

AP Physics 1
Spring Final Exam Formulas

1.) Work and Energy

$$F_g = mg \quad F_{||} = F_g \sin\theta \quad F_{\perp} = F_g \cos\theta \quad F_f = \mu F_N \quad W = \vec{F} \cdot \vec{d} = Fd\cos\phi \quad P = \frac{W}{\Delta t} \quad P = \vec{F} \cdot \vec{v} = Fv\cos\phi$$

$$F = kx \quad U_e = \frac{1}{2}kx^2 \quad U_g = mgy \quad K = \frac{1}{2}mv^2 \quad W_{net} = \Delta K \quad W_{field} = -\Delta U \quad K_i + U_i + W_{other} = K_f + U_f$$

2.) Momentum and Impulse

$$\vec{p} = m\vec{v} \quad \vec{J} = \vec{F}\Delta t \quad \vec{J} = \Delta\vec{p} = m\Delta\vec{v} \quad K = \frac{1}{2}mv^2 \quad v_i - v_{2i} = -(v_1 - v_2)$$

3.) Rotational Motion

$$\omega_{av} = \frac{\Delta\theta}{\Delta t} \quad a_{av} = \frac{\Delta\omega}{\Delta t} \quad \omega = \alpha t + \omega_0 \quad \Delta\theta = \frac{1}{2}\alpha t^2 + \omega_0 t \quad \omega^2 = \omega_0^2 + 2\alpha\Delta\theta \quad \Delta\theta = \left(\frac{\omega_0 + \omega}{2}\right)t \quad \Delta s = r\Delta\theta \quad v_t = r\omega \quad a_t = r\alpha$$

$$K = \frac{1}{2}mv^2 \quad K = \frac{1}{2}I\omega^2 \quad U_g = mgy \quad y = d\sin\theta \quad K_1 + U_1 = K_2 + U_2 \quad \tau = rF\sin\theta \quad \sum\vec{F} = m\vec{a} \quad \sum\vec{\tau} = I\vec{\alpha} \quad \vec{L} = I\vec{\omega} \quad F_g = mg$$

4.) Oscillations and Gravity

$$\vec{F}_{net} = m\vec{a} \quad F_g = mg \quad U_s = \frac{1}{2}kx^2 \quad a_c = \frac{v_t^2}{r} \quad v_t = \frac{2\pi r}{T} \quad F_g = G\frac{m_1 m_2}{r^2} \quad U_g = -G\frac{m_1 m_2}{r} \quad G = 6.67 \times 10^{-11} \frac{\text{N} \cdot \text{m}^2}{\text{kg}^2}$$

$$K_1 + U_1 = K_2 + U_2 \quad K = \frac{1}{2}mv^2 \quad x = A\cos(\omega t) \quad v = -\omega A\sin(\omega t) \quad a = -\omega^2 A\cos(\omega t) \quad T = \frac{2\pi}{\omega} = \frac{1}{f} \quad T_s = 2\pi\sqrt{\frac{m}{k}} \quad T_p = 2\pi\sqrt{\frac{\ell}{g}}$$

$$g = G\frac{M}{r^2} \quad v = \sqrt{\frac{GM}{r}} \quad T = 2\pi\sqrt{\frac{r^3}{GM}}$$

5.) Sound and Waves

$$v = \frac{\lambda}{T} = \lambda \cdot f \quad T = \frac{2\pi}{\omega} = \frac{1}{f} \quad v = \sqrt{\frac{T}{\mu}} \quad \mu = \frac{m}{L} \quad \lambda_n = \frac{2L}{n} \quad (n = 1, 2, 3, \dots) \quad \lambda_n = \frac{4L}{n} \quad (n = 1, 3, 5, \dots) \quad v = 340 \text{ m/s}$$

6.) Electricity and Circuits

$$F = k\left|\frac{q_1 q_2}{r^2}\right| \quad k = 9.0 \times 10^9 \frac{\text{N} \cdot \text{m}^2}{\text{C}^2} \quad \Delta V = IR \quad R = \frac{\rho\ell}{A} \quad P = I\Delta V \quad E = Pt \quad V_{ab} = V_a - V_b \quad R_s = \sum_i R_i \quad \frac{1}{R_p} = \sum_i \frac{1}{R_i}$$