Mr. Schneider presents...

Heat Formulae

Concepts	Formula	Units
$\begin{pmatrix}\text{Fahrenheit}\\\text{temperature}\end{pmatrix} = \begin{pmatrix}\text{Celsius}\\\text{temperature}\end{pmatrix}\left(\frac{9°F}{5°C}\right) + 32°F$	$T_F = T_C\left(\frac{9°F}{5°C}\right) + 32°F$	$°F = °C\left(\frac{°F}{°C}\right) + °F$
$\begin{pmatrix}\text{Celsius}\\\text{temperature}\end{pmatrix} = \left[\begin{pmatrix}\text{Fahrenheit}\\\text{temperature}\end{pmatrix} - 32°F\right]\left(\frac{5°C}{9°F}\right)$	$T_C = [T_F - 32°F]\left(\frac{5°C}{9°F}\right)$	$°C = [°F - °F]\left(\frac{°C}{°F}\right)$
$\begin{pmatrix}\text{Kelvin}\\\text{temperature}\end{pmatrix} = \begin{pmatrix}\text{Celsius}\\\text{temperature}\end{pmatrix} + 273°K$	$T_k = T_c\left(\frac{1°K}{1°C}\right) + 273°K$	$°K = (°C)\left(\frac{°K}{°C}\right) + °K$
$\text{Kinetic energy} = \frac{1}{2}(\text{Mass})(\text{Velocity})^2$	$KE = \frac{1}{2}mv^2$	$1\text{ joule} \equiv 1(\text{kilogram})\left(\frac{\text{meter}}{\text{second}}\right)^2$
$\begin{pmatrix}\text{Length}\\\text{change}\end{pmatrix} = \begin{pmatrix}\text{Original}\\\text{length}\end{pmatrix}\begin{pmatrix}\text{Expansion}\\\text{constant}\end{pmatrix}\begin{pmatrix}\text{Temperature}\\\text{change}\end{pmatrix}$	$\Delta l = l_0 \alpha \Delta T$	$\text{meters} = (\text{meters})\left(\frac{1}{°C}\right)(°C)$
$\text{Heat input} = (\text{Mass})(\text{Specific heat})(\text{Temperature change})$	$Q = mc\Delta T$	$\text{calories} = (\text{grams})\frac{(\text{calories})}{(\text{gram})(°C)}(°C)$
$\text{Heat input} = (\text{Mass})(\text{Heat of fusion})$	$Q = mH_f$	$\text{calories} = (\text{grams})\left(\frac{\text{calories}}{\text{gram}}\right)$
$\text{Heat input} = (\text{Mass})(\text{Heat of vaporization})$	$Q = mH_v$	$\text{calories} = (\text{grams})\left(\frac{\text{calories}}{\text{gram}}\right)$
$\begin{pmatrix}\text{Heat added}\\\text{to system}\end{pmatrix} = \begin{pmatrix}\text{Increase in system's}\\\text{internal KE}\end{pmatrix} + \begin{pmatrix}\text{Work output}\\\text{from system}\end{pmatrix}$	$Q = \Delta IKE + W$	$\text{calories} = \text{calories} + \text{calories}$
$\begin{pmatrix}-\text{Heat released}\\\text{by system}\end{pmatrix} = \begin{pmatrix}-\text{Decrease in}\\\text{system's internal KE}\end{pmatrix} + \begin{pmatrix}-\text{Work input}\\\text{to system}\end{pmatrix}$	$Q = \Delta IKE + W$	$\text{calories} = \text{calories} + \text{calories}$
$\begin{pmatrix}\text{Temperature}\\\text{change}\end{pmatrix} = -\begin{pmatrix}\text{Altitude}\\\text{increase}\end{pmatrix}\left(\frac{10°C}{\text{kilometer}}\right)$	$\Delta T = -\Delta h\left(\frac{10°C}{\text{km}}\right)$	$°C = (\text{km})\left(\frac{°C}{\text{km}}\right)$
$\text{Mechanical efficiency} = \frac{\text{Work output}}{\text{Energy input}}$	$\varepsilon = \frac{W_{out}}{E_{in}}$	$\% = \frac{\text{calories}}{\text{calories}}$
$\text{Carnot efficiency} = \frac{\text{Input temperature} - \text{Output temperature}}{\text{Input temperature}}$	$\varepsilon_c = \frac{T_{hot} - T_{cold}}{T_{hot}}$	$\% = \frac{°K - °K}{°K}$