

PHYS 252 TEST #1 1/25/19 Dr. Holmes NAME key

DO ALL 7 PROBLEMS. THE WORTH OF EACH PART OF EACH PROBLEM IS [MARKED] BESIDE THE PART OF THE PROBLEM. SHOW YOUR WORK FOR PARTIAL CREDIT EITHER UNDER THE PROBLEM OR ON A SEPARATE SHEET OF PAPER WITH THE PROBLEM NUMBER CLEARLY IDENTIFIED.

- 1) a) What is the speed of light in vacuum?
 [2] 3.0×10^8 m/s b) What is the speed of light in water (given that water has an index of refraction of 1.33) ?
 [4] 2.26×10^8 m/s.
- c) Given that the wavelength of a ray of light in the air is 550 nm, what is the wavelength of the ray in water?
 [4] 413 nm. d) Given that the wavelength of a ray of light in air is 550 nm, what is the frequency of the ray in water?
 [4] 5.46×10^{14} Hz.
- 2) A ray of light in water (assume $n = 1.33$ for water) hits a water/air interface at an angle of 67 degrees **with respect to the SURFACE** of the interface. a) What is the angle of **reflection** measured from the **SURFACE**?
 [2] 67° . b) What is the angle of **reflection** measured from the **NORMAL**?
 [2] 23° . c) What is the angle the **transmitted ray** into the air makes **with the NORMAL** (if totally reflected, answer TIR)?
 [6] 31.3° .
- c) Can rays of light in the water be totally reflected from the water/air interface?
 [2] Yes.
- d) Can rays of light in the air be totally reflected from the water/air interface?
 [2] No.
- 3) A lens is made from glass of index of refraction 1.57 . Its front lens has a radius of curvature of +12 cm, and its back surface has a radius of curvature of -16 cm.
- a) **DRAW A PICTURE** of this lens on the right side of this problem. Be sure to show relative curvatures. [2]
- b) Is the lens converging or diverging?
 [2] converging
- c) What is the focal length of this lens?
 [5] 84.2 cm (or 12.0 cm)
- d) If the lens had a front surface of radius of curvature of -12 cm, what would its focal length be?
 [5] -12.0 cm (or -84.2 cm).

4) a) **Draw a diagram** showing the eye, lens, object and image for a person wearing glasses to correct for near-sightedness: [4]

b) If the person with near-sightedness can make out an object as close as (but no further than) 44 cm without glasses, what should the focal length of the glasses be if the person is to make out an object that is at the far viewing distance of 25 m away?

[4] -44.8 cm.

c) **DESIGN** a lens that has the above focal length (from part b) and **DRAW A PICTURE** of the lens making sure to show relative curvatures. [6]

$n_{\text{glass}} =$ _____ $R_1 =$ _____ $R_2 =$ _____

Picture:

5) A magnifying glass has a focal length of 3.3 cm. a) What is the magnification of this lens when used properly?

[6] 8.58 X.

b) What should the image distance be if it is used "properly".

[4] -25 cm.

c) **DRAW A DIAGRAM** showing the object, lens, image, eye, and focal points for the lens. [4]

