Physics 2205 7 December, 1999
Study Guide for Exam 3

This study guide only covers material presented since Exam 2, namely Chapters 23, 24, and 25. These chapters will account for about 35% of Exam 3. You should also review the previous two study guides, focusing especially on Chapters 4, 5, and 6.

Chapter 23

The law of reflection	$\theta_i = \theta_r$
Focal length	$f = r/2$
Definition of index of refraction	$n = c/v$
Snell's Law	$n_1 \sin\theta_1 = n_2 \sin\theta_2$
Critical angle	$\sin\theta_c = n_2/n_1$
The mirror/lens equation:	$1/f = 1/d_o + 1/d_i$
Magnification:	$m = (h_i/h_o) = -(d_i/d_o)$

You will also need to review the rules for ray tracing
for mirrors: page 691 for lenses: page 704
and the sign conventions
for mirrors: page 693 for lenses: page 707

And, as described in problem 23.23, the plane mirror is a special case of the curved mirror, where r and f both equal ∞. In this case:

$$d_i = d_o$$
$$h_i = h_o$$

Chapter 24

The basis of this chapter is the application of Huygens' Principle, which we first used to illustrate the diffraction of waves through an opening. We then showed that Huygens' Principle can be used to derive Snell's Law.

The major phenomena introduced:

Double-slit interference	$d \sin\theta = m\lambda$	m = 0,1,2 ... maxima
Diffraction (one slit)	$D \sin\theta = m\lambda$	m = 1,2,3 ... minima
Diffraction grating	$d \sin\theta = m\lambda$	m = 1,2,3 ... maxima

Since the diffraction grating produces such sharp maxima, it's an effective means of spreading white light out into a spectrum. Another method is to use a prism, which exploits the fact that the index of refraction of a material is a function of wavelength.

We also looked at polarization.

$I = I_o/2$	if I_o unpolarized
$I = I_o \cos^2 \theta$	if I_o polarized

When light is reflected from a surface, it is polarized in a direction perpendicular to the plane of reflection. For sunlight reflected from a horizontal surface, this means that the reflected light will be polarized horizontally. The polarization will be 100% when the incident angle (and reflected angle) equals Brewster's Angle.

Brewster's angle $\tan \theta_p = n_2/n_1$

Chapter 25

We only covered a little of this chapter.

The camera f-ratio = f/D

Resolution limit $\theta_{res} = 1.22 \lambda / D$