**Harold’s Physics Formulas**

**Cheat Sheet**

30 April 2024

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|  | **Mechanics:**  **Linear Translation** | **Mechanics:**  **Angular / Rotational Motion** | **Electricity / Magnetism** | **Fluid Mechanics / Thermodynamics** | **Atomic and Nuclear /**  **Waves and Optics** |
| **Kinematics** |  |  |  |  |  |
| **Position**  **(m)**  (rad) | *Horizontal / 1-D:*  *Vertical:* |  |  | *Fluid Mechanics:*  *(Conservation of Mass)* | *Waves:*  *Optics:*  ***Refraction:***  *(bend)*  *Snell’s Law:*  ***Diffraction:***  *(spread out)* |
|  | | *Optics*: |
| **Velocity**  **(m/s)**  Angular Velocity / Angular Frequency  (rad/s) |  |  | *Speed of Light:* | *Fluid Mechanics:* | *Waves and Optics:*  ***Reflection****:*  *(throw back)*  *Critical angle:*  *Maxima for a thin film:* |
|  | |
| **Acceleration**  **(m/)**  (rad/) | *Linear:*  *Tangential (linear):* | *Angular:*  *Centripetal (center):* | ***Constants:***  *Gravitational Constant*  *Gravity Acceleration (Earth)*  *Speed of Light in Vacuum*  *Electron-Volt*  *Charge of an Electron*  *Mass of an Electron*  *Mass of a Proton*  *Mass of a Neutron*  *Electric Permittivity*  *Magnetic Permeability*  *Avogadro’s Number*  *Boltzmann Constant*  *Coulomb Constant*  *Faraday Constant*  *Planck’s Constant*  *Avogadro’s Number*  *pi* | | |
| *Net:* | |
|  | |
| **Jerk (Jolt)**  **(m/)**  (rad/) |  |  |

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| **Dynamics** |  |  |  |  |  |
| **Mass**  **(kg)**  /  Moment of Inertia  () | = actual mass  = effective mass |  |  | *NA* | ***Magnification****:* |
| **Momentum**  **(kgm/s)**  () | *Conservation of Linear Momentum:*  *Elastic Collision = bounce off*  *Inelastic Collision = stick together* | *Conservation of Angular Momentum:* | *NA* | *Fluid Mechanics:* | *Atomic and Nuclear:* |
| [Inelastic Collision: Definition, Formula, and Examples](https://www.sciencefacts.net/inelastic-collision.html) | | |
| **Force**  **(N = kgm/)**  **/**  **Torque**  (J = Nm) | *Hooke’s Law:* |  | *Electricity:*  *Coulomb’s Law:*  *Magnetism:* | *Fluid Mechanics:* | *NA* |
| **Impulse**  **(Ns)**  (Nms) |  |  | *NA* | *NA* | *NA* |
| **Yank**  **(N/)**  **/**  Rotatum  (J/s) |  |  | *NA* | *NA* | *NA* |
| **Energy** |  |  |  |  |  |
| **Work**  **(J = Nm)** |  |  |  | *Thermodynamics:* | *NA* |
| **Kinetic**  **Energy**  **(J)** | *Translational:* | *Rotational:* |  | *Fluid Mechanics:*  *Bernoulli’s Equation:*  *Thermodynamics:* | *Atomic and Nuclear:* |
| **Potential**  **Energy**  **(J)** |  | *Coiled Spring:* |  | *Fluid Mechanics:*  *Continuity of Mass:*  *Continuity of Volume:*  Thermodynamics*:* | *Atomic and Nuclear:*  *Relativity:* |
| **Heat**  **Energy**  **(J)** | *Conservation of Energy:* | | | *Thermodynamics:* | *NA* |
| **Power**  **(W)** |  |  |  | *where:* | *NA* |

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| **Engineering Application** | |  |  |  |  |
| **Period / Frequency**  **(Hz)** | *Kepler’s Third Law:* |  | *For:* | *NA* | *Waves and Optics:*  *Doppler Effect:* |
| **Center**  **of Mass**  **(m)** | *where*  *and* |  | *NA* | *NA* | *NA* |
| **Rigid Bodies** | *(Down = ‘−‘)* | *(CW = ‘−‘)* | *NA* | *NA* | *NA* |
| **Conservation Laws** | *Conservation of Linear Momentum*  *(Physics)* | *Conservation of Angular Momentum*  *(Physics)* | *Conservation of Electric Charge*  *(Circuits)* | *Conservation of*  *Mass (or Matter)*  *(Chemistry)*  *Bernoulli’s Equation:*  *(Fluid Mechanics / Pressure)* | *Conservation of Energy*  *(Physics)* |

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| **Electricity** | | | |
| **Terms** | **Formulas** |  | |
| **Electric Field**  **(V/m or N/C)** |  |  | *Gauss’s Law:* | |
| **Potential / Voltage**  **(V)** |  |  | Draw the symbol of battery | |
| **Current**  **(A)** |  |  |  | |
| **Circuits** |  | **Series** | **Parallel** | |
| **Circuit Terms** | capacitor and inductor |  |  | |
| **Resistance**  **(Ω)** |  |  |  | |
| **Inductance**  **(H)** |  |  |  | |
| **Capacitance**  **(F)** |  |  |  | |
| **Kirchhoff's Current Law (KCL)** | The algebraic sum of currents in a network of conductors meeting at a **point** (node) is zero. | | Kirchhoff’s Current Law (KCL) | Kirchhoff's Law | |
| **Kirchhoff's Voltage Law (KVL)** | The directed sum of the potential differences (voltages) around any closed **loop** is zero. | | Is there any proof of Kirchhoff's law of voltage and current? - Quora | |

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| **Magnetism** | | |
| **Term** | **Formulas** | **Laws** |
| **Magnetic**  **Field**  **(T)** |  | *Ampere’s Circuit Law:*  *Gauss’s Law for Magnetism:* |
| **Magnetic**  **Flux**  **(Wb)** |  | *Gauss’s Law for Magnetism:* |
| **EMF**  **(V)** |  | *Faraday’s Law of Induction:* |