Optics Review Problems

1. When looking at your reflection in a plane mirror that is 45 cm behind the mirror, how far does the light ray that creates your image travel from a lightbulb directly above the mirror to your eyes?

**Alana**: 45 cm **Blaze**: 90 cm **Clara**: 135 cm

F

C

R:

S:

O:

T:

1. Find the information (region, size, orientation, type) for the image below:

**Dayle**: behind mirror, larger, inverted , real **Elvis**: past C, larger, inverted, real

**Clair**: past C, smaller, inverted, real **Emil**: behind mirror, smaller, upright, virtual

1. Find the information (region, size, orientation, type) for the image below:

F

C

R:

S:

O:

T:

**Siran**: behind mirror, larger, inverted , real **Kathy**: past C, larger, inverted, real

**Leana**: past C, smaller, inverted, real **Sarah**: behind mirror, smaller, upright, virtual

1. A mirror is placed in front of a cat and the cat freaks out because it sees “another” cat 3 times bigger than it. If the cat is sitting 30 cm from the mirror, what kind of mirror is it and what is the focal length?

**Makay**: convex, 7.5 cm **Jamey**: convex, 22.5 cm

**Molly**: concave, 22.5 cm **Posey**: concave, 7.5 cm

1. A plane mirror and a concave mirror (focal length = .3 m) are placed 1 m away, facing each other. A lightbulb is placed 0.2 m from the concave mirror. Where do I place a piece of paper to see a real image of the filament?

**Banks**: 0.8 m behind the plane mirror

**James**: 0.6 m behind the concave mirror

**Garus**: 0.47 m in front of the plane mirror

**Paris**: 0.36 m in front of concave mirror

1. Light is passing through air when it encounters an unknown material. The light’s speed slows down to 1.2 \* 108 m/s. If the light hit the material at an angle of 50o to the normal, what is the refracted angle?

**Pyper**: 42.7o  **Samie**: 17.8o  **Slade**: 39.7o **Carie**: 14.9o

1. A beam of light is emitted 10.0 cm beneath the surface of a liquid and strikes the surface 15.0 cm from the point directly above the source. If the angle of incidence is 5o bigger than the critical angle and total internal reflection occurs, what is the index of refraction of the liquid?

**Kasey:** 1.60 **Blair:** 2.08 **Carlo:** 1.14 **Carly:** 1.28

1. A ray of light in air (*n* = 1.0) is incident on glass (*n* = 1.5) at a small angle θ*a* to the normal. The angle of the ray to the normal in the glass is *θg* . The speeds of light in air and the glass are *va* and *vg*, respectively. How do the values of the speed of light and the angle of the ray of light to the normal in air compare to those in the glass?



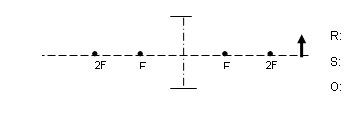
**Alvin:**

**Brett:**

**Aldin:**

**Della:**

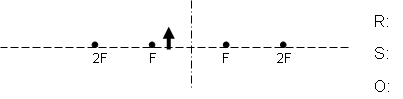
1. Find the information (region, size, orientation, type) for the image below:



**Sasha**: same side as object, larger, inverted, real **Isaac**: past C, larger, inverted, real

**Pyper**: b/t f and C, smaller, inverted, real **Wyatt**: same side as object, smaller, upright, virtual

1. Find the information (region, size, orientation, type) for the image below:



**Ranee**: same side as object, larger, inverted, real **Viola**: past C, larger, inverted, real

**Zelda**: b/t f and C, smaller, inverted, real **Renee**: same side as object, larger, upright, virtual

1. A magnifying glass has a focal length of 15 cm. How many times bigger are the letters on a piece of paper if I hold the magnifying glass 10 cm from the paper?

**Jenny**: 2 x bigger **Rowan**: 3 x bigger **Regan**: 4 x bigger **Gerry**: 5 x bigger

1. I place the magnifying glass from problem K, 50 cm from my eyeball (where the retina is always 1.7 cm from the lens). If an object is placed 60 cm on the other side of the magnifying lens, what does the focal length of my eye change to for the image to be in focus?

**Elmie**: 1.52 cm **Casie**: 1.57 cm **Emmie**: 1.61 cm **Alpha**: 1.64 cm

1. An object is placed in front of a thin lens. An upright image is formed that is one-third the height of the object. If the image is 6.0 cm from the lens, what is the focal length of the lens?

**Logan**: -27 cm **River**: -9 cm **Conor**: 9 cm **Vance**: 27 cm

1. A student is given a loudspeaker with a square opening and asked to make a change in the dimensions of the opening so that the sound wave is more spread out vertically and narrowed horizontally. Which of the following is the correct use of the principle of diffraction to accomplish the desired result?

**Edmon:** The task is impossible since diffraction affects only electromagnetic radiation and very short wavelengths.

**Halee:** Make the opening into a rectangle with a longer vertical dimension and a shorter horizontal dimension.

**Jamie:** Make the opening into a rectangle with a longer horizontal dimension and a shorter vertical dimension.

**Jordy:** Keep the opening in the shape of a square, but reduce both the horizontal and vertical dimensions.

1. I look through a diffraction grating at an incandescent lightbulb and see multiple rainbows. Measuring the angles, I find that the 3rd rainbow ends at 65o to the side. If the spectrum of visible light is 400-700 nm range, approximately how many lines per cm are in the diffraction?

**Tammy**: 5400 **Selah**: 7500 **Perla**: 430,000 **Posey**: 4300

Teachers corner puzzle maker

Clara/Question A

Elvis/Question B

Sarah/Question C

Molly/Question D

Paris/Question E

Samie/Question F

Carly/Question G

Alvin/Question H

Wyatt/Question I

Renee/Question J

Rowan/Question K

Emmie/Question L

River/Question M

Jamie/Question N

Posey/Question O