PHYS 202 Equations Sheet

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|  |  |  |  | $$\vec{F}=m\vec{a}$$$$\vec{E}=\frac{\vec{F}}{q}$$ |

$T\_{F}=\frac{9}{5}T\_{C}+32$   $T\_{K}=T\_{C}+273$ $∆T\_{F}=\frac{9}{5}∆T\_{C}$ $∆T\_{K}=∆T\_{C}$

 $∆A=2αA\_{0}∆T$ $∆V=βV\_{0}∆T$ $β=3α$, for solids

α steel = α concrete = 12x10-6(Co)-1, α aluminum = 23x10-6(Co)-1, α copper = 17x10-6(Co)-1.
Volume coefficient of expansion of radiator coolant = β = 390 x 10-6 (Co)-1.

Heat transfer: $Q=mc∆T$ $ Q=mL$
(Specific heat of water = 4186 J/(kg.K), Specific heat of ice = 2000 J/(kg.K), Latent heat of fusion of ice = 33.5 x 104 J/kg)

Work = Force x Distance Power = Work/TimeFirst Law of thermodynamics: ∆U = Q - W. Work = W= P.∆V
Work done by a gas: W = P∙ΔV (Isobaric process) (Isothermal process)
Area of a rectangle = length x width, Area of a triangle = $\frac{1}{2}$ x base x height
Circumference, C and Area, A of a circle (radius *r*): $C=2πr$ $A= πr^{2}$
Heat engines, refrigerators, and heat pumps: Coefficient of performance, 
Entropy, *S*. 
Coulomb’s law is given by:  Coulomb’s constant = k = 9 x 109 (SI)
Electric current = I = $\frac{Charge}{Time}$ Resistance, R: $R=ρ\frac{L}{A}$

Ohm’s law: V = IR Electric Power = P = IV Electrical energy =IVt

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| Electric potential due to a point charge (q) at a distance r: | Electric potential in terms of EPE and point charge (q): | Electric field due to a point charge (q) at a distance r: | Electric field (E) from potential gradient: |
| $$V=k\frac{q}{r}$$ | $$V=\frac{EPE}{q}$$ | $$E=k\frac{q}{r^{2}}$$ | $$\vec{E}=-\frac{∆V}{∆X}$$ |

Capacitors:   

Proton: charge = 1.6 x 10-19C, mass = 1.673 x 10-27kg.
Electron: charge = -1.6 x 10-19C, mass = 9.11x10-31kg.

|  |  |  |
| --- | --- | --- |
| Combination | Resistors | Capacitors |
| Series |  |  |
| Parralel |  |  |

Time constant of an RC circuit = RC.





1. Force on a moving electric charge in a magnetic field. 

2. Force on a moving electric charge in an electric field. 

3. Centripetal force: $F\_{c}=m\frac{v^{2}}{r}$

4. Force on a current in a magnetic field. 

5. Magnetic field produced by electric current: 

6. Faraday’s law of induction and Magnetic flux:   
7. Equations for transformers and power loss during transmission are shown below:
  P = IV  V = IR $V\_{rms}=\frac{V\_{p}}{\sqrt{2}}$
8. Reactance (XC) of a capacitor, Reactance (XL) of an inductor, Impedance (Z) and resonant frequency (f0):
  $f=\frac{1}{T}$  
9. Electromagnetic waves: $c=\frac{E}{B}$ $c= λf$
10.Snell’s law: $n\_{1}Sinθ\_{1}=n\_{2}Sinθ\_{2}$
11. Telescope: magnification = $\left|m\right|=\frac{f\_{o}}{f\_{e}}$ Length: (*f0+fe)*
12. Lens/mirror equations:**** Magnification:****