PHYS206: General Physics IV KOÇ UNIVERSITY Spring Semester 2013

College of Arts and Sciences

Section 1a Quiz 6 21 March 2013

Closed book. No calculators are to be used for this quiz.
Quiz duration: 10 minutes

Name: **Student ID:** **Signature:**

A particle has rest mass $6.64 \times 10^{-27} kg$ and momentum $2.10 \times 10^{-18} kg.m/s$

(a) What is the total energy (kinetic plus rest energy) of the particle?

(b) What is the kinetic energy of the particle?

(c) What is the ratio of the kinetic energy to the rest energy of the particle?

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Section 1b Quiz 6 21 March 2013

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Quiz duration: 10 minutes

Name: **Student ID:** **Signature:**

Using the equations given below, show that $E^2 = (mc^2)^2 + (pc)^2$.

$E = \gamma mc^2$

$p = \gamma mv$

$$\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$$

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Section 1c Quiz 6 21 March 2013

Closed book. No calculators are to be used for this quiz.
Quiz duration: 10 minutes

Name: Student ID: Signature:

An extraterrestrial spaceship is moving away from the earth after an unpleasant encounter with its inhabitants. As it departs, the spaceship fires a missile toward the earth. An observer on earth measures that the spaceship is moving away with a speed of 0.600c. An observer in the spaceship measures that the missile is moving away from him at a speed of 0.800c. As measured by an observer on earth, how fast is the missile approaching the earth?

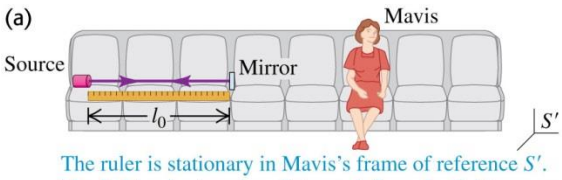
PHYS 206: **KOÇ UNIVERSITY** **Spring Semester 2013**

College of Arts and Sciences

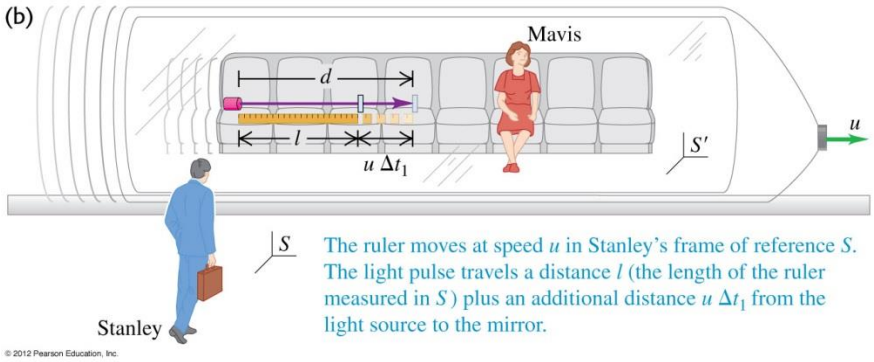
Section 1d **Quiz 6** **21 March 2013**

Closed book. No calculators are to be used for this quiz.
Quiz duration: 10 minutes

Name: **Student ID:** **Signature:**



The ruler is stationary in Mavis's frame of reference S'. The light pulse travels a distance l_0 from the light source to the mirror.



The ruler moves at speed u in Stanley's frame of reference S. The light pulse travels a distance l (the length of the ruler measured in S) plus an additional distance $u\,\Delta t_1$ from the light source to the mirror.

Explanation for the thought experiment shown in figure above:
a) A ruler is at rest in Mavis's frame S'. A light pulse is emitted from a source at one end of the ruler, reflected by a mirror at the other end, and returned to the source position. b) Motion of the light pulse as measured in Stanley's frame S.

Using this information, find a relation between l and l_0.

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Section 1e **Quiz 6** **21 March 2013**

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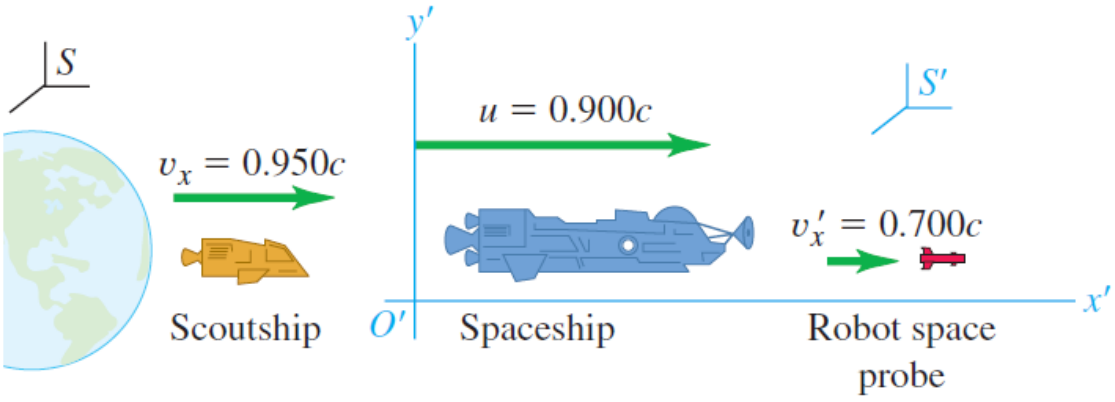
Quiz duration: 10 minutes

Name: **Student ID:** **Signature:**

(a) A spaceship moving away from the earth at 0.900c fires a robot space probe in the same direction as its motion at 0.700c relative to the spaceship. What is the probe's velocity relative to the earth?

(b) A scoutship is sent to catch up with the spaceship by traveling at 0.950c relative to the earth. What is the velocity of the scoutship relative to the spaceship?



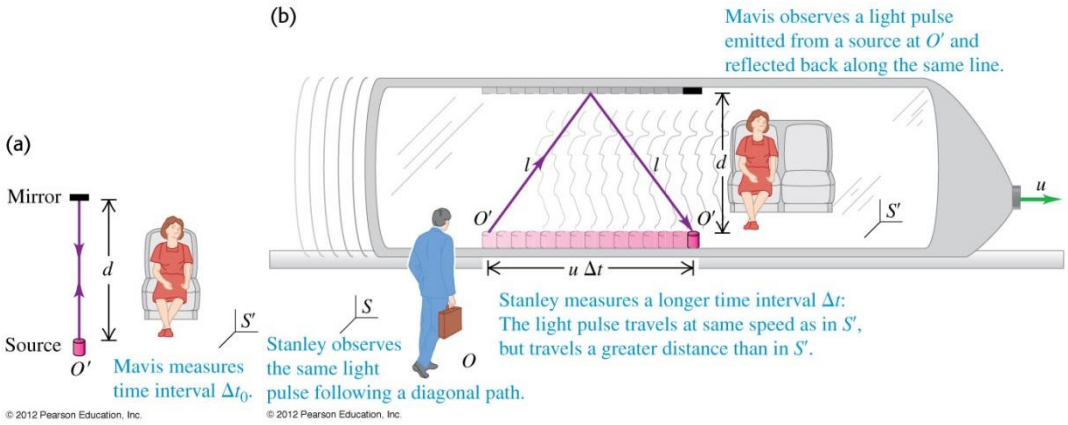
PHYS 206: **KOÇ UNIVERSITY** **Spring Semester 2013**

College of Arts and Sciences

Section 1f **Quiz 6** **21 March 2013**

Closed book. No calculators are to be used for this quiz.
Quiz duration: 10 minutes

Name: **Student ID:** **Signature:**



Explanation for the thought experiment shown in figure above:
a) Mavis, in frame of reference S', observes a light pulse emitted from a source at O' and reflected back along the same line. b) How stanley (in frame of reference S) and Mavis observe the same light pulse. The positions of O' at the times of departure and return of the pulse are shown.

Using this information find a relation between Δt and Δt_0.