

# Physics Formulas

## Kinematics

$$\begin{aligned}v &= \Delta d / \Delta t \\a &= \Delta v / \Delta t \\ \Delta d &= v\Delta t \\d &= \frac{1}{2}(v_i + v_f)t \\d &= v_i t + \frac{1}{2}at^2 \\v_f &= v_i + at \\v_f^2 &= v_i^2 + 2ad\end{aligned}$$

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## Force

$$\begin{aligned}F_{\text{net}} &= ma \\F_f &= \mu_k F_N \\T &= 2\pi \sqrt{l/g} \text{ (pendulum)} \\F_{A \text{ on } B} &= -F_{B \text{ on } A}\end{aligned}$$

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## Centripetal Acceleration

$$\begin{aligned}a_c &= v^2 / r \\v &= (2\pi r) / T \\a_c &= (4\pi^2 r) / T^2\end{aligned}$$

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## Universal Gravitation

$$\begin{aligned}F &= G (m_A m_B) / d^2 \\v &= \sqrt{(Gm_E / r)} \\(T_a / T_b)^2 &= (r_a / r_b)^3 \\T &= 2\pi \sqrt{(r^3 / Gm_E)} \\T^2 &= (4\pi^2 / Gm_s) r^3\end{aligned}$$

## Momentum

$$\begin{aligned}p &= mv \\F\Delta t &= p_2 - p_1 \\p_{A1} + p_{B1} &= p_{A2} + p_{B2}\end{aligned}$$

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## Work, Energy, and Power

$$\begin{aligned}K &= \frac{1}{2}mv^2 \\W &= Fd \\ \Delta K &= W \\W &= Fd \cos\theta \\P &= W / t\end{aligned}$$

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## Conservation of Energy

$$\begin{aligned}U_g &= mgh \\E &= K + U_g \\K_{\text{before}} + U_{\text{before}} &= K_{\text{after}} + U_{\text{after}}\end{aligned}$$

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## Waves

$$\begin{aligned}v &= \lambda f \\v &= \lambda / T \\f &= 1 / T\end{aligned}$$

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## Constants

$$\begin{aligned}g &= 9.80 \text{ m/s}^2 \\G &= 6.67 \times 10^{-11} \text{ N}\cdot\text{m}^2/\text{kg}^2 \\c &= 3.00 \times 10^8 \text{ m/s}\end{aligned}$$

# Physics Formulas

## Light

$P$  = luminous flux (lm)

$E$  = illuminance (lx)

$I$  = luminous intensity (cd)

$$c = \lambda \nu$$

$$E = P / (4\pi d^2)$$

$$I = P / 4\pi$$

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## Reflection and Refraction

$$n_{\text{substance}} = c / v_{\text{substance}}$$

$$n_i \sin\theta_i = n_r \sin\theta_r$$

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