

14: Appendix A- Units

Units Used in Physics (Fundamental units in bold)

| Quantity | Common Symbol | Unit | Unit in Terms of Base SI Units |
|------------------------|-----------------------|------------------------------------|--|
| Acceleration | \vec{a} (14.1) | m/s ² | m/s ² |
| Amount of substance | n | mole | mol |
| Angle | θ, ϕ (14.2) | radian (rad) | |
| Angular acceleration | $\vec{\alpha}$ (14.3) | rad/s ² | s ⁻² |
| Angular frequency | ω (14.4) | rad/s | s ⁻¹ |
| Angular momentum | \vec{L} (14.5) | kg • m/s ² | kg • m/s ² |
| Angular velocity | $\vec{\omega}$ (14.6) | rad/s | s ⁻¹ |
| Area | A | m ² | m ² |
| Atomic number | Z | | |
| Capacitance | C | farad (F) | A ² • s ⁴ /kg • m ² |
| Charge | q, Q, e | coulomb (C) | A • s |
| Charge density: | | | |
| Line | λ (14.7) | C/m | A • s/m |
| Surface | σ (14.8) | C/m ² | A • s/m ² |
| Volume | ρ (14.9) | C/m ³ | A • s/m ³ |
| Conductivity | σ (14.10) | $\frac{1}{\Omega \cdot m}$ (14.11) | A ² • s ³ /kg • m ³ |
| Current | I | ampere | A |
| Current density | \vec{J} (14.12) | A/m ² | A/m ² |
| Density | ρ (14.13) | kg/m ³ | kg/m ³ |
| Dielectric constant | κ (14.14) | | |
| Electric dipole moment | \vec{p} (14.15) | C • m | A • s • m |
| Electric field | \vec{E} (14.16) | N/C | kg • m/A • s ³ |

| Quantity | Common Symbol | Unit | Unit in Terms of Base SI Units |
|----------------------------|---------------------------------------|--|---|
| Electric flux | Φ (14.17) | $\text{N} \cdot \text{m}^2/\text{C}$ | $\text{kg} \cdot \text{m}^3/\text{A} \cdot \text{s}^3$ |
| Electromotive force | ε (14.18) | volt (V) | $\text{kg} \cdot \text{m}^2/\text{A} \cdot \text{s}^3$ |
| Energy | E, U, K | joule (J) | $\text{kg} \cdot \text{m}^2/\text{s}^2$ |
| Entropy | S | J/K | $\text{kg} \cdot \text{m}^2/\text{s}^2 \cdot \text{K}$ |
| Force | \vec{F} (14.19) | newton (N) | $\text{kg} \cdot \text{m}/\text{s}^2$ |
| Frequency | f | hertz (Hz) | s^{-1} |
| Heat | Q | joule (J) | $\text{kg} \cdot \text{m}^2/\text{s}^2$ |
| Inductance | L | henry (H) | $\text{kg} \cdot \text{m}^2/\text{A}^2 \cdot \text{s}^2$ |
| Length: | ℓ , L | meter | m |
| Displacement | Δx , $\Delta \vec{r}$ (14.20) | | |
| Distance | d, h | | |
| Position | x, y, z, \vec{r} | | |
| Magnetic dipole moment | $\vec{\mu}$ (14.21) | $\text{N} \cdot \text{J}/\text{T}$ | $\text{A} \cdot \text{m}^2$ |
| Magnetic field | \vec{B} (14.22) | tesla (T) = Wb/m^2 | $\text{kg}/\text{A} \cdot \text{s}^2$ |
| Magnetic flux | Φ_m (14.23) | weber (Wb) | $\text{kg} \cdot \text{m}^2/\text{A} \cdot \text{s}^2$ |
| Mass | m, M | kilogram | kg |
| Molar specific heat | C | $\text{J}/\text{mol} \cdot \text{K}$ | $\text{kg} \cdot \text{m}^2/\text{s}^2 \cdot \text{mol} \cdot \text{K}$ |
| Moment of inertia | I | $\text{kg} \cdot \text{m}^2$ | $\text{kg} \cdot \text{m}^2$ |
| Momentum | \vec{p} (14.24) | $\text{kg} \cdot \text{m}/\text{s}$ | $\text{kg} \cdot \text{m}/\text{s}$ |
| Period | T | s | s |
| Permeability of free space | μ_0 (14.25) | $\text{N}/\text{A}^2 = \text{H}/\text{m}$ | $\text{kg} \cdot \text{m}/\text{A}^2 \cdot \text{s}^2$ |
| Permittivity of free space | ε_0 (14.26) | $\text{C}^2/\text{N} \cdot \text{m}^2 = \text{F}/\text{m}$ | $\text{A}^2 \cdot \text{s}^4/\text{kg} \cdot \text{m}^3$ |
| Potential | V | volt (V) = J/C | $\text{kg} \cdot \text{m}^2/\text{A}^2 \cdot \text{s}^3$ |
| Power | P | watt (W) = J/s | $\text{kg} \cdot \text{m}^2/\text{s}^3$ |
| Pressure | p | pascal (Pa) = N/m^2 | $\text{kg}/\text{m} \cdot \text{s}^2$ |
| Resistance | R | ohm (Ω) = V/A | $\text{kg} \cdot \text{m}^2/\text{A}^2 \cdot \text{s}^3$ |
| Specific heat | c | $\text{J}/\text{kg} \cdot \text{K}$ | $\text{m}^2/\text{s}^2 \cdot \text{K}$ |
| Speed | v | m/s | m/s |

| Quantity | Common Symbol | Unit | Unit in Terms of Base SI Units |
|-------------|----------------------|-------------------|-------------------------------------|
| Temperature | T | kelvin | K |
| Time | t | second | s |
| Torque | $\vec{\tau}$ (14.27) | N • m | kg • m ² /s ² |
| Velocity | \vec{v} (14.28) | m/s | m/s |
| Volume | V | m ³ | m ³ |
| Wavelength | λ (14.29) | m | m |
| Work | W | joule (J) = N • m | kg • m ² /s ² |

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