Science Olympiad, Optics, Division B, January 15th 2011

Name (Partner#1):

Name (Partner#2):

School:

Points:

Geometric Optics:

Physical Optics:

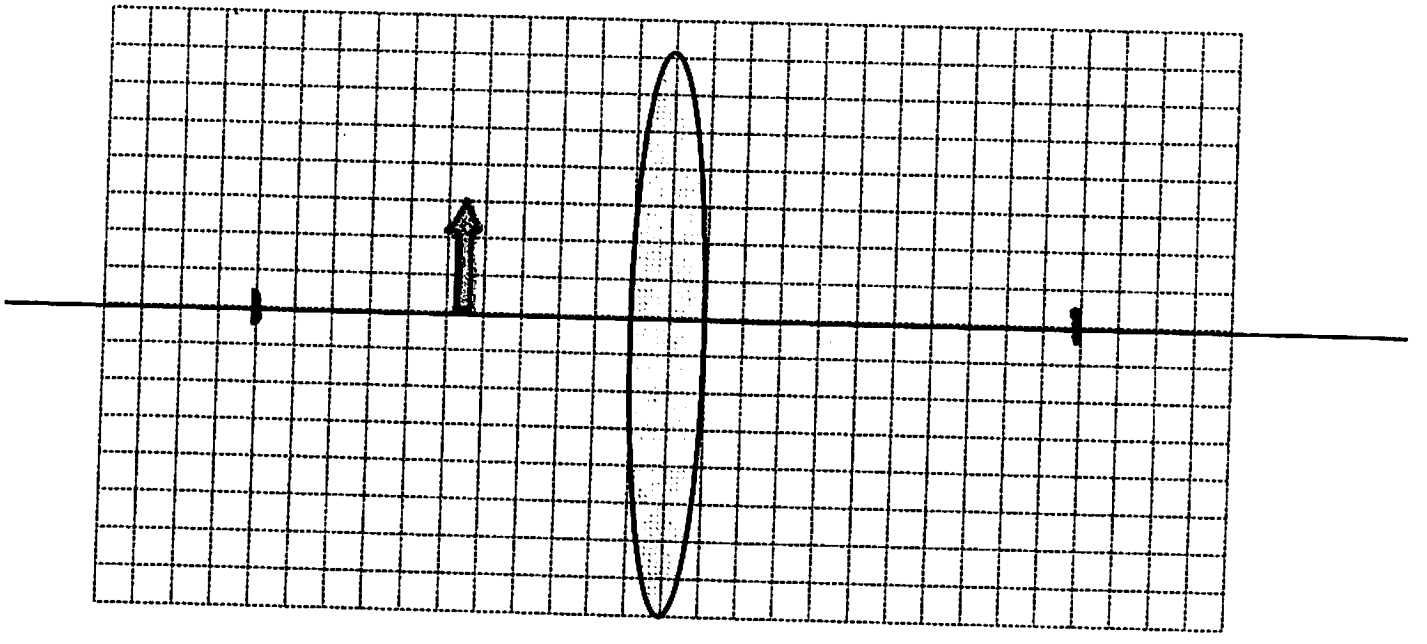
LaserShoot Setup t:

LaserShoot Accuracy:

Total Score:

I. Geometric Optics (30 point total)

Diagram to be used for Questions 1-10



1. What type of optic is represented in the center of the diagram above
   a. Is it a mirror or a lens (1pt)?
   b. Is it concave or convex (1pt)?
2. What do the red perpendicular short lines represent (1pt)?
3. Label the principle axis on the diagram (1pt)
4. Draw the image that would be produced from this Object (green arrow) and Optic.
   a. (3pts for the correct Image + 3pts for drawing light rays entering and exiting the Optic)
   b. (2 pts) Characterize the resulting image with at least three of the following terms that describe its relationship to the Object (terms: real, virtual, inverted, upright, shrunk, magnified)

5. Still considering the diagram on page 1, the optic's focal distance is 22cm and the Object's distance is 11cm:
    a. (5 pts) Calculate the Image's distance. Show your work including the formula.
    b. (5 pts) Calculate the Image's magnitude. Show your work including the formula.

6. Draw a concave lens (1pt). Is its focal distance >0 or <0 (1 pt)?

7. Draw a concave mirror (1pt). Is its focal distance >0 or <0 (1pt)?

8. Draw a convex lens (1pt). Is its focal distance >0 or <0 (1 pt)?

9. Draw a convex mirror (1pt). Is its focal distance >0 or <0 (1pt)?

II. Physical Optics (30 point total)

1. Identify the missing labels on the diagram to the right (4pts):

   1a.

   1b.

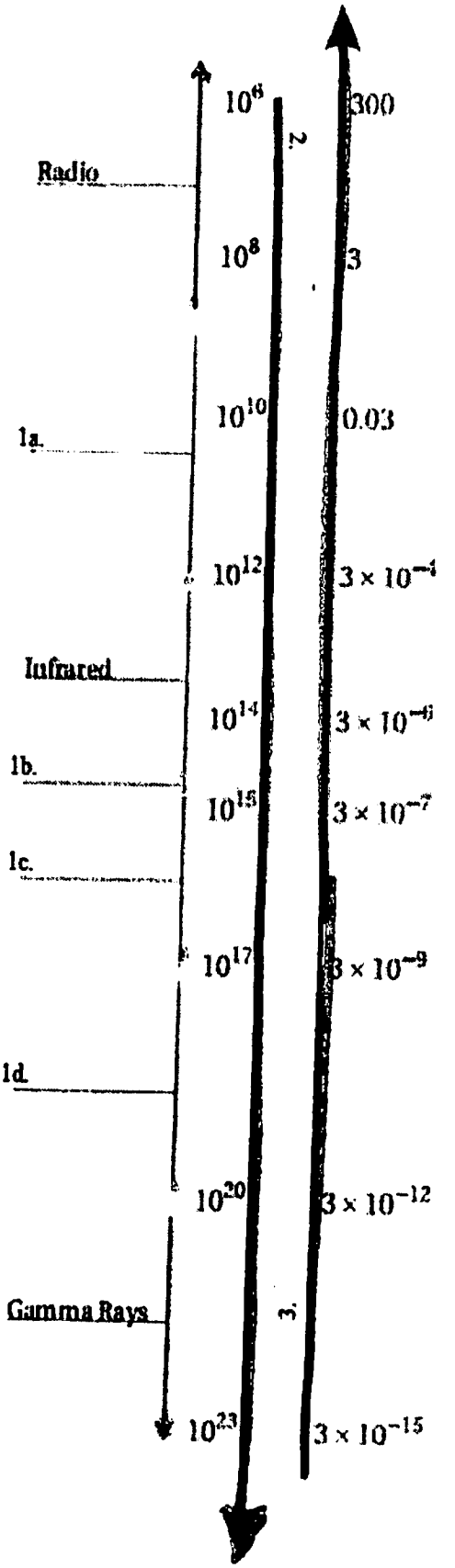
   1c.

   1d.

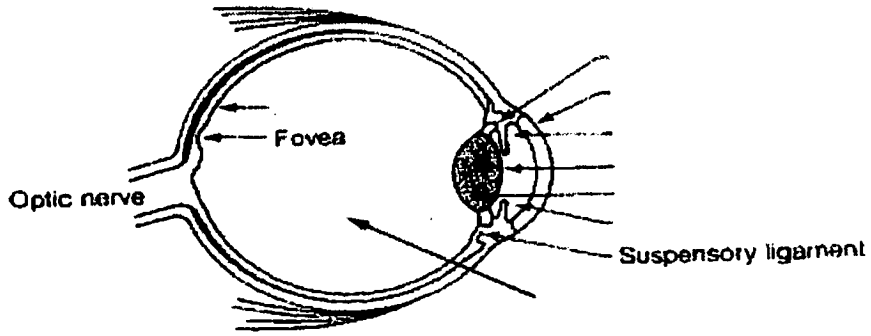
2. What does the bark blue line represent, and what are its typical units of measure (2pts)?

3. What does the red line represent and what are its typical units of measure (2pts)?

4. This diagram is a _____spectra (1pt).

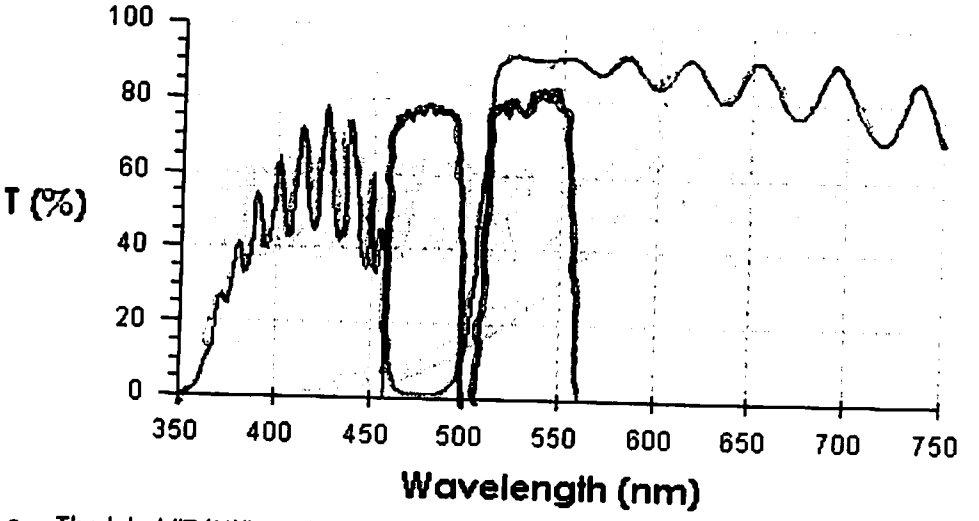


5. Label the missing part of this diagram (8pts):



6. Is the lens in the eye a convex or concave lens (1pt)?

7. Identify items on the following spectra graph:



a. The label "T (%)" on the Y-Axis is an abbreviation for what (1pt)?
b. The blue trace on the graph represents an optical filter that is doing what (1pt)?

c. The red trace on the graph represents an optical filter that is doing what? (1pt)

d. The green trace on the graph represents an optical filter that is doing what (1pt)?

e. Using the three optical filters represented in the graph above, design an arrangement of these filters to collect blue/green light into Detector 1 and green light into Detector 2. Briefly describe how the light moves through the device. Use the partially labeled figure below (8pt):

(green trace="Filter1", blue trace="Filter2", and red trace="Filter3)