Formula sheet

Energy = Work = Force × Distance, $(E = Fd)$.

Potential Energy: $P.E. = mgh$.

For gravity, $g = 9.8\text{m/sec}^2$, $(F = \text{weight} = mg)$.

Kinetic Energy: $K.E. = \frac{1}{2}mv^2$

Power = Energy/Time, $(P = E/t, \text{ or } E = Pt)$, and also $P = Fv$.

Heat energy: $\Delta E = c_P m \Delta T$.

Wind Power: $P/A^2 = 6.1 \times 10^{-4} v^3 (\text{kW/m}^2)$, v in units of m/sec, Area, A, in m^2; theoretical maximum efficiency is 59%.

Carnot Efficiency = $(T_{hot} - T_{cold})/T_{hot}$; T in ^{0}K.

$^0C = \frac{5}{9}(^0F - 32)$, $^0K =^0 C + 273$.

Coefficient of Performance (COP) $= T_{hot}/(T_{hot} - T_{cold}) = Q_{hot}/(Q_{hot} - Q_{cold})$.

Drag force $F_{ad} = C_D A_f v^2/370$; v in miles/hr, A_f in ft^2, F_{ad} in pounds.

Rolling force $F_r = C_r mv$, v in miles/hr.

Acceleraton force $F_{acc} = ma$.

Hill climbing force $F_h = msg$.

Energy loss: $Q(\text{Btu}) = 24A(\text{degree days})/R_T$,

$\frac{Q}{t}(\text{Btu/hr}) = A(T_i - T_o)/R$; T in ^{0}F, A in ft^2.

Degree-days = $(65^0 F - T_{out})(\text{number of days})$

Price of fuels

42 Gallon barrel of oil: $130.00

1000 cubic feet of natural gas: $13.00

1 kilowatt hour of electricity: $0.12

1 gallon gasoline: $4.00

1 gram of Uranium: $0.10

Heat capacities in Btu/(ft^3 ^{0}F)

Water: 62

Wood: 29

Stone: 20

Concrete: 22

Facts and Factors

1 gallon of water weighs 8.3 pounds.

density of water is 1gm/cm^3.

1 Watt = 1 Joule/sec = 3.41 Btu/hr = 1.34×10^{-3} horsepower = 0.737 ft lb/sec.

1 Calorie = 1 kilocalorie = 1000 calories.

1 mile = 1609 meters = 5280 ft.

1ton = 2000lb = 0.907 metric tonne.

mass of proton and neutron about 1.67×10^{-27} kg.

Methane is CH_4, Carbon Dioxide is CO_2

speed of light = 3×10^8 meters/sec

1 ft = 0.3048 meter

1 kg = 2.2 lbs

2006 population of the U.S. is about 300 million

R-values: inside air layer:0.68, outside air layer:0.17, glass:0.03, plywood:0.94