The molecular weights of carbon and oxygen are 12.01 g/mol and 16.00 g/mol, respectively. What is the specific volume, in m^3/kg, of carbon dioxide (CO_2) if its molar specific volume is 22.27 $m^3/kmol$?

SOLUTION:

The molecular weight of CO_2 is,

$$M_{CO_2} = M_C + 2M_O = 12.01\ \text{g/mol} + 2(16.00\ \text{g/mol}) = 44.01\ \text{g/mol} = 44.01\ \text{kg/kmol}. \quad (1)$$

The specific volume is related to the molar specific volume by,

$$v = \frac{\bar{v}}{M} = \frac{22.27\ \frac{\text{m}^3}{\text{kmol}}}{44.01\ \frac{\text{kg}}{\text{kmol}}}, \quad (2)$$

$$\boxed{v = 0.506\ \frac{\text{m}^3}{\text{kg}}}.$$