The standard method to estimate the photon attenuation coefficient in inhomogeneous media is to use the relation between CT numbers and electron density N_e by assuming the attenuation coefficient is independent of the atomic number. The method is sufficiently accurate for most radiotherapy dose calculations. When energy is lower than 100 keV such as brachytherapy applications, however, photoelectric and Rayleigh scattering become important. Hence, the atomic number needs to be considered in estimating the attenuation coefficient. In this study we propose a method to calculate the effective atomic number, Z-eff, of the medium from CT number and consequently to more accurately estimate the attenuation coefficient for low energy photons. We formulate the attenuation coefficient as a sum of photoelectric, Rayleigh scattering, and Compton scattering. Each term is represented by a simple function of energy, N_e, and Z-eff. A solution of the equation relating CT number with the attenuation coefficient gives Z-eff of the medium. We applied this method to a fictitious 50 keV monoenergetic CT scanner. We calculated CT numbers, N_e, and Z-eff for body tissues with known compositions and mass densities. The new method significantly improves the standard method in estimating the attenuation coefficient at low photon energies for materials with Z-eff different from water (Z-eff = 7.45) such as skeleton (Z-eff = 13.26) and adipose tissue (Z-eff = 6.71).