## Answer on Question #76749, Chemistry / General Chemistry

### Question:

A gaseous mixture consists of 28.4 mole percent of hydrogen and 71.6 mole percent of methane. A 15.6 L gas sample, measured at 19.4 °C and 2.23 atm is burned in air. Calculate the heat released.

### Solution:

Pressure: $p = 2.23 \cdot 101325 = 225955$ Pa

Volume: $V = 15.6$ L $= 0.0156$ $m^3$

Temperature: $T = 19.4 + 273.1 = 292.5$ K

Gas constant: $R = 8.314$ $(m^3 \cdot Pa)/(mol \cdot K)$

Ideal gas low: $pV = nRT$, so the total amount of molecules of gases:

$n = pV / RT = (225955 \cdot 0.0156) / (8.314 \cdot 292.5) = 1.45$ mol

Amount of hydrogen: $1.45 \cdot 0.284 = 0.4118$ mol

Heat of combustion of hydrogen: 286 kJ/mol

Energy released by hydrogen: $286 \cdot 0.4118 =$ <u>117.77 kJ</u>

Amount of methane: $1.45 \cdot 0.716 = 1.0382$ mol

Heat of combustion of methane: 889 kJ / mol

Energy released by methane: $889 \cdot 1.0382 =$ <u>922.96 kJ</u>

Total heat released: $117.77 + 922.96 =$ **1040.73 kJ**

### Answer:

1040.73 kJ