OpenStax Ch. 28 - Special Relativity   **Name**

This shows **some** of the possible questions you encountered on the online test. Point values here are arbitrary.

1. (5) Sally's rocket is moving with respect to you at 88% of the speed of light. She watches a movie that is 90.0 minutes long, for her. How much time elapses on your desk clock, in minutes, while she watches the movie?

Hint: The proper time Δt_0 is the time interval where beginning and end are both at rest for one observer.

2. (10) Suppose NASA sends astronauts on a spacecraft moving at speed v=0.98c (relative to Earth) to Bellatrix, 35 ly (light years) from Earth, and the 3rd brightest star in Orion. (Note: 1 ly = c x 1 year).

a) (5) How many years pass on Earth until they return?

b) (5) How much time passes on the clocks carried by the astronauts until they return?

3. (5) An electron of rest mass 9.10938×10^{-31} kg, is accelerated to a speed of v=0.78c. How large is its kinetic energy, measured in units of keV (kilo-electron-volts)?

4. (5) Your friend Brutus is able to launch a 1.60-meter long spear with a speed of 0.995c towards the moon, where c is the speed of light. While you see the spear flying, how long is it in your reference frame, in meters?

5. (5) According to Einstein's equation, $E_0 = mc^2$, how much mass, in milligrams, would have to be destroyed so that 50.0 TJ (terajoules) of energy is released?