Physics 52	***Time: 75 minutes***
Exam #1 Chapter 33-34	***Instructor: Nayer Eradat***
September 26, 2006	***Student Name:***

Attention: enter the answers to the multiple choice questions in the following table. Not doing so will cost you the loss of corresponding points

Answers to the Multiple Choice questions (student use)

1:	**2:**	**3:**	**4:**	**5:**
6:	**7:**	**8:**	**9:**	**10:**
11:	**12:**	**13:**	**14:**	**15:**

You have plenty of space on each page for the solutions.
Ask for extra paper if needed.
Draw proper diagrams, show the arguments at every step of solution and the final answer clearly. Box the final answer
First concentrate on the problems or questions that you know the best.
Good luck ☺

Grading Table (Instructor use only):

	MC	P1	P2	P3	Total
MAX	**45**	**20**	**20**	**20**	**105**
Your Score					

Student name:

Equations for Calculus Based Physics III Optics &Heat and Thermodynamics

$$n=\frac{c}{v};\quad \lambda=\frac{\lambda_0}{\mathrm{n}};\quad \theta_{\mathrm{r}}=\theta_a;\quad n_{\mathrm{a}}\sin\theta_a=n_b\sin\theta_b;\quad \sin\theta_{crit}=\frac{n_b}{n_a};\quad I=I_{\max}\cos^2\phi;$$

$$\tan\theta_p=\frac{n_b}{n_a};\quad m=\frac{y'}{y};\quad \frac{1}{s}+\frac{1}{s'}=\frac{2}{R}=\frac{1}{f};\quad m=-\frac{s'}{s};\quad \frac{n_a}{s}+\frac{n_b}{s'}=\frac{n_b-n_a}{R};\quad m=-\frac{n_a s'}{n_b s};$$

$$\frac{1}{f}=(n-1)\left(\frac{1}{R_1}-\frac{1}{R_2}\right);\quad f\text{-}number=\frac{f}{D};\quad M=\frac{25}{f};\quad M=m_1M_2=\frac{25s'_1}{f_1f_2};\quad M=-\frac{f_1}{f_2};$$

Chapters 33 & 34 so far....

Some Physical Constants and Conversion Factors

$c=2.99792458\times10^8\,m/s$ $\quad \mathrm{n}_{\mathrm{air}}=1.00$ $\quad \mathrm{n}_{\mathrm{water}}=1.33$

$centi\rightarrow10^{-1}$ $\quad deca\rightarrow10^{1}$

$deci\rightarrow10^{-2}$ $\quad hecta\rightarrow10^{2}$

$mili\rightarrow10^{-3}$ $\quad kilo\rightarrow10^{3}$

$micro\rightarrow10^{-6}$ $\quad mega\rightarrow10^{6}$

$nano\rightarrow10^{-9}$ $\quad giga\rightarrow10^{9}$

$pico\rightarrow10^{-12}$ $\quad tera\rightarrow10^{12}$

$femto\rightarrow10^{-15}$ $\quad peta\rightarrow10^{15}$

$1m=3.28ft$ $\quad 1km=0.621mi$ $\quad 1N=0.225lb$ $\quad 1gal=3786L=0.003786m^3$

$\rho_{water}=1000\frac{kg}{m^3}$ $\quad \rho_{air}=1.20\frac{kg}{m^3}$ $\quad \mathrm{p}_0=1.01\times10^5\,Pa$ $\quad \mathrm{G}=6.67\times10^{-11}\frac{N.m^2}{kg^2}$

Student name:

1. (20 points, 5 each section) The left end of a long glass rod, 10.00 cm in diameter, has a convex hemispherical surface 5.00 cm in radius. The refractive index of the glass is 1.60.
    a. Determine the position of the image if an object is placed in air on the axis of the rod 12.0 cm to the left of the end of the rod. Is the image is real or virtual? Upright or inverted?
    b. Determine the position of the image if an object is placed in air on the axis of the rod 3.0 cm from the left end of the rod. Is the image is real or virtual? Upright or inverted?
    c. What is the magnification of the system in each case?
    d. Draw a proper ray diagram for the case b if the object is 3.00 cm high.

Student name:

2. (20 points, 5 each section) Several optical instruments are placed along the x axis, with their axes aligned along the x axis. A plane mirror is located at x=0. A converging lens with focal length 5.00 m is located at x=12.5. An object is placed at x=22.5 m.
    a. First, find the location of the image produced just by lens itself (as if no other instruments were present) and magnitude of magnification.
    b. Next, find the location of the image created by the plane mirror (after the light has passed through the lens) and magnitude of magnification.
    c. What is the location of the final image, as seen by an observer looking toward the mirror, through the lens? Keep in mind that the light must pass back through the lens, and thus you must do one more calculation with the thin lens equation. What is the and magnitude of magnification
    d. What is the magnitude of the magnification of the final image?

Student name:

3. (20 points) A convex-convex lens has radii of curvature with magnitudes of $|R_1|$=10 cm and $|R_2|$=15 cm. The lens is made of glass with index of refraction n_g=1.5 (R_1 refers to the radius of curvature of the surface through which light will enter the lens, and R_2 refers to the radius of curvature of the surface from which light will exit the lens).
    a. (6 points) Is this lens converging or diverging?
    b. (7 points) What is the focal length f of this lens in air (index of refraction for air is 1)?
    c. (7 points) What is the focal length of the lens if it is immersed in water?