propane

$$C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(g) \quad ; \Delta H = -2043\ kJ$$

Calculate the volume of propane gas at 25.0 C and 1.08 atm required to provide 565 kJ of heat using the reaction above.

1 - Convert the energy to moles propane using the thermochemical equation.

2 - Convert moles propane to volume using the ideal gas law.

$-2043\ kJ = mol\ C_3H_8$

$$-565\ kJ \times \frac{mol\ C_3H_8}{-2043\ kJ} = 0.27655\ mol\ C_3H_8 \quad (1)$$

$$V = \frac{nRT}{P}$$

$n = 0.27655\ mol\ C_3H_8 \quad R = 0.08206\ \frac{L \cdot atm}{mol \cdot K}$

$T = 25.0\ ^\circ C = 298.2\ K \quad P = 1.08\ atm$

$V = ???$

$$V = \frac{(0.27655\ mol\ C_3H_8)\left(0.08206\ \frac{L \cdot atm}{mol \cdot K}\right)(298.2\ K)}{(1.08\ atm)}$$

$= \boxed{6.27\ L\ propane\ required}$