1 Multiple Choice - Single Answer ✔ 3.0 - Hide Answer

Two rockets each of proper length equal to L_0 are crossing one another from opposite directions at velocities $\pm$ 0.56 c as observed from earth. The length of one rocket measured by an observer in the other rocket is

- L_0
- 0.383 L_0
- 0.203 L_0
- 0.916 L_0
- 0.242 L_0
- 0.764 L_0

2 Multiple Choice - Single Answer ✔ 3.0 - Hide Answer

The kinetic energy of a freely moving object is 0.9 MeV. If the mass of the object is 10.0 MeV/c^2 then its speed (in the unit of c, where c is the speed of light in vacuum) is

- 0.123c
- 0.397c
- 0.816c
- 0.203c
- 0.729c
- 0.54c

3 Multiple Choice - Single Answer ✖ 0.0 - Hide Answer

A jet is moving at a speed of 709 km/hour with respect to the ground. An observer on the jet is measuring the length of an air strip on the ground of proper length 2.5 km. The measured length differs from the actual length on ground by an amount (in picometer, where 1 picometer=10^{-12} metre) equal to

- 107.741 picometer
- 538.709 picometer
- 269.354 picometer
- 53.87 picometer
- 1131.29 picometer
- 808.064 picometer

1 | Multiple Choice - Single Answer | ✔ | 2.0 | - | Hide Answer

The Lorentz transformation can be applied for bodies

- which must be accelearting
- moving with any uniform velocity
- moving with uniform velocity comparable to the speed of light only
- which are at rest only
- moving with uniform velocity equal to the speed of light only
- moving with uniform velocity very small compared to the speed of light only

2 | Multiple Choice - Single Answer | ✔ | 2.0 | - | Hide Answer

A rocket leaves earth with a speed 0.71c (where c is the speed of light in vacuum). While traveling the clock in the rocket records the interval between two events happening at the same location in the rocket as 1 hour. According to an observer on earth the same two events will appear to have an interval equal to

- 0.71 hour
- 1.42 hour
- 2.454 hour
- 2.122 hour
- 1.965 hour
- 3.451 hour

3 | Multiple Choice - Single Answer | ✔ | 2.0 | - | Hide Answer

An event takes place at $x = (x_1, x_2, x_3, x_4)$ in the space-time. For x to be a space-like four-vector

- the event must be satisfying the condition $x_1^2 + x_2^2 + x_3^2 = x_4^2$
- the event must be located exterior of the light cone with vertex at x=0
- the event must be located interior of the forward light cone with vertex at x=0
- the event must be located on the negative x_4 axis
- the event must be located on the positive x_4 axis
- the event must be located interior of the backward light cone with vertex at x=0

Q No.	Q. Type	Status	Marks	Comment	
4	Multiple Choice - Single Answer	✔	2.0	-	Hide Answer

A rod of proper length L_0 moving relative to earth appears to have a length from earth as $L = L_0/\gamma$. What is the value of γ for a rod moving at a uniform speed of 0.28c, where c is the speed of light in vacuum

- 1.77
- 1.04
- 1.35
- 1.56
- 0.96
- 2.18

Section - 3

Marks per question : 4 **Marks Scored : 8.0**

Q No.	Q. Type	Status	Marks	Comment	
1	Multiple Choice - Single Answer	✔	4.0	-	Hide Answer

A spaceship from earth goes to a planet with a uniform velocity 0.84c (where c is the speed of light in vacuum) and spends 4 months in the planet. The spaceship then returns to earth with a uniform velocity 0.72c. If the entire trip (from taking off from earth to landing back on earth) takes 6 years as per the clock in the spaceship, what is the earth-planet distance from earth's frame expressed in light years. Given that, 1 light year=distance traveled by light in vacuum in 1 year. Also assume that the planet is at rest with respect to the earth.

- 8.8 light year
- 3.52 light year
- 1.76 light year
- 5.63 light year
- 6.86 light year
- 5.28 light year

Q No.	Q. Type	Status	Marks	Comment	
2	Multiple Choice - Single Answer	✔	4.0	-	Hide Answer

Two events as observed from some inertial frame (say S′) are separated by a distance of 25.8×10^8 metres and an interval of 10.0 sec. What is the proper time interval between the two events.

- 3.061 sec
- 5.102 sec
- 3.572 sec
- 2.041 sec
- 7.654 sec
- 1.53 sec