Laboratory permeability studies can contribute significantly to the quantification of aquifer heterogeneity. However, intrinsic permeabilities obtained by standard core analysis techniques using gas are different from those obtained using water. This is because gas measurements may be affected by a molecular phenomenon known as gas slippage. An empirical correlation is presented for liquid and gas permeability measurements obtained for a suite of Permo-Triassic sandstones and shales from the Sherwood Sandstone Group of northern England. Liquid permeability tests were performed using synthetic formation brines and deionized water. Gas permeability tests used nitrogen as the permeant. Liquid permeabilites, k_l, ranged from 9.0×10^{-19} $m^2$to $2.4 \times 10^{-12} m^2$ and gas permeabilites, k_g, ranged from $1.7 \times 10^{-17} m^2$ to $2.6 \times 10^{-12} m^2$.The liquid and gas permeability data exhibit log-normal frequency distributions; the log transformed liquid and gas permeability data have means of $5.1 \times 10^{-16} m^2$ and $4.3 \times 10^{-15} m^2$respectively. A linear least-squares fit to the data has the form $\log_{10} k_l = 1.17 \log_{10} k_g + 1.51$. k_l/k_g ratios, in the range 0.03 to 0.9, indicate that Hagen-Poiseuille type models may not provide appropriate descriptions of gas flow in the Sherwood Sandstone.