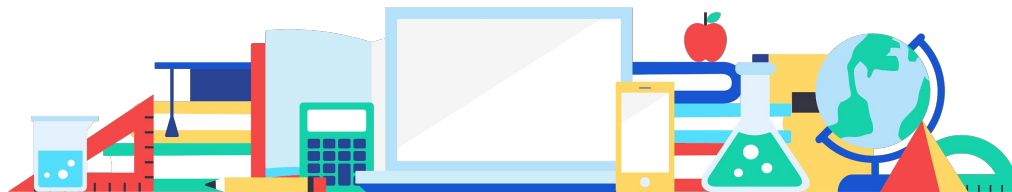




Physics 1 Topics & Resources

Updated July 2020



Key Topics

Key Topics Covered in Physics 1

- Kinematics
 - ◆ Displacement & Velocity
 - ◆ Acceleration
 - ◆ Projectiles
 - ◆ Uniform Circular Motion
- Dynamics & Energy
 - ◆ Forces
 - ◆ Newton's Laws of Motion
 - ◆ Central Forces
 - ◆ Friction
 - ◆ Work & Power
 - ◆ Kinetic & Potential Energy
 - ◆ Conservation of Energy
- Impacts & Momentum
 - ◆ Impact Forces & Momentum Changes
 - ◆ Conservation of Linear Momentum
 - ◆ Elastic & Inelastic Collisions
 - ◆ Center of Mass
- Gravity
 - ◆ Newton's Law of Gravitation
 - ◆ Gravitational Energy
- Rotational & Oscillatory Motion
 - ◆ Moments & Torque
 - ◆ Moment of Inertia
 - ◆ Angular Kinematics
 - ◆ Simple Harmonic Motion
- Electricity
 - ◆ Electric Charges
 - ◆ Coulomb's Law & Current
 - ◆ Circuits & Resistance
 - ◆ Electric Power & Energy
 - ◆ Series and Parallel Circuits
- Waves
 - ◆ Pulses
 - ◆ Wave Motion & Types of Waves
 - ◆ Standing Waves & Resonance
 - ◆ Sound & The Doppler Effect

Key Formulae

Key Formulae in Physics 1

→ Kinematics

$$v_{avg} = \frac{\Delta x}{\Delta t} = \frac{x_f - x_0}{t_f - t_0} \quad a_{avg} = \frac{\Delta v}{\Delta t} = \frac{v_f - v_0}{t_f - t_0} \quad v_f = v_0 + at$$

$$d = \left(\frac{v_f + v_0}{2}\right)t \quad d = v_0t + \frac{1}{2}at^2 \quad v_f^2 = v_0^2 + 2ad \quad a_c = \frac{v^2}{r}$$

→ Dynamics & Energy

$$F_{net} = ma \quad F_c = \frac{mv^2}{r} \quad f_k = \mu_k N \quad f_s \leq \mu_s N$$

$$KE = \frac{1}{2}mv^2 \quad W_{total} = \Delta KE \quad W = Fd \cos \theta \quad P = \frac{W}{t} = \frac{\Delta E}{t}$$

$$PE_{gravity} = mgh \quad PE_{elastic} = \frac{1}{2}kx^2 \quad \Delta PE_{electrical} = q\Delta V$$

$$KE_i + PE_i + W_{NC} = KE_f + PE_f$$

→ Impacts & Momentum

$$\vec{p} = m\vec{v} \quad \vec{F} = \frac{m\Delta\vec{v}}{\Delta t} = \frac{\Delta\vec{p}}{\Delta t} \quad \vec{F}\Delta t = m\vec{v}_f - m\vec{v}_i$$

$$m_1\vec{v}_{1i} + m_2\vec{v}_{2i} = m_1\vec{v}_{1f} + m_2\vec{v}_{2f} \quad x_{CM} = \frac{\sum m_i x_i}{\sum m_i}$$

Key Formulae

Key Formulae in Physics 1 (continued)

→ Gravity

$$F_g = \frac{GM_1M_2}{r^2} \quad g = \frac{GM_E}{r_E^2} \quad PE = -\frac{GM_0M_E}{r}$$

$$v_{orbit} = \sqrt{\frac{GM_E}{r}} \quad \frac{1}{2}M_0v_{esc}^2 = \frac{GM_0M_E}{r_E}$$

→ Rotational & Oscillatory Motion

$$\tau = Fr \sin \theta \quad I = \sum m_i r_i^2 \quad \omega = \frac{\Delta \theta}{\Delta t} \quad \alpha = \frac{\Delta \omega}{\Delta t} \quad \Delta \theta = \omega_0 t + \frac{1}{2} \alpha t^2$$

$$\tau = I\alpha \quad L = I\omega \quad \tau = \frac{\Delta L}{\Delta t} \quad KE = \frac{1}{2}I\omega^2 \quad W = \tau\theta$$

$$T = 2\pi\sqrt{\frac{m}{k}} \quad T = 2\pi\sqrt{\frac{L}{g}}$$

→ Electricity

$$F = \frac{kq_1q_2}{r^2} \quad I = \frac{\Delta Q}{\Delta t} \quad V = IR \quad R = \frac{\rho L}{A} \quad E = PT = IVt$$

Series: $I = I_1 = I_2 = I_3$
 $V = V_1 + V_2 + V_3$
 $R = R_1 + R_2 + R_3$

Parallel: $I = I_1 + I_2 + I_3$
 $V = V_1 = V_2 = V_3$
 $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

→ Waves

$$v = f\lambda$$

Units

Units for Physics 1

→ Fundamental SI Units

- ◆ Length : Meter m
- ◆ Mass : Kilogram kg
- ◆ Time : Second s
- ◆ Electric Current : Ampere A
- ◆ Temperature : Kelvin K
- ◆ Amount of substance : Mole mol
- ◆ Luminous Intensity : Candela cd

→ Derived SI Units

- ◆ Velocity : m/s
- ◆ Acceleration : m/s^2
- ◆ Force : Newton N = kg m/s^2
- ◆ Momentum : kg m/s
- ◆ Impulse : N s = kg m/s
- ◆ Angular Velocity : rad/s
- ◆ Angular Acceleration : rad/s^2
- ◆ Torque : Nm
- ◆ Angular Momentum : $\text{kg m}^2/\text{s}$
- ◆ Moment of Inertia : kg m^2
- ◆ Spring Constant : N/m
- ◆ Frequency : Hertz Hz = s^{-1}
- ◆ Pressure : Pascal Pa = N/m^2
- ◆ Work/Energy : Joule J = N m
- ◆ Power : Watt W = J/s
- ◆ Electric Charge : Coulomb C = A s
- ◆ Electric Potential : Volt V = J/C
- ◆ Resistance : Ohm Ω = V/A

Physics 1

Additional Resources

- <https://apstudents.collegeboard.org/courses/ap-physics-1-algebra-based>
- <https://www.khanacademy.org/science/ap-physics-1>
- <https://www.edx.org/course/ap-physics-1>
- https://en.wikipedia.org/wiki/AP_Physics_1
- <https://www.princetonreview.com/college-advice/ap-physics-1-exam>
- <https://fiveable.me/ap-physics/study-guides-for-every-ap-physics-1-unit/>