

**Here is a list of some the formulae that we've seen so far:**

For general energy processes:

$$TE = KE + GPE + E_{other\ forms} \quad P = \frac{\Delta E}{\Delta t}$$

$$W = F d \quad KE = \frac{1}{2} m v^2 \quad GPE = m g h$$

General efficiency, any process:

$$e = \text{efficiency} = \left( \frac{W_{output}}{E_{input}} \right) (100\%)$$

For heat engines:

$$e = \left( \frac{W_{output}}{E_{input}} \right) (100\%) = \left( 1 - \frac{Q_{cold}}{Q_{hot}} \right) (100\%)$$

Theoretical maximum efficiency (heat engine, with T in Kelvins):

$$e_{Car} = \text{carnot efficiency} = \left( 1 - \frac{T_{cold}}{T_{hot}} \right) (100\%)$$

For energy processes involving heat:

For temperature changes:

$$Q = m c \Delta T$$

For phase changes:

$$Q = m L$$

Temperature conversion:

$$C^{\circ} = \frac{5}{9} (F^{\circ} + 32) \quad F^{\circ} = \frac{9}{5} C^{\circ} + 32$$

General motion equations:

$$v = \frac{d}{t} = \frac{\Delta d}{\Delta t} \quad F_{NET} = m a \quad F_{GRAV} = \text{weight} = m g$$

Passenger efficiency:

$$\text{passenger efficiency} = \frac{(\text{number of passengers}) \times (\text{miles traveled})}{\text{fuel consumed}}$$

**Here are some of the units we've run across:**

Physical Quantity	Symbol	MKS (S.I.)	English (and other)
mass	m	kg	slugs
length	x, y, z, d	m	ft, mi, yd, cm, km
force	F, W	N $\equiv$ kg m/s <sup>2</sup>	lb
speed, velocity	v	m/s	mi/hr, mph, ft/s, km/hr
acceleration	a, g	m/s <sup>2</sup>	ft/s <sup>2</sup> , mi/hr <sup>2</sup>
work	W	J $\equiv$ kg m <sup>2</sup> /s <sup>2</sup>	Btu, kWh, Cal, cal, Quads
energy, heat	E, TE, GPE, Q	J $\equiv$ kg m <sup>2</sup> /s <sup>2</sup>	Btu, kWh, Cal, cal, Quads
power	P	W $\equiv$ J/s	hp