General Physics - Spring 2021 - Quiz 2

Show your work, answers alone get no credit. If an answer has units, give the units.

{30} **1** You add 189 Joules of heat to a gas. While the gas is heated it expands at a constant pressure 114 $\frac{\mathrm{N}}{\mathrm{m}^2}$ from a volume of 4 cubic meter to 7 cubic meters. What is the change in the interal energy of the gas?
Solution:

$$\Delta U = Q - W = Q - P\ \Delta V = -153\mathrm{J}.$$

{30} **2** A gas is at a temperature of 34 K. What is the average kinetic energy of a molecules in the gas.
Solution:

$$\langle K \rangle = \frac{3}{2} kT = 7.04 \times 10^{-22}\mathrm{J}.$$

..... constants .....
Boltzmann Constant: $1.38 \times 10^{-23}\mathrm{J/K}$.
Stefan-Boltzmann Consant: $5.67 \times 10^{-8}\mathrm{W/m^2 \cdot K^4}$.
Avagadro's Number: 6.022×10^{23}.
..... equations .....

$$\langle K \rangle = \frac{3}{2} kT$$

$$Q = mc\Delta T$$

$$Q = m\ell$$

$$\frac{dQ}{dt} = kA\frac{\Delta T}{\Delta x}$$

$$\frac{dQ}{dt} = \sigma\epsilon A(T^4 - T_{\mathrm{env}}^4)$$

$$W = P\Delta V$$

$$\Delta U = Q - W$$