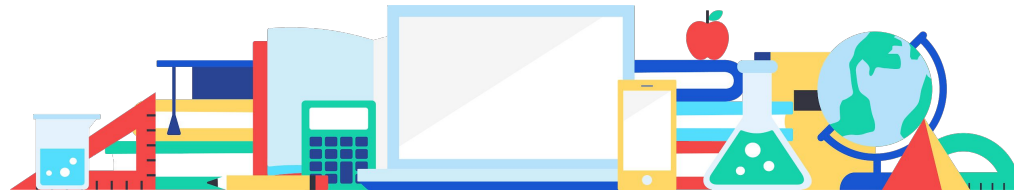# Physics 2 Topics & Resources

Updated July 2020

Key Topics

Key Topics Covered in Physics 2

- ➜ Electricity & Circuits
  - ◆ Electric Field
  - ◆ Electric Potential
  - ◆ Capacitance
  - ◆ Capacitors in Circuits
- ➜ Electromagnetism
  - ◆ Magnetic Fields
  - ◆ Force on Moving Charges
  - ◆ Field due to a Current
  - ◆ Force between 2 Wires
  - ◆ Induced EMF & Faraday's Law
- ➜ Physical Optics
  - ◆ EM Waves
  - ◆ Reflection
  - ◆ Refraction & Internal Reflection
  - ◆ Diffraction & Interference
  - ◆ Polarization
- ➜ Ray Optics
  - ◆ Plane Mirrors
  - ◆ Concave & Convex Mirrors
  - ◆ Converging & Diverging Lenses

- ➜ Fluids
  - ◆ Pascal's Principle & Static Pressure
  - ◆ Buoyancy & Fluid Motion
  - ◆ Bernoulli's Equation
  - ◆ Applications of Bernoulli
- ➜ Thermodynamics
  - ◆ Temperature & Moles
  - ◆ Ideal Gas Law
  - ◆ 1st Law of Thermodynamics
  - ◆ 2nd Law of Thermodynamics
  - ◆ Heat Transfer
- ➜ Modern Physics
  - ◆ Quantum Theory
  - ◆ Atomic Structure
  - ◆ Nuclear Structure
  - ◆ Radioactive Decay
  - ◆ Special Relativity

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Key Formulae

Key Formulae in Physics 2

➜ **Electricity & Circuits**

$$F = \frac{kQq}{r^2} \qquad \vec{E} = \frac{\vec{F}}{q} \qquad W = -\Delta PE = q\Delta V \qquad C = \frac{Q}{V} = \frac{\epsilon_0 A}{d}$$

$$E = \frac{1}{2}CV^2 \qquad \text{Series: } \frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} \qquad \text{Parallel: } C = C_1 + C_2 + C_3$$

➜ **Electromagnetism**

$$F = qvB\sin\theta \qquad F = IlB\sin\theta \qquad B = \frac{\mu_0 I}{2\pi r} \qquad B = \frac{\mu_0 NI}{2r}$$

$$B = \mu_0\frac{N}{L}I \qquad F_{12} = \frac{\mu_0 I_1 I_2 l}{2\pi r} \qquad \epsilon = Blv \qquad \Phi = BA\cos\theta \qquad \epsilon = -\left(\frac{\Delta\Phi}{\Delta t}\right)$$

➜ **Physical Optics**

$$c = f\lambda \qquad n_1\sin\theta_1 = n_2\sin\theta_2 \qquad \sin\theta_c = \frac{n_2}{n_1}$$

$$\frac{n\lambda}{d} = \frac{x}{L} \qquad n\lambda = d\sin\theta$$

➜ **Ray Optics**

$$\frac{1}{F} = \frac{1}{S_o} + \frac{1}{S_i} \qquad m = -\frac{S_i}{S_o}$$

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Key Formulae in Physics 2 (continued)

Key Formulae

➜ **Fluids**

$$\frac{F_1}{A_1} = \frac{F_2}{A_2} \qquad p = p_0 + \rho g h \qquad F_B = \rho g V_d \qquad v_1 A_1 = v_2 A_2$$

$$P_1 + \rho g h_1 + \frac{1}{2}\rho v_1^2 = P_2 + \rho g h_2 + \frac{1}{2}\rho v_2^2$$

➜ **Thermodynamics**

$$U = \frac{3}{2}nRT \qquad KE_{avg} = \frac{3}{2}kT \qquad v_{rms} = \sqrt{\frac{3kT}{m}} \qquad \frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$PV = nRT \qquad PV = NkT \qquad \Delta U = Q + W$$

$$\eta = \frac{W}{Q_{in}} = 1 - \frac{Q_{out}}{Q_{in}} = 1 - \frac{T_C}{T_H} \qquad H = \frac{Q}{t} = \frac{kA(T_2 - T_1)}{d}$$

➜ **Modern Physics**

$$E = hf \qquad KE_{max} = hf - hf_0 \qquad p = \frac{h}{\lambda} \qquad \lambda = \frac{h}{mv}$$

$$\Delta x \Delta p \geq \frac{h}{4\pi} \qquad E = mc^2$$

$$\Delta t' = \gamma \Delta t \qquad \Delta x' = \frac{\Delta x}{\gamma} \qquad \gamma^2 = \frac{1}{\left(1 - \frac{v^2}{c^2}\right)}$$

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Units

Units for Physics 2

➔ **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
- ◆ 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
- ◆ Capacitance : Farad F = C/V
- ◆ Magnetic Flux : Weber $Wb = kg\ m^2/(A\ s^2)$
- ◆ Magnetic Flux Density : Tesla T = N/(A m)
- ◆ Inductance : Henry $H = kg\ m^2/(A^2\ s^2)$

Physics 2

Additional Resources

→   https://apstudents.collegeboard.org/courses/ap-physics-2-algebra-based

→   https://www.khanacademy.org/science/ap-physics-2

→   https://en.wikipedia.org/wiki/AP_Physics_2

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