**Harold’s Physics Formulas**

**Cheat Sheet**

30 April 2024

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **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/) |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **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 |
| **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* |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **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)* |

|  |
| --- |
| **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 |

|  |
| --- |
| **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:* |