Transport Coefficients for a Dilute Gas

Viscosity	$\eta \approx \frac{1}{3}\langle v\rangle\, \ell\, n\, m$
Thermal Conductivity	$K_T \approx \frac{1}{3}\langle v\rangle\, \ell\, n\, \frac{\partial\bar{\varepsilon}}{\partial T}$
Self-Diffusion	$D \approx \frac{1}{3}\langle v\rangle\, \ell$

where $n=N/V$, $\langle v\rangle = \sqrt{8kT/\pi m}$, $\ell = \frac{1}{\sqrt{2}n\sigma_o}$

σ_o = scattering cross-section (usually temperature dependent)
[$\sigma_o = \pi d^2$ for hard spheres of diameter d]

$\frac{\partial\bar{\varepsilon}}{\partial T}$ = single molecule specific heat (usually temperature independent)
[$\partial\varepsilon/\partial T = 3/2\ k$ for a monatomic gas]

In terms of T and P (noting that $n=P/kT$)		correct prefactors for hard spheres
$\eta \approx \frac{2}{3\sigma_o}\sqrt{\frac{mkT}{\pi}}$	(varies as $T^{1/2}$, independent of P)*	$5\pi/16\sigma_o$
$K_T \approx \frac{2}{3\sigma_o}\sqrt{\frac{kT}{\pi m}}\frac{\partial\bar{\varepsilon}}{\partial T}$	(varies as $T^{1/2}$, independent of P)*	$25\pi/32\sigma_o$
$D \approx \frac{2}{3\sigma_o}\sqrt{\frac{(kT)^3}{\pi m}}\frac{1}{P}$	(varies as $T^{3/2}$ and $1/P$)*	$3\pi/8\sigma_o$

*In general, the T dependence is stronger since for real gases σ_o decreases with increasing T.

Experimental values for argon (Ar) at T=300 K, P=1atm ($\rho = nm = 1.6$ kg / m^3)	calculated molecular diameter d (using correct hard sphere expressions)
$\eta = 2.3\times10^{-5}$ Nsm^{-2}	3.6×10^{-10} m
$K_T = 0.018$ Js^{-1}m^{-1}K^{-1}	3.5×10^{-10} m
$D = 1.9\times10^{-5}$ m^{2}s^{-1}	3.4×10^{-10} m

Note that one can extract the scattering cross section σ_o, and thus information about the molecular size and intermolecular potential from these transport coefficients.