

*Physics 831 Quiz #3 - Take-home, due Monday, Sep. 30, at beginning of class*

1. Find the specific heat per particle,  $(dE/dT)/N$ , of a low temperature electrically neutral gas of protons, neutrons and electrons at a baryon density,  $\rho_B = \rho_n + \rho_p$ , and temperature  $T$ . To simplify things, assume the masses of the protons are equal,  $m_p = m_n = M$ , that the electrons are massless, and that the nucleons can be treated non-relativistically. These are reasonable assumptions if the Fermi energies are on the order of 10-50 MeV. Express the answer in terms of  $\rho_B$ ,  $M$  and lowest non-zero order of  $T$ . It is fine to let  $\hbar = c = 1$ .