

Chapter 26: Wave Optics

Constructive interference for small angles, $d\theta = m\lambda$

Table 23-1 The Visible Spectrum

Spectral colors and the approximate frequencies and vacuum wavelengths corresponding to each color.

Color		Frequency (10^{14} Hz)		Wavelength (nm = 10^{-9} m)
Violet		6.7–7.5		400–450
Blue		6.0–6.7		450–500
Green		5.5–6.0		500–550
Yellow		5.0–5.5		550–600
Orange		4.6–5.0		600–650
Red		4.3–4.6		650–700

Chapter 27: Relativity

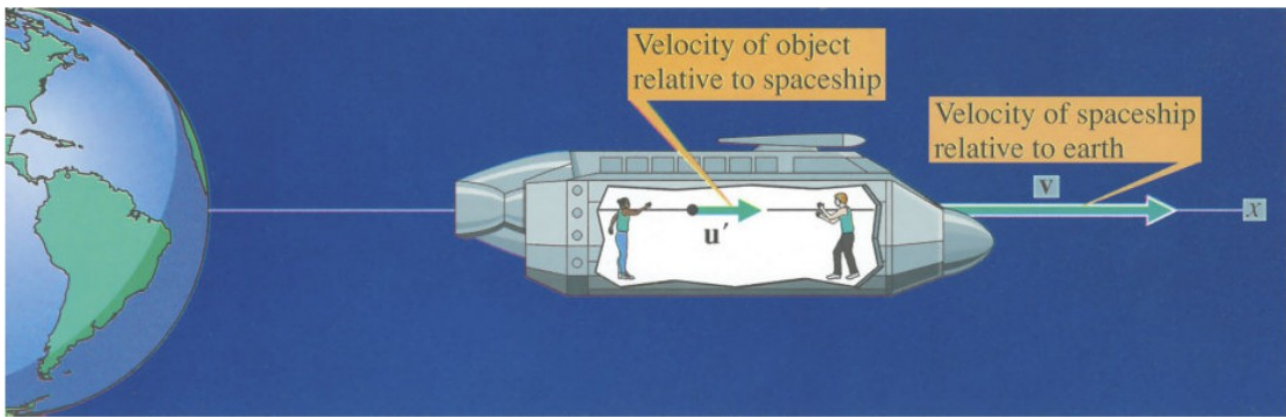
Time dilation, $\Delta t = \frac{\Delta t_0}{\sqrt{1 - (v/c)^2}}$

Frequency, $f = \frac{1}{\Delta t}$

Length contraction, $\ell = \ell_0 \sqrt{1 - (v/c)^2}$

Distance-speed-time, $\ell = v\Delta t$

Relative velocity, $u_x = \frac{u'_x + v_x}{1 + u'_x v_x / c^2}$



Mass and energy are interchangeable, $E = mc^2$

Power, $P = \frac{E}{\Delta t}$

Chapter 29: The Atom

Wavelengths in any hydrogen series, $\frac{1}{\lambda} = R \left(\frac{1}{(n')^2} - \frac{1}{n^2} \right)$; $n' = 1, 2, 3, \dots$ and $n > n'$

The largest value of $1/\lambda$ occurs for $n' = 1$ and $n \rightarrow \infty$.

Rydberg constant, $R = 1.097 \times 10^7 \text{ m}^{-1}$

Chapter 30: Nuclear Physics and Elementary Particles

A specific nuclide is indicated by ${}^A_Z\text{X}$.

Binding energy, $\Delta E = \Delta mc^2 = [Zm_p + (A - Z)m_n - m]c^2$

Table 30-1 **Masses of selected particles and atoms**

The atomic masses include the masses of atomic electrons.

Atom or subatomic particle	Mass, u
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electron		5.486×10^{-4}	
proton		1.007276	
neutron		1.008665	
hydrogen	${}^1_1\text{H}$	1.007825	(99.99%)
	${}^2_1\text{H}$	2.014102	(0.01%)
helium	${}^4_2\text{He}$	4.002603	(~100%)
beryllium	${}^9_4\text{Be}$	9.012182	(~100%)
carbon	${}^{12}_6\text{C}$	12.000000	(98.9%)
	${}^{13}_6\text{C}$	13.003355	(1.1%)
nitrogen	${}^{14}_7\text{N}$	14.003074	(99.6%)
	${}^{15}_7\text{N}$	15.000109	(0.4%)
oxygen	${}^{16}_8\text{O}$	15.994915	(99.8%)
	${}^{17}_8\text{O}$	16.999133	(0.04%)
	${}^{18}_8\text{O}$	17.999159	(0.2%)
aluminum	${}^{26}_{13}\text{Al}$	26.981541	(100%)
iron	${}^{56}_{26}\text{Fe}$	55.934939	(100%)
lead	${}^{206}_{82}\text{Pb}$	205.97446	(24.1%)
	${}^{207}_{82}\text{Pb}$	206.97589	(22.1%)
	${}^{208}_{82}\text{Pb}$	207.97664	(52.3%)
uranium	${}^{235}_{92}\text{U}$	235.04393	(0.7%)
	${}^{238}_{92}\text{U}$	238.05079	(99.3%)

Useful conversion: $(1 \text{ u})c^2 = 931.5 \text{ MeV}$ Decay constant, $\lambda = \frac{\ln 2}{T_{1/2}}$ Radioactive decay, $A(t) = A_0 e^{-\lambda t}$