Physics 210: Unquiz 8	Name:_____

A material has a coefficient of linear expansion given by $\alpha = 1 \text{x} 10^{-4}/^{\circ}\text{C}$. 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 1.01x10 ^{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=1x10^5 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 $c_v = \frac{3}{2} R (\text{J/mole K}); R = 8.314 \text{J/(mol K)}$ 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) Calculate Q

$Q = mc\Delta T = 1 kg x 1500 J/KgC x 100 C = 1.5 x 10^5 J$

(b) Calculate W

$W = P\Delta V = 3 * 1.01 x 10^5 x 0.04 * 100 = 121 J$

(c) Calculate ΔU

$\Delta U = Q - W \approx 1.5 x 10^5 J$

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 $P = 1 x 10^5$ Pa and changes volume from 1 m^3 to 2 m^3.

(e) Calculate W

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

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 $Q = nc_v \Delta T = 1 x 3/2 x 8.314 x 100 = 1247.1 J$

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