Physics 210: Unquiz 09	Name:_________________

A material has a coefficient of linear expansion given by $\alpha = 1\times10^{-4}/°C$. The same material has a specific heat of 1500 J/kg C. Suppose 1 kg of this material (with a volume of 0.04 m^3 is heated from 0C to 100C. It is surrounded by the atmosphere which has a pressure of 1.01×10^{5} Pa.

(a) Calculate Q

(b) Calculate W

(c) Calculate ΔU

An ideal gas goes through an isothermal process at T=100C.

(d) Calculate ΔU

An ideal gas goes through an isobaric process at $P=1\times10^{5}$ Pa and changes volume from 1 m^3 to 2 m^3.

(e) Calculate W

1 mole of an ideal gas with a (molar) specific heat at a constant volume given by $c_v = \frac{3}{2}R\left(J/\text{mole K}\right); R = 8.314\, J/(\text{mol K})$ of goes through an isovolumeric process at and changes temperature from 0C to 100C.

(f) Calculate W

(g) Calculate Q

(h) Calculate ΔU

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A material has a coefficient of linear expansion given by $\alpha = 1 \times 10^{-4} / {}^{\circ}C$. The same material has a specific heat of 1500 J/kg C. Suppose 1 kg of this material (with a volume of 0.04 m^3 is heated from 0C to 100C. It is surrounded by the atmosphere which has a pressure of $1.01\text{x}10^{5}$ Pa.

(a) Calculate Q

$Q = mc\Delta T = 1\,kg \times 1500\,J/Kg\,C \times 100\,C = 1.5\text{x}10^{5}\,J$

(b) Calculate W

$W = P\Delta V = 3 * 1.01\text{x}10^{5} \times 0.04 * 100 = 121\,J$

(c) Calculate ΔU

$\Delta U = Q - W \approx 1.5\text{x}10^{5}\,J$

An ideal gas goes through an isothermal process at T=100C.

(d) Calculate ΔU

$\Delta U = 0$

An ideal gas goes through an isobaric process at $P=1\text{x}10^{5}$ Pa and changes volume from 1 m^3 to 2 $m^{3.}$

(e) Calculate W

$W = P\Delta V = 1\text{x}10^{5}(2) = 2\text{x}10^{5}\,J$

1 mole of an ideal gas with a (molar) specific heat at a constant volume given by

$c_v = \frac{3}{2}R(J/mole\,K); R = 8.314\,J/(mol\,K)$ of goes through an isovolumeric process

and changes temperature from 0C to 100C.

(f) Calculate W $W = P\Delta V = 0$

(g) Calculate Q $Q = nc_v\Delta T = 1 \times 3/2 \times 8.314 \times 100 = 1247.1\,J$

(h) Calculate ΔU $\Delta U = Q - W = Q = 1247.1\,J$