790.

Problem 53.4 (RHK)

We have to find the pressure for an ideal gas of molecules to have the same density as that of the conduction electrons in copper, $n = 8.49 \times 10^{28}$ m^{-3}. We may assume that $T = 297$ K.
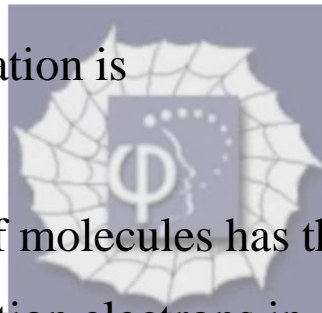
Solution:

The ideal gas equation is

$p = nkT$.

As the ideal gas of molecules has the same density as that of the conduction electrons in copper,

$n = 8.49 \times 10^{28}$ m^{-3}. The temperature of the gas is

$T = 297$ K.

Therefore,

$$p = 8.49 \times 10^{28} \times 1.38 \times 10^{-23} \times 297 \text{ Pa}$$

$$= 3.48 \times 10^{8} \text{ Pa.}$$

As $1 \text{ Pa} = 9.869 \times 10^{-6}$ atm,

we find

$$p = 3.48 \times 10^{8} \times 9.869 \times 10^{-6} \text{ atm}$$

$$= 34.3 \times 10^{2} \text{ atm.}$$