Physics 2220
Spring 2006
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SIXTH MIDTERM

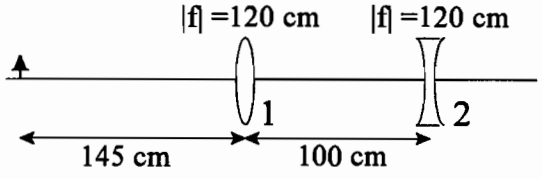
4

Name: Solution Student ID #:

Discussion Instructor (circle): Barcikowski El-Gendy Johnson Rodriguez

SHOW ALL WORK!!!!!
REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES!
Use the conversion constants and data given on the front page.

Given the lens system shown with a real object 145 cm to the left of lens 1. You supply the signs for the focal lengths.



(a) Calculate the position, right or left of lens 1, and the distance for the image just of lens 1.
(b) Is the image in (a) real or virtual?
(c) Calculate the position, measured from lens 2, distance and right or left, of the final image in this system.
(d) Is the final image erect or inverted, with respect to the original object? Justify your answer.

7 pts. (a) $\frac{1}{p} + \frac{1}{q} = \frac{1}{f}$

p = object distance = 145 cm
q = image distance = ?
f = + 120 cm

$\frac{1}{145\text{cm}} + \frac{1}{q} = \frac{1}{120\text{cm}} \Rightarrow$ q = 696 cm to the right of lens 1

3 pts. (b) The image is **real** because q, the image distance, is positive

10 pts. (c) The image from lens 1 is considered to be the object for lens 2

$p_2 = 100\text{cm} - q_1 = -596\text{cm}$
$q_2 = ?$
$f_2 = -120\text{cm}$

$\frac{1}{p_2} + \frac{1}{q_2} = \frac{1}{f_2} \Rightarrow q_2 = -150\text{cm}$ or 150 cm to the left of lens 2

5 pts. (d) Total magnification = $M = m_1 m_2 = \left(-\frac{q_1}{p_1}\right)\left(-\frac{q_2}{p_2}\right) = +1.21$

The sign of the total magnification is positive, so the final image is erect/upright.