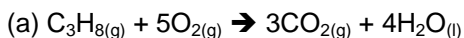


Revised August 2006

AP WORKED ANSWERS

1995, 2

Points 1, 4, 2, 2



(b) Moles of $\text{C}_3\text{H}_8 = \frac{10.0}{44} = 0.227$ mols

From ratio (1:5)

Moles of $\text{O}_2 = 5 \times 0.227 = 1.13$ mols

$$V = \frac{(n)(R)(T)}{(P)} = \frac{(1.13)(0.0821)(303)}{1} = 28.1 \text{ L}$$

28.1 L of O_2 is 21% of the volume of air needed

$$\text{so } 100\% \text{ of the volume of air} = \left(\frac{28.1}{21}\right)(100)$$

= **134 L**

(c) Using $\Delta H = [\text{H}_f \text{ Products}] - [\text{H}_f \text{ Reactants}]$

$$-2220.1 = [3(-393.5) + 4(-285.3)] - [(H_f \text{ C}_3\text{H}_8) + 5(0)]$$

(Oxygen is an element that has a standard enthalpy of formation = 0)

$$\Delta H_f \text{ Propane} = \underline{\underline{-101.6 \text{ kJ}}}$$

Alternative methods via Hess's Cycle OR algebraic manipulation of equations.

(d) Since 1 mole of propane (44g) produces 2220.1 kJ of energy (standard enthalpy of combustion) in an exothermic reaction, 30g of propane evolves (gives off/releases)

$$\left(\frac{30}{44}\right)(2220.1) = 1513.7 \text{ kJ of energy}$$

Converting to J by multiplying kJ by 1000 gives the energy transferred to the water.

$$(1513.7 \text{ kJ})(1000) = 1513700 \text{ J}$$

Then apply;

$$q = m c \Delta T$$

$$= 1513700 = (8000)(4.18) \Delta T$$

$$\Delta T = \underline{\underline{45 \text{ K}}}$$