

PHYSICS FORMULA SHEET

Grade 11 SPH3U

Fundamental Formulas

a^2 = b^2 + c^2 - 2(b)(c)cosA a/sinA = b/sinB = c/sinC -b ± √(b^2 - 4ac) / 2a

Kinematic Equations

Δd = v_i Δt + 1/2 a (Δt)^2 a_g = 9.8 m/s^2 [down] Δd = v_f Δt - 1/2 a (Δt)^2 v_avg = Δd / Δt = (d_f - d_i) / (t_f - t_i) Δd = ((v_f + v_i) / 2) Δt a_avg = Δv / Δt = (v_f - v_i) / (t_f - t_i) v_f = v_i + a Δt (v_f)^2 = (v_i)^2 + 2 a Δd

Dynamics Formulas

F_g = m g F_net = m a F_f = μ_f F_N

Gravitational, Electric, and Magnetic Fields Formulas

m_electron = 9.11 × 10^-31 kg m_neutron = 1.675 × 10^-27 kg m_proton = 1.673 × 10^-27 kg v = f λ f = 1/T n_1 sin θ_1 = n_2 sin θ_2 n = λ_1 / λ_2 n_2 = λ_1 / λ_2 e = 1.602 × 10^-19 C 1 eV = 1.602 × 10^-19 J 1 C = 6.2 × 10^18 electrons |P_n S_1 - P_n S_2| = (n - 1/2) λ sin θ_n = ((n - 1/2) λ) / d sin θ_c = n_2 / n_1 F_g = G m_1 m_2 / r^2 g = G m_p / r^2 v = √(G m_p / r) G = 6.67 × 10^-11 N · m^2 / kg^2 k = 8.99 × 10^9 N · m^2 / C^2 E = k q_1 q_2 / r^2 F_E = k q_1 q_2 / r^2 ΔV = ΔE_E / q ε = -ΔV / Δd V = E_E / q F_E = q E E_E = k q_1 q_2 / r ΔE_E = -q ε Δd ΔE_E = k q_1 q_2 / r_f - k q_1 q_2 / r_i ΔE_E = E_E f - E_E i V = k q Δd / r^2 I = q · N / Δt q = Ne F_M = q v B sin θ F_M = I L B sin θ

Quantum Mechanics and Special Relativity

Δt_m = Δt_s / √(1 - v^2/c^2) L_m = L_s √(1 - v^2/c^2) p = m v / √(1 - v^2/c^2) m_m = m_s / √(1 - v^2/c^2) E_total = m c^2 / √(1 - v^2/c^2) E_rest = m c^2 E_total = E_K + E_rest W = e ΔV E_photon = h f = h c / λ E_k = h f - h f_0 E_k = h f - W p_photon = h f / c = h / λ 1 eV = 1.602 × 10^-19 J h = 6.63 × 10^-34 J · s

Uniform Circular Motion Equations

a_c = v^2 / r a_c = 4 π^2 r f^2 a_c = 4 π^2 r / T^2 v = 2 π r / T F_c = m v^2 / r Σ F = m a_c

Work and Energy Formulas

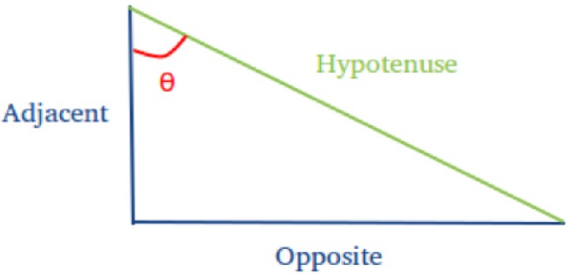
W = F Δd cos θ W = ΔE ΔE_k = 1/2 m v^2 F_x = k Δx T = 2 π √(m/k) ΔE_g = m g Δh E_e = 1/2 k Δx^2 P = W / Δt

Collisions and Momentum Equations

m_1 v_i_1 + m_2 v_i_2 = m_1 v_f_1 + m_2 v_f_2 1/2 m_1 v_i_1^2 + 1/2 m_2 v_i_2^2 = 1/2 m_1 v_f_1^2 + 1/2 m_2 v_f_2^2 p = m v Δp = F Δt v_f = (m_1 v_i_1 + m_2 v_i_2) / (m_1 + m_2) v_f_1 = ((m_1 - m_2) / (m_1 + m_2)) v_i_1 + ((2 m_2) / (m_1 + m_2)) v_i_2 v_f_2 = ((m_2 - m_1) / (m_1 + m_2)) v_i_2 + ((2 m_1) / (m_1 + m_2)) v_i_1 v_f_1 = ((m_1 - m_2) / (m_1 + m_2)) v_i_1 v_f_2 = ((2 m_1) / (m_1 + m_2)) v_i_1

Waves and Light Formulas

v = f λ f = 1/T n_1 sin θ_1 = n_2 sin θ_2 n = λ_1 / λ_2 n_2 = λ_1 / λ_2 |P_n S_1 - P_n S_2| = (n - 1/2) λ sin θ_n = ((n - 1/2) λ) / d sin θ_c = n_2 / n_1 sin θ_m = m λ / d sin θ_n = ((n - 1/2) λ) / d x_m = m L λ / d x_n = ((n - 1/2) L λ) / d Δx = L λ / d x_n / L = ((n - 1/2) λ) / d 2t = ((m + 1/2) λ) / n_film 2t = n λ / n_film Δx = L (λ / (2t)) sin θ_n = x_n / L sin θ_m = ((m + 1/2) λ) / w sin θ_n = n λ / w d = 1 / N y_m = ((m + 1/2) L λ) / w y_n = n L λ / w Δy = L λ / w



S OH C AH T OA Sine(θ) = opp / hyp Cosine(θ) = adj / hyp Tangent(θ) = opp / adj