**Physics 7B Final Review Sheet**

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| --- | --- | --- | --- | --- |
| **Process** | **Constant** | **1st law of thermodynamics** | **W, Q, and U** | **S** |
| Isothermal | T | ΔT = 0 ΔEint=0, Q = W |  | R ln (V2 / V1)R ln (P1 / P2) |
| Isobaric | P | Q = ΔEint + W = ΔEint + PΔV |  W = n\,R\,\Delta T \Delta U = n\,c_V\,\Delta T | CP ln (T2 / T1) |
| Isovolumetric | V | ΔV = 0, W = 0, Q = ΔEint |  \Delta U = n\,c_V\,\Delta T | CV ln (T2 / T1) |
| Adiabatic | Q = 0 | ΔEint = -W |  P V^{\gamma} = \operatorname{constant} \qquad  \gamma = {C_{P} \over C_{V}} = \frac{f + 2}{f},  W = P_1 V_1^\gamma \frac{V_2^{1-\gamma}-V_1^{1-\gamma}}{1-\gamma}  | CV ln (T2 / T1) + R ln (V2 / V1)  |

Q = nCVΔT volume constant

Q = nCPΔT pressure constant

 conduction  radiation



First law of thermodynamics

 Wout = Qin - Qout

Second law of thermodynamics

e = Wout / Qin <= ecarnot = 1 – Tc/Th = 1 – Qc/Qh

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| --- | --- |
| Boltzmann distributionhttp://hyperphysics.phy-astr.gsu.edu/hbase/quantum/imgqua/dismb3.gif |  |

Gauss’s law



Gaussian Surface



Line of charge





Charged disk

 

Ring of charge



Circuits

 Electrical conductivity = σ = 1/ρ



Kirchoff’s rule



Capacitors

|  |  |  |
| --- | --- | --- |
| Parallel plate |  |  |
| Spherical | http://hyperphysics.phy-astr.gsu.edu/hbase/electric/imgele/csph.gif  | http://hyperphysics.phy-astr.gsu.edu/hbase/electric/imgele/csph2.gifhttp://hyperphysics.phy-astr.gsu.edu/hbase/electric/imgele/csph3.gifhttp://hyperphysics.phy-astr.gsu.edu/hbase/electric/imgele/csph4.gif |
| Cylindrical | http://hyperphysics.phy-astr.gsu.edu/hbase/electric/imgele/ccyl3.gif | http://hyperphysics.phy-astr.gsu.edu/hbase/electric/imgele/ccyl4.gifhttp://hyperphysics.phy-astr.gsu.edu/hbase/electric/imgele/ccyl5.gifhttp://hyperphysics.phy-astr.gsu.edu/hbase/electric/imgele/ccyl6.gif |



Dielectrics



RC circuits



Lorentz force



Ampere’s law

  



Biot-Savart Law

 

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|  | http://hyperphysics.phy-astr.gsu.edu/hbase/magnetic/imgmag/loopc2.gifhttp://hyperphysics.phy-astr.gsu.edu/hbase/magnetic/imgmag/loopc3.gif |
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| http://hyperphysics.phy-astr.gsu.edu/hbase/magnetic/imgmag/loopa4.gif |

Lenz’s law



Faraday’s law



Motional EMF



Inductance

 

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LC circuits

  