Relevant equations you may or may not need:

Lorentz transformations $\begin{cases} x' = \gamma(x - vt) \\ y' = y; \quad z' = z \\ t' = \gamma\left(t - \frac{v}{c^2}x\right) \end{cases}$ $\begin{cases} u'_x = \dfrac{u_x - v}{1 - \frac{u_x v}{c^2}} \\ u'_{y,z} = \dfrac{u_{y,z}}{\gamma\left(1 - \frac{u_x v}{c^2}\right)} \end{cases}$ $\gamma = \dfrac{1}{\sqrt{1 - \left(\frac{v}{c}\right)^2}}$

Length contraction $L = L_0/\gamma$; time dilation $\tau = \gamma\tau_0$,

Doppler effect: $f_{obs} = f_{source}\sqrt{\dfrac{1 + v/c}{1 - v/c}}$ *(approaching observer)*

Relativistic energy and momentum: $\begin{matrix} \vec{p} = \gamma m \vec{v} \\ E = \gamma m c^2 \end{matrix}$; $E^2 = p^2c^2 + m^2c^4$; $\dfrac{\vec{v}}{c} = \dfrac{\vec{p}c}{E}$

Photoelectric effect: $hf = \varphi + K_{max}$ Optical transitions: $hf = E_{ini} - E_{fin}$

Wave-particle duality $E = \hbar\omega = hf$, $p = \hbar k = \dfrac{h}{\lambda}$; $k = \dfrac{2\pi}{\lambda} = \dfrac{\omega}{c} = \dfrac{2\pi f}{c}$

Uncertainty principle $\Delta p \cdot \Delta x \geq \dfrac{\hbar}{2}$; $\Delta E \cdot \Delta t \geq \dfrac{\hbar}{2}$

General Schrödinger equation: $i\hbar\dfrac{\partial\Psi(x,t)}{\partial t} = -\dfrac{\hbar^2}{2m}\dfrac{\partial^2\Psi(x,t)}{\partial x^2} + U(x)\Psi(x,t)$

$P_{a<x<b} = \int_a^b |\Psi(x,t)|^2 dx$; Normalization: $\int_{-\infty}^{\infty} |\Psi(x,t)|^2 \, dx = 1$;

Time-independent 1D Schrödinger equation: $-\dfrac{\hbar^2}{2m}\dfrac{d^2\psi_n(x)}{dx^2} + U(x)\psi_n(x) = E_n\psi_n(x)$; $\Psi_n(x,t) = \psi_n(x)e^{-iE_nt/\hbar}$

1-D infinite square well $0<x<L$: $E_n = \dfrac{\hbar^2\pi^2n^2}{2mL^2}$; $\psi_n(x) = \sqrt{\dfrac{2}{L}}\sin\left(\dfrac{\pi n x}{L}\right)$.

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

General solutions for the equation $\dfrac{d^2\psi}{dx^2} + k^2\psi = 0$ are $A\cos(kx) + B\sin(kx)$ or $Ce^{ikx} + De^{-ikx}$

General solution for the equation $\dfrac{d^2\psi}{dx^2} - \alpha^2\psi = 0$ is $Ae^{\alpha x} + Be^{-\alpha x}$

Boundary conditions: a wave function is (a) always continuous; (b) smooth (derivative is continuous) unless U(x)=∞.

Hydrogen-like ion energy levels: $E_n = -\dfrac{Z^2 m_e \left(ke^2\right)^2}{2\hbar^2 n^2} = -\dfrac{Z^2 E_R}{n^2}$

Angular momentum values: $\begin{matrix} L^2 = \hbar^2 l(l+1); \\ L_z = \hbar m \end{matrix}$ $\begin{matrix} l = 0(s), 1(p), \ 2(d), 3(f), \dots n-1 \\ m = -l, -l+1, \dots l-1, l \end{matrix}$

Spin values: $\begin{matrix} S^2 = \hbar^2 s(s+1) \\ S_z = \hbar m_s \end{matrix}$; for electron, proton, neutron: $s = \frac{1}{2}$

$E_{rot-vib} = \dfrac{\hbar^2}{2I}\ell(\ell+1) + \left(\nu + \dfrac{1}{2}\right)\hbar\omega$;

Nuclear binding energy $E_b = (Z \cdot m_p + N \cdot m_n - M_A)c^2$

Nuclear nomenclature ${}^{A}_{Z}X$

Some useful constants

$c = 3 \cdot 10^8$ m/s

$h = 2\pi\hbar = 6.63 \cdot 10^{-34}$ J·s

$h = 4.14 \cdot 10^{-15}$ eV·s

$hc = 1240$ eV·nm

$\hbar c = 197$ eV·nm

$m_e = 0.51$ MeV/c^2

$m_p = 938.3$ MeV/c^2

$m_n = 939.6$ MeV/c^2

$u = 931.5$ MeV/c^2

$E_R = \dfrac{m_e\left(ke^2\right)^2}{2\hbar^2} = 13.6 eV$

Handy trig identities

$e^{ix} = \cos x + i\sin x$

$e^{-ix} = \cos x - i\sin x$

$\cos x = (e^{ix} + e^{-ix})/2$

$\sin x = (e^{ix} - e^{-ix})/2i$

$|e^{ix}|^2 = 1$