

37.77 How much air is required to burn 25lb of methane with 30% excess air?

- A. 260lb
- B. 340lb
- C. 430lb
- D. 560lb

Use the **Combustion Reactions of Common Fuel Constituents** table and consider the reaction and **Stoichiometric Oxygen and Air Requirements** for methane. Optionally, re-write the reaction including nitrogen on both sides to validate the stoichiometric air requirements provided in the table. Calculate the air-to-fuel ratio on a molar/volume basis as well as on a mass basis. Use the **Periodic Table** for atomic weights as needed. Alternatively, use the values provided directly in the table.

$$CH_4 + 2(O_2 + 3.77N_2) \rightarrow CO_2 + 2H_2O + 7.54N_2$$
$$\frac{N_{air}}{N_{fuel}} = \frac{2 + 2(3.77)}{1} = 9.54 \frac{moles_{air}}{moles_{fuel}} = 9.54 \frac{ft^3_{air}}{ft^3_{fuel}}$$
$$\frac{m_{air}}{m_{fuel}} = \frac{9.54(29)}{1(16)} = 17.29 \frac{lb_{air}}{lb_{fuel}}$$

Calculate the mass of air based on the mass of fuel given, the air-to-fuel ratio, and the amount of excess air.

$$m_{air} = (25lb_{fuel}) \left(17.29 \frac{lb_{air}}{lb_{fuel}} \right) (1.3) = 562lb_{air}$$

Answer D