6 One mole of an ideal monatomic gas is initially at a temperature of 263 K

(1) $T_f = ?$ if 3280 J of heat are added and the gas does 722 J of work.

(2) What happens if 2 moles of gas are present under the same conditions

(1)

$n = 1 \text{ mol}$

$T_i = 263 \text{ K}$

$Q = 3280 \text{ J}$ (heat in positive)

$W = -722 \text{ J}$ (work out negative)

$$\Delta Q + W = \Delta U$$

$$3280\,J + -722\,J = 2.558E3\,J$$

$$\Delta U = \frac{3}{2} n R \Delta T = \frac{3}{2} n R \left(T_f - T_i\right)$$

$$T_f = \frac{\Delta U}{\frac{3}{2} n R} + T_i = \frac{2558\,J}{\frac{3}{2}(1\,mol)\,8.31\,\frac{J}{mol\,K}} + 263K$$

$$= 468K$$

with 2 mol

$$T_f = \frac{1}{2}\left(T_{f\ \text{for 1 mol}}\right)$$

why? $\quad \frac{\Delta U}{\frac{3}{2}(2n)R} = \frac{1}{2}\left(\frac{\Delta U}{\frac{3}{2} n R}\right)$