PHYS213- FORMULA SHEET
Term202

Relations

$e_{tot} = a\sigma T^4$	$T\lambda_{max} = 2.898 \times 10^{-3}\ \mathrm{m.K}$	$u(\lambda) = \frac{8\pi hc\lambda^{-5}}{e^{hc/\lambda KT} - 1}$
$E = nhf$	$K_{max} = \frac{1}{2}mv^2 = eV_s$	$K_{max} = hf - \phi$
$2d\sin\theta = n\lambda$	$\lambda' - \lambda_o = \frac{h}{m_e c}(1 - \cos\theta)$	$m = ZIT$
$F = k\frac{(Z_1 e)(Z_2 e)}{r^2}$	$U = k\frac{(Z_1 e)(Z_2 e)}{r}$	$\Delta n = \frac{k^2 Z^2 e^4 NnA}{4R^2 K \sin^4(\varphi/2)}$
$\frac{1}{\lambda} = R\left(\frac{1}{n_f^2} - \frac{1}{n_i^2}\right)$	$L = m_e vr = n\hbar$	$\frac{e}{m_e} = \frac{V\theta}{B^2 ld}$
$r_n = \frac{n^2 a_0}{Z}$	$E_n = -\frac{13.6Z^2}{n^2}$	$\lambda = \frac{h}{p}$
$v_p = \frac{\omega}{k}$	$v_g = \frac{d\omega}{dk}$	$v_g = v_p + k\frac{dv_p}{dk}$
$\Delta x \Delta p_x \geq \frac{\hbar}{2}$	$\Delta E \Delta t \geq \frac{\hbar}{2}$	$D\sin\theta = D\frac{y}{L} = \begin{cases} n\lambda \\ (n + 0.5)\lambda \end{cases}$
$T = \frac{1}{f} = \frac{2\pi r}{v}$	$\lambda_{min} = \frac{1.24 \times 10^3}{V} nm$	$qE = qvB$
$\int_{-\infty}^{\infty} \lvert\psi\rvert^2\, dx = 1$	$P(x) = \int_a^b \lvert\psi\rvert^2\, dx$	$\langle Q \rangle = \int_{-\infty}^{\infty} \psi^*\, Q\, \psi\, dx$
$\psi_n(x) = \sqrt{\frac{2}{L}}\sin\left(\frac{n\pi x}{L}\right)$	$E_n = \frac{n^2\pi^2\hbar^2}{2mL^2}$	$\Psi(x,t) = \psi(x)e^{-i\omega t}$
$\psi_n(x,t) = Ae^{i(kx-\omega t)}$	$\Delta Q = \sqrt{\langle Q^2 \rangle - \langle Q \rangle^2}$	$[Q]\psi = q\psi$
$[P_x] = \frac{\hbar}{i}\frac{\partial}{\partial x}$	$[E] = i\hbar\frac{\partial}{\partial t}$	$[K] = -\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2}$
$[H] = -\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2} + U(x)$	$P_x = n\frac{\pi\hbar}{L}$	$\lvert\vec{L}\rvert = \hbar\sqrt{\ell(\ell + 1)}$
$L_z = m_\ell \hbar$	$P(r) = r^2\lvert R_{n,\ell}(r)\rvert^2$	$\langle r \rangle = \int_o^{\infty} rP(r)\, dr$

$$E_n = \left(n + \frac{1}{2}\right)\hbar\omega$$

$$T(E) = \left\{1 + \frac{1}{4}\left[\frac{U^2}{E(U-E)}\right]\sinh^2(\alpha L)\right\}^{-1} \qquad \alpha = \frac{\sqrt{2m(U-E)}}{\hbar}$$

$$T(E) = \left\{1 + \frac{1}{4}\left[\frac{E^2}{U(E-u)}\right]\sin^2(\alpha' L)\right\}^{-1} \qquad \alpha' = \frac{\sqrt{2m(E-U)}}{\hbar}$$

$$-\frac{\hbar^2}{2m}\frac{\partial^2\Psi(x,t)}{\partial x^2} + U(x)\Psi(x,t) = i\hbar\frac{\partial\Psi(x,t)}{\partial t}$$

$$\int_0^\infty x^n e^{-x} dx = n! \qquad \int_0^\infty z^2 e^{-az^2}\, dz = \frac{1}{4a}\sqrt{\frac{\pi}{a}}\ ,\ a > 0$$

$$E_{n_1,n_2,n_3} = \frac{\pi^2\hbar^2}{2m}\left(\frac{n_1^2}{L_1^2} + \frac{n_2^2}{L_2^2} + \frac{n_3^2}{L_3^2}\right)$$

$$\Psi(r,\theta,\phi,t) = R_{n,\ell}(r)Y_\ell^{m_\ell}(\theta,\phi)e^{-i\omega t}$$

Constants:

$e = 1.6 \times 10^{-19}$C	$m_e = 9.11 \times 10^{-31}$kg	$h = 6.626 \times 10^{-34}$ J.s, $\hbar = h/2\pi$
$c = 3 \times 10^8$ m/s	$m_p = 1.67 \times 10^{-27}$kg	$k = 9 \times 10^9$ N.m^2/C^2
$hc = 1240$ eV.nm	$R = 1.0973 \times 10^7$ m^{-1}	$\sigma = 5.67 \times 10^{-8}$ W.m^{-2}.K^{-4}
$\lambda_c = 0.00243$ nm	$a_0 = 0.0529$ nm	$k_B = 1.38 \times 10^{-23}$ J/K