Physics 256 Assignment 4 Fall 2012

Due: Wednesday, October 10th, 2012 4:00 pm in the drop box on Physics 2nd floor or electronically 47 marks

1) a) A point source is located 3 m from me. If the light travels 1 m beyond me where it hits a lens, what is the radius of curvature of the wavefront at the lens? **2 marks**

b) If the light is focused by the lens to a point 33 cm beyond the lens, what is the radius of curvature of the wavefront leaving the lens? **1 mark**

c) Sketch these wavefronts and the paths of 2 light rays through the lens. **3 marks**

2) An infrared beam with wavelengths 700 nm to 1000nm is used in OCT imaging to measure the positions of two plates in Argon gas. Proportionally, how much of the light will be scattered at 1000 nm compared with 700 nm? **3 marks**

3) Hecht 4.6 Assume the beam strikes the wall 5.0 m along the reflected ray. Reflection See posted websites for review of geometry. **3 marks**

4) Hecht problem 5.76. Two mirror reflection. **4 marks Use the law of reflection.**

5) a) Hecht 4.12. The angle given is the angle to the normal. **2 marks They want the angle of refraction.**

b) Hecht problem 4.16. **2 marks** The angle given is the angle to the normal. If the transmitted beam is reversed so that it impinges on the interface, show that $\theta_t = 55°$. **2 marks**

6) a) Apparent depth problem. Hecht 4.21: Take an object emitting light at the bottom of a pool with water of refractive index 4/3. Draw the rays seen by the eye at a small angle to the normal. Use Snell's Law and assume the small angle approximation $\sin\theta = \theta = \tan\theta$. Draw a diagram. **6 marks**

b) Do 4.24. **3 marks Move the camera the same distance that the object appears to move. You will get the same effect independent of the glass thickness. I recommend drawing a diagram.**

7) a) 4.52:Critical angle. **2 marks** Do not do the comparison as the question # is incorrect.

b) What is the angle of refraction for this angle of incidence? **2 marks**

c) 4.55 **2 marks**

8) Hecht problem 4.57. **4 marks** Draw a sketch. **6 marks** Fish is looking upwards- reverse the ray paths in Week 5 slide.