A 30.0 L container of propane used with a barbeque grill contains 529 g of propane, $C_3H_8$. If, on a hot summer day, the temperature of the gas is 30°C, what is the pressure of the propane in the tank (in atm)?

P = ?
V = 30.0 L
n = 11.99 mol
R = 0.0821 atm·L / mol·K
T = 30°C + 273 = 303 K

$529\text{ g} \times \frac{1\text{ mol}}{44.11\text{ g}} = 11.99\text{ mol}$

$PV = nRT$

$P = \frac{nRT}{V} = \frac{(11.99\text{ mol})(0.0821\ \frac{\text{atm}\cdot\text{L}}{\text{mol}\cdot\text{K}})(303\text{ K})}{30.0\text{ L}}$

$P = 9.94\text{ atm}$

What would be the pressure of the propane in the tank by the end of the summer after 347 g of the propane have been used and the temperature is 19°C?

P = ?
V = 30.0 L
n = 4.13 mol
R = 0.0821 atm·L / mol·K
T = 292 K

$529\text{ g} - 347\text{ g} = 182\text{ g} \times \frac{1\text{ mol}}{44.11\text{ g}} = 4.13\text{ mol}$

$P = \frac{nRT}{V} = \frac{(4.13\text{ mol})(0.0821)(292\text{ K})}{30.0\text{ L}}$

$P = 3.30\text{ atm}$

The grill and tank are then stored in a garage for the winter. What would be the pressure in the tank on a January day when the temperature is −5.0°C?

268 K

$P = \frac{nRT}{V} = \frac{(4.13\text{ mol})(0.0821)(268\text{ K})}{30.0\text{ L}} = 3.03\text{ atm}$

A 30.0L container of propane used with a barbeque grill contains 529 g of propane, $C_3H_8$. If, on a hot summer day, the temperature of the gas is 30°C, what is the pressure of the propane in the tank (in atm)?

$P = ?$
$V = 30.0\,L$
$n = 11.99\,mol$
$R = 0.0821 \frac{atm \cdot L}{mol \cdot K}$
$T = 30°C + 273 = 303K$

$529\,g \times \frac{1\,mol}{44.11\,g} = 11.99\,mol$

$PV = nRT$

$P = \frac{nRT}{V} = \frac{(11.99\,mol)(0.0821 \frac{atm \cdot L}{mol \cdot K})(303K)}{30.0L}$

$P = 9.94\,atm$

What would be the pressure of the propane in the tank by the end of the summer after 347g of the propane have been used and the temperature is 19°C?

$P_2 = ?$
$V = 30.0L$
$n = 4.13\,mol$
$R = 0.0821 \frac{atm \cdot L}{mol \cdot K}$
$T = 292K$

$529\,g - 347\,g = 182\,g \times \frac{1\,mol}{44.11\,g} = 4.13\,mol$

$P = \frac{nRT}{V} = \frac{(4.13\,mol)(0.0821)(292K)}{30.0L}$

$P = 3.30\,atm$

The grill and tank are then stored in a garage for the winter. What would be the pressure in the tank on a January day when the temperature is -5.0°C?

$-5.0°C + 273 = 268K$

$P = \frac{nRT}{V} = \frac{(4.13\,mol)(0.0821)(268K)}{30.0L} = 3.03\,atm$

If all of the propane were released into a large flexible container kept at 111 kPa and 299 K, what would be the volume of the container?

$P = 111\ kPa$

$V = ?$

$n = 4.13\ mol$

$R = 8.314\ \frac{kPa \cdot L}{mol \cdot K}$

$T = 299\ K$

$$V = \frac{nRT}{P} = \frac{(4.13\ mol)\left(8.314\ \frac{kPa \cdot L}{mol \cdot K}\right)(299\ K)}{111\ kPa}$$

$$V = 92.49\ L$$

If the volume of the flexible container was compressed to 49.9 L and the pressure was adjusted to 198 kPa, what would be the temperature of the propane?

$$T = \frac{PV}{nR} = \frac{(198\ kPa)(49.9\ L)}{(4.13\ mol)\left(8.314\ \frac{kPa \cdot L}{mol \cdot K}\right)} = 288\ K$$

$288\ K - 273 = 15^{\circ}C$