PH-105 Assignment Sheet - 1

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16. A spaceship is moving away from an observer B on earth at a velocity 0.6c along +ve x-direction. The spaceship has a gun shooting the particles at a velocity 0.8c along the +ve x-direction relative to the spaceship. (a) Find out the velocity of the particles as seen by the observer B on earth. (b) Find out the kinetic energy measured by the observer B and an observer in the spaceship.

Solution :
(a) In earth frame velocity = 0.8c + 0.6c / (1 + 0.8c * 0.6c / c^2) = 0.946c
(b) KE in spaceship frame = $mc^2(1/\sqrt{(1-(0.8c/c)^2)}-1) = 2mc^2/3$
KE in earth frame = $mc^2(1/\sqrt{(1-(0.946)^2)}-1) = 25mc^2/12$