World of Light - Exam 1 study guide

Exam 1 will be on Friday, April 24
Bring a calculator to the exam *(smart phones are fine)*

The exam will cover:
- material that we've learned in class
- labs 1 and 2
- problem sets 1, 2, and 3
- book chapters 1 and 2, and section 6.5.

Scientific units
scientific notation
metric system (meters, seconds, joules, hertz; prefixes: mega, kilo, centi, milli, micro, nano)
unit analysis
unit conversion

Terminology
For each of the following terms, you should be able to define it, provide examples of it, and, if appropriate, draw a diagram for it.

waves - wavelength, crest, trough, amplitude
waves - transverse and longitudinal
standing waves - nodes and antinodes, wavelength
water waves - shallow and deep water
medium that waves travel through
refractive index
electromagnetic spectrum - gamma ray, X-ray, UV, visible, IR, microwave, radio
electromagnetic wave - oscillating electric and magnetic fields
sound spectrum - ultrasound, audible sound, infrasound
spectra - line spectra and continuous spectra, reading spectra
absorption, transmission, reflection
resonance, coupling, damping
normal modes, fundamental frequency, first harmonic, overtones, octaves
shadows - umbra, penumbra
pinhole camera - focal length
scalars, vectors, scalar fields, vector fields
photons, photoelectric effect, photodiode
energy, power
hydrogen atom energy levels, ionization energy
scattering of light
superposition - waves passing, constructive and destructive interference, standing waves
Doppler shift - for light, sound, water waves

Calculations

You will be given all equations that you need. However, you need to know what each equation is, when to use it, and how to use it.

speed of light in vacuum = $c = 3\times10^8$ m/s
acceleration due to gravity = $g = 10$ m/s^2
speed of sound in air = 350 m/s
Rydberg constant = $R = 1.097\text{x}10^7$ m^{-1}

$$v = \frac{d}{t} \quad v = \lambda f \qquad v = \sqrt{\frac{\lambda g}{2\pi}} \quad v = \sqrt{gh} \qquad v = \frac{c}{n}$$

$$E = hf$$

$P = E/t$ (P = power, E = energy, t = time)

$$\frac{1}{\lambda} = R\left(\frac{1}{n^2} - \frac{1}{m^2}\right)$$

Colors
reading spectra
correspondence between light wavelength and color
absorption, transmission
energy in a spectral peak
color addition with lights
color subtraction with paint
causes of colors of common things (sky, clouds, sunset, leaves, etc.)