and proper time is 4.0 microseconds. $\gamma = 1/\sqrt{(1-v^2/c^2)} = 1/\sqrt{(1-0.60^2)} = 1.25$. $\Delta t = \gamma \Delta t_0 = 1.25 \times 4.0 = 5.0$ microseconds in the stated second frame.

Relativity · 4.2

Reasoning

A proper interval is 8 microseconds and gamma is 1.25. Find the other-frame interval. Use the same sequence: known quantities $\rightarrow$ model $\rightarrow$ relation $\rightarrow$ substitution $\rightarrow$ unit and interpretation.

Relativity · 5.1

Reasoning

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. Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

Relativity · 5.2

Reasoning

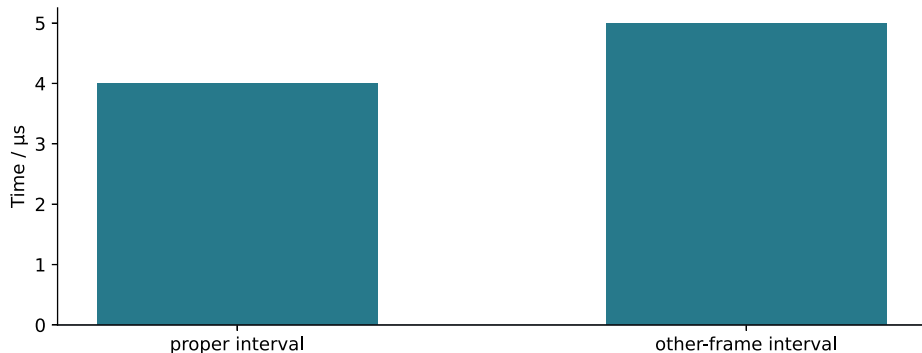
All inertial observers must measure the same time interval between any two events. This claim is false: Time dilation is not an instrument fault. Proper length is measured in the object rest frame; a contracted length is measured in a frame where it moves.

Relativity · 5.3

Reasoning

Relativity and measuring events: 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.

Relativity · diagram



- Original teaching diagram: Relativity and measuring events
- Use the labels and the stated model together.

Relativity · original transfer

Your turn

At $v=0.60c$, lab lifetime is 10 microseconds. Find proper lifetime and lab travel distance. Identify the proper clock.

Relativity · transfer reasoning

Method and interpretation

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.

Check yourself

- Explain proper time using the stated model.
- Explain inertial frame using the stated model.
- Change one value in the original transfer; explain which assumption still matters.