ETHANOL COMBUSTION ACTIVITY Names Key

In this course, it is important to practice use of your skills in balancing reaction equations. This is the basis for quantifying potential heat release as well as initiating calculations related to equilibrium modeling. Here you are asked to find the A/F ratio on both a molar and mass basis for stoichiometric combustion of ethanol C_2H_5OH in air.

Remember that air is comprised of roughly 21% Oxygen and 79% Nitrogen.
We can write 1 mole of air as being 0.21 O_2 + 0.79 N_2, or we can write 4.76 moles of air as being 1 O_2 + 3.76 N_2

a) Write a balanced chemical reaction equation.

$$1\ C_2H_6O + 3\ (O_2 + 3.76N_2) \rightarrow 2\ CO_2 + 3\ H_2O + 11.3\ N_2$$

b) Find the A/F ratio on a molar basis.

$$\frac{3(4.76)\ \text{moles air}}{1\ \text{mole fuel}} \qquad AFR_{molar} = 14.28:1$$

c) Find the A/F ratio on a mass basis.
Molecular masses are approximately: C = 12 g/mol, H = 1 g/mol, O = 16 g/mol, N = 14 g/mol

$$\frac{3\left(32 + 3.76(28)\right)\ \text{mass air}}{\left(2(12) + 6(1) + 16\right)\ \text{mass fuel}} = \frac{411.84}{46}$$

$$AFR_{mass} = 8.95:1$$