Indian Institute of Technology Guwahati

Tutorial-4 | PH131: Modern Physics | Due on: 28 October 2025

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1. (a) The rest energy of a particle is found to be equal to its kinetic energy. What must be the speed of the particle as observed from a rest frame?
   (b) If a spacecraft is to be brought from rest to a speed of 0.6c, how many joules of energy per kilogram of rest mass will be needed?

2. Find the total energy and kinetic energy (in GeV) and the momentum (in GeV/c) of a proton whose speed is 0.9c. .Given that the rest mass of the proton is 0 .938GeV/c^2.

3. The work function of cesium is 1.9 eV. What is the maximum wavelength of light that can eject photoelectron from cesium. If light with wavelength equal to 500 nm strikes cesium what is the maximum kinetic energy of the ejected electrons?

4. Consider electromagnetic radiations at wavelength equal to 100 μm and 100 nm. Use Rayleigh-Jeans formula and Planck radiation formula to find energy per unit volume at each of two wavelengths for a frequency interval of 1 Hertz. Compare the difference in energies as given by the two formulae at the two different wavelengths, assuming T=1200 K.
