

Tutorial-10
PH101

- 1) A rod of proper length l_0 oriented parallel to the x axis moves with speed u along the x axis in S . What is the length measured by an observer in S' .
- 2) The frequency of light reflected from a moving mirror undergoes a Doppler shift because of the motion of the image. Find the Doppler shift of light reflected directly back from a mirror which is approaching the observer with speed v .
- 3) In the frame S , a particle is moving with energy and momentum E and p_x respectively. Frame S' moves to the x direction with a speed v_x with respect to S , determine the momentum p'_x , and energy E' observed in S' . Also, show that $E'^2 - p'^2_x c^2 = E^2 - p^2_x c^2$.
- 4)(a) A body of mass m at rest breaks up spontaneously into two parts, having rest masses m_1 and m_2 and respective speeds v_1 and v_2 . Show that $m > m_1 + m_2$.
(b) A particle of rest mass m and speed v collides and stick to a stationary particle of mass M . What is the final speed of the composite particle.
- 5) A photon of energy E_0 collides head on with a free electron of rest mass m_0 and speed v . The photon is scattered at 90° . Find the energy E of the scattered photon.