Quiz 7 Version A

1) Consider a lens that is flat (i.e. planar) on one side, and convex on the other surface. Such a lense is called "plano-convex". It looks like it is cut off a sphere. The radius of curvature of this lense is 26cm. The refractive index is 1.62. An object is placed 68cm away from the lens on the convex side. Where and of what type is the image?
   A) This is a real inverted image about 1m away from the lens on the opposite side of the object.
   B) This is a virtual image about 1m away from the lens right side up.
   C) This is a virtual image about 2m away from the lens right side up.
   D) This is a real inverted image about 2m away from the lens on the opposite side of the object.
   E) This is a virtual image about 50cm away from the lens inverted.

2) A double slit interference experiment is done in a water tank, often called a "ripple tank" because of the water waves looking like ripples o the water surface. The slits are 3.5cm apart, and a viewing screen is 0.8m from the slits. The wave speed is 0.12m/s, and the frequency 12Hz. How far from the center of the screen will the first maximum be found?
   A) 2cm   B) 5cm   C) 10cm   D) 20cm   E) 40cm
3) A contact lense is in the shape of a convex meniscus. The inner surface is shaped to fit the eye. It has a curvature radius of 7.80mm. The lens is made out of plastic with an index of refraction of n=1.56. The lens has a focal length of 44.4cm. What is the curvature radius of the outer surface of the lense?
   A) 7.16mm       B) 7.32mm       C) 7.56mm       D) 7.75mm       E) 8.02mm

4) What is the focal length of a concave mirror if an object placed 50cm in front of the mirror has a real image 200cm from the mirror?
   A) 20cm       B) 30cm       C) 40cm       D) 50cm       E) 60cm

   A cameras zoom lens covers the focal length range from 38mm to 110 mm. You point the camera at a distant object and photograph it first at 50mm and then at 100mm. What's the ratio of the images on the two photos?
   A) 2.9       B) 4.0       C) 2.0       D) 1.5       E) 1.0

5) A converging lense has surfaces with radii R1=80cm and R2=-36cm, and an index of refraction of n=1.63. An emerald that is 2cm tall is placed 15cm to the left of the lense. What will the magnification be? I.e. what is the ratio of image size divided by actual size of the emerald.
   A) 0.5       B) 1.0       C) 1.5       D) 2.0       E) 2.5

   Note: Magnification is defined to be a positive number. So feel free to take \(|h'|/|h|\)
DVD technology encodes the binary information as depressions in the information layer of the DVD. The zeros and ones are detected via interference of a laser beam with itself after it reflects from the information layer. The depth of the depressions is thus tuned to the wavelength of the laser used. For DVDs laser with wavelength of about 640nm are used. What do you think is the depth of the depressions?
   a. 40nm  
   b. 80nm  
   c. 160nm  
   d. 320nm  
   e. 640nm

8) A coherent source of monochromatic light of unknown wavelength shines on a double slit separated by 0.20mm. Bright spots separated by 0.70cm appear on a screen 3.0m away. What is the wavelength of the light?
   A) 400nm  
   B) 500nm  
   C) 600nm  
   D) 700nm  
   E) 800nm
9) X rays of wavelength 0.14nm are aimed at an unknown crystal in a diffractometer. A first order peak is observed at an angle of 38.2 degrees. What is the spacing of the Bragg planes in the crystal?
   A) 0.1nm   B) 0.2nm   C) 0.3nm   D) 0.4nm   E) 0.5nm

10) A double slit experiment has slit spacing of 0.035 mm, slit-to-screen distance 1.5m, and light with a wavelength of 500 nm is used to create an interference pattern on the screen. What is the phase difference between two waves arriving at a point 0.56 cm away from the center line on the screen?
    A) 90 degrees  B) 70 degrees  C) 50 degrees  D) 180 degrees  E) 120 degrees