

5. Show that the mean-scattering time of a molecule travelling at speed v is

$$\tau = \frac{1}{n\sigma v} ,$$

where n is the molecular density and σ is the collision cross section. Estimate the mean time between collisions of nitrogen molecules at sea level in the Earth's atmosphere assuming they are travelling at their mean speed.

[You may assume nitrogen molecules are spheres of diameter 0.37 nm and the atmosphere is pure nitrogen.]