

$$T = T_C + 273.15$$

$$T_F = \frac{9}{5} T_C + 32$$

$$\overline{KE} = \frac{1}{2} m v_{rms}^2 = \frac{3}{2} kT$$

$$\Delta L = \alpha L_0 \Delta T$$

$$\Delta V = \beta V_0 \Delta T$$

heat lost = *heat gained*

$$Q = cm \Delta T =$$

$$Q = mL$$

$$n = \frac{m}{M} = \frac{N}{N_A}$$

$$Q/t = \frac{kA \Delta T}{L}$$

$$Q/t = e \sigma A T^4$$

$$PV = nRT = NkT$$

$$\frac{P_1 V_1}{n_1 T_1} = \frac{P_2 V_2}{n_2 T_2}$$

$$U = \frac{3}{2} NkT = \frac{3}{2} nRT$$

$$\Delta U = \frac{3}{2} nR \Delta T$$

$$\Delta U = Q - W$$

$$W = P \Delta V$$

$$\Delta S = \frac{Q}{T}$$

$$Eff = \frac{W}{Q_H} = 1 - \frac{Q_C}{Q_H}$$

$$\frac{Q_C}{Q_H} = \frac{T_C}{T_H}$$

$$Eff_C = 1 - \frac{T_C}{T_H}$$

$$R = 8.31 \text{ J/mol}\cdot\text{K}$$

$$\sigma = 5.67 \times 10^{-8} \text{ J/s}\cdot\text{m}^2\cdot\text{K}^4$$

$$1 \text{ u} = 1.66 \times 10^{-27} \text{ kg}$$

$$k = 1.38 \times 10^{-23} \text{ J/K}$$

$$N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$$

$$g = 9.80 \text{ m/s}^2$$

$$1 \text{ liter} = 10^{-3} \text{ m}^3$$

$$1 \text{ cm} = 10^{-2} \text{ m}$$

$$1 \text{ mm} = 10^{-3} \text{ m}$$

Substance	L_f (J/kg)	L_v (J/kg)	c (J/kg·C°)	k (J/s·m·C°)	α (C°) ⁻¹	β (C°) ⁻¹
Ice	3.35×10^5		2.00×10^3	2		
Water vapor		2.26×10^6	2020 (C_p)	2.2		
Water	3.35×10^5	2.26×10^6	4186	0.6		2.07×10^{-4}
Copper			387	390	1.7×10^{-5}	5.1×10^{-5}