

Mole Problem

Using your knowledge of mole calculations and unit conversions, determine how many atoms there are in 1 gallon of gasoline. Assume that the molecular formula for gasoline is C_6H_{14} and that the density of gasoline is approximately 0.85 grams/mL.

There are _____ atoms in 1 gallon of gasoline.

Mole Problem – Solution

Using your knowledge of mole calculations and unit conversions, determine how many atoms there are in 1 gallon of gasoline. Assume that the molecular formula for gasoline is C_6H_{14} and that the density of gasoline is approximately 0.8500 grams/mL.

Using a conversion factor of 3785 mL per gallon, we can determine that the mass of gasoline in one gallon is $3785 \text{ mL} \times 0.8500 \text{ g/mL} = 3217 \text{ grams}$.

Because the molar mass of C_6H_{14} is 86 g/mole, there are $3217 / 86$ moles of gasoline molecules, or 37.4 moles of molecules present.

Multiplying 37.4×20 (the number of atoms per mole of gasoline), there are 748 moles of atoms.

Finally, multiplying 748 moles of atoms by 6.02×10^{23} atoms/mole, we can find that there are 4.50×10^{25} atoms present in the sample.

There are 4.50×10^{25} atoms in 1 gallon of gasoline.