

## FORMULAS

### ELECTRICITY:

Power (**Watts**) = Energy (**Joules**)/Time (**sec**)  
Power(**Watts**) = Current(**Amps**) \* Voltage (**Volts**)  
Voltage (**Volts**) = Current (**Amps**) \* Resistance (**Ohms**)  
Voltage (**Volts**) = Energy (**Joules**)/Charge (**Coloumbs**)  
-1 **Coloumb of Charge** = **6.2 \* 10<sup>18</sup> electrons**  
Electric Force is proportional to Charges/Dis<sup>2</sup>  
Electric Field is Force/Charge  
Series Circuits:  $R_{tot} = R1 + R2 \dots$   
Parallel Circuits:  $V1=V2, 1/R_{tot} = 1/R1 + 1/R2 \dots$

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 $D = ViT + 1/2 AT^2$

$Vf^2 = Vi^2 + 2AD$                        $A = \Delta V / \Delta T$   
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### CONSERVATION OF ENERGY:

$\Delta Q + KE + PE + \Delta W = \Delta Q + KE + PE + \Delta W$

$KE = \frac{1}{2} M V^2$

KE= Kinetic Energy in **Joules**

$PE = M * g * h, g = 9.8 \text{ m/sec}^2$     PE =Potential Energy in **Joules**

• $\Delta$ Work (**Joules**)= Force (N) \*  $\Delta$ Distance (m) = Pressure (Pa) \*  $\Delta$  Volume (meters cubed)

### HEAT $\Delta Q$

Two substances in contact:  $\Delta Q = \Delta Q$  for thermal equilibrium

-Increasing/decreasing temperature without changing phase:

(C is the specific heat of a substance changing temperature)

$\Delta Q = m * C * \Delta T$

-Changing phase:

$\Delta Q = m * H_f$  for melting/freezing,     $\Delta Q = m * H_v$  for vaporizing/condensing

( $H_f$  and  $H_v$  are the heat of fusion and the heat of vaporization for a substance changing phase)

Thermodynamics Law 1 Conservation of Energy

**Heat Added** = **Internal Energy(Temp)** + **Work done**

**$\Delta Q$**  =  **$\Delta U$**  +  **$\Delta Work$**

Efficiency =  $(T_{hot} - T_{cold}) / T_{hot}$  (law 2)

T=Temperature in **Kelvin**

Entropy or Order to Chaos, 2nd law

WATER: ICE: C=2090 J/Kg °K, Liquid C=4187 J/Kg °K, STEAM C=2020 J/Kg °K

WATER:                       $H_f = 335,000 \text{ J/kg}$                        $H_v = 2,260,000 \text{ J/Kg}$

Person: C= 3470 J/Kg °K, C for liquid or gas person=1674 J/Kg °K

boils at 1700 degrees Celsius

$H_f = 277633 \text{ J/Kg}, H_v = 1872988 \text{ J/Kg},$

Other conversions:

Density of Water= 1 gram per milliliter=1000 **kilograms per cubic meter**

1000 grams= 1 kilogram, 1 kilogram=.001 grams

degrees Celsius= degrees Kelvin- 273

1 Kilocalorie= 1 Calorie = 1000 calories = 4187 Joules

1 Kilowatt Hour = 861 Calories