Physics Problem Set 2 - due Mon. April 11 by 6pm (8888527)

Question 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

1. Question Details OSColPhys1 25.3.007. [3561652]

Calculate the index of refraction for a medium in which the speed of light is 2.035×10^8 m/s. (The speed of light in vacuum is 2.998×10^8 m/s. Enter your answer to at least three decimal places.)

1.4732

Identify the most likely substance based on the table below.

---Select--- glycerine

Index of Refraction in Various Media

Medium	n
Gases at 0°C , 1 atm	
Air	1.000293
Carbon dioxide	1.00045
Hydrogen	1.000139
Oxygen	1.000271
Liquids at 20°C	
Benzene	1.501
Carbon disulfide	1.628
Carbon tetrachloride	1.461
Ethanol	1.361
Glycerine	1.473
Water, fresh	1.333
Solids at 20°C	
Diamond	2.419
Fluorite	1.434
Glass, crown	1.52
Glass, flint	1.66
Ice at 20°C	1.309
Polystyrene	1.49
Plexiglas	1.51
Quartz, crystalline	1.544
Quartz, fused	1.458
Sodium chloride	1.544
Zircon	1.923

2. Question Details OSColPhys1 25.3.011. [2153229]

Components of some computers communicate with each other through optical fibers having an index of refraction n = 1.35. What time in nanoseconds is required for a signal to travel 0.230 m through such a fiber?

[ ] 1.04 ns

3. Question Details OSColPhys1 25.P.011.WA. [2667970]

Light enters a liquid (from air) at an angle of 47° with respect to the normal and is refracted into the liquid at an angle of 26° with respect to the normal. Determine the index of refraction of the liquid.

[ ] 1.67

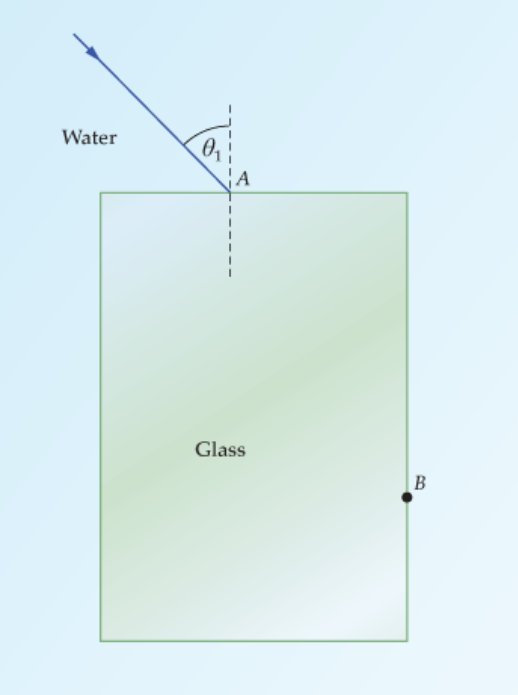
Supporting Materials

Physical Constants

4. Question Details OSColPhys1 25.P.019.WA. [2668095]

A cube made of crown glass (n = 1.52) is submerged in water (n = 1.33), as shown in the figure. If a ray of light enters the cube at point A with an angle of incidence in the water of 67.0°, determine the angle of refraction in water for this light as it travels from the glass and into water at point B.

[ ] 42.6 °



Supporting Materials

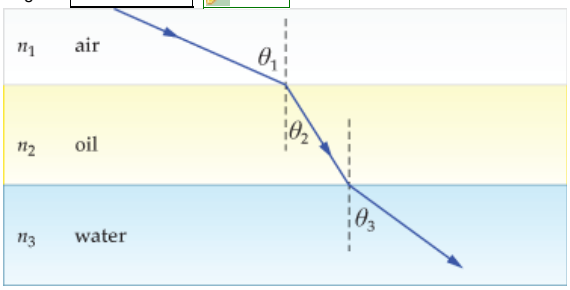
Physical Constants

5. Question Details OSColPhys1 25.P.010.Tutorial.WA. [2668035]

As shown in the figure, a light beam travels from air, through olive oil, and then into water. If the angle of refraction θ_2 for the light in the olive oil is 29.6°, determine the angle of incidence θ_1 in air and the angle of refraction θ_3 in water. The index of refraction for olive oil is 1.47.

θ_1 = [ ] 46.6 °

θ_3 = [ ] 33.1 °



Supporting Materials

Physical Constants

6. Question Details OSColPhys1 25.P.021.Tutorial.WA. [2668164]

You have a beaker with a layer of olive oil floating on top of water. A ray of light travels through the oil and is incident on the water with an angle of 70.4°. Using the index of refraction of the oil as 1.470 and the index of refraction of water as 1.333, determine the critical angle in oil for the oil-water interface.

θ_c = [ ] 65.1 °

Determine if the ray of light refracts into the water or reflects off the oil-water interface back into the oil.

- ○ refracts into the water
- ○ reflects back into the oil

Supporting Materials

Physical Constants

7. Question Details OSColPhys1 25.P.023.WA. [2668221]

You can determine the index of refraction of a substance by determining its critical angle.

(a) What is the index of refraction of a substance that has a critical angle of 49.1° when submerged in carbon tetrachloride, which has an index of refraction of 1.461?

[ ] 1.93

(b) What would the critical angle be for this substance in air?

[ ] 31.2 °

Supporting Materials

Physical Constants

8. Question Details OSColPhys1 25.P.041.WA. [2668356]

If a converging lens forms a real, inverted image 12.0 cm to the right of the lens when the object is placed 61.0 cm to the left of a lens, determine the focal length of the lens.

[ ] 10 cm

Supporting Materials

Physical Constants

9. Question Details OSColPhys1 25.P.042.WA. [2667995]

A doctor examines a mole with a 16.5 cm focal length magnifying glass held 11.7 cm from the mole.

(a) How far is the image from the lens?

[ ] 40.2 cm

Is the image real or virtual?

- ○ real
- ○ virtual

(b) What is its magnification?

[ ] 3.44

(c) How big is the image of a 5.00 mm diameter mole?

[ ] 17.2 mm

Supporting Materials

Physical Constants

10. Question Details OSColPhys1 25.P.043.WA. [2668118]

Suppose your 50.0 mm focal length camera lens is 53.5 mm away from the film in the camera.

(a) How far away is an object that is in focus?

[ ] 0.764 m

(b) What is the height of the object if its image is 1.95 cm high?

[ ] 0.279 m

Supporting Materials

Physical Constants

11. Question Details OSColPhys1 25.P.045.WA. [2667960]

(a) If the converging lens in a slide projector has a focal length of 101.00 mm and the slide is located 103 mm from the lens, determine the distance from the lens to the screen.

5.2 m

(b) Determine the dimensions of the image of the slide, if the slide measures 25.0 mm wide × 38.0 mm high.

width 1260 mm

height 1920 mm

Supporting Materials

Physical Constants

12. Question Details OSColPhys1 26.P.031.WA. [2692039]

(a) What magnification is produced by a 0.150 cm focal length microscope objective that is 0.155 cm from the object being viewed?

-30 ×

(b) What is the overall magnification if an eyepiece that produces a magnification of 8.40× is used?

-252 ×

Supporting Materials

Physical Constants

13. Question Details OSColPhys1 26.P.030.WA. [2668194]

You are looking at a lab specimen that is mounted 1.65 cm from the objective lens of your microscope. If the barrel length of the microscope is 16.0 cm and the focal length of the eyepiece is 6.55 cm, determine the focal length of the objective lens.

1.4 cm

Supporting Materials

Physical Constants

14. Question Details OSColPhys1 26.P.036.WA. [2667975]

You have a compound microscope with objective and eyepiece focal length respectively of 0.58 cm and 2.0 cm, and a lens separation of L = 13.2 cm. By interchanging these two lenses and adjusting the length of the barrel of the microscope to some new value L', you can build another microscope with the same magnification. Determine the length L' for the barrel of the new microscope.

11.8 cm

Supporting Materials

Physical Constants

15. Question Details OSColPhys1 25.P.049.WA. [2668163]

You place a photographic slide in front of a converging (convex) lens with a 2.63 cm focal length and it forms an image 13.5 cm from the slide. **note: this is distance between image and object, not image and lens**

(a) If the image is real, determine the distance from the lens to the slide. Enter the smallest value first and the largest value second. If there is only one value, enter "none" for the smallest value.

smallest value [ ] 3.58 cm

largest value [ ] 9.92 cm

(b) If the image is virtual, determine the distance from the lens to the slide. Enter the smallest value first and the largest value second. If there is only one value, enter "none" for the smallest value.

smallest value [ ] none cm

largest value [ ] 2.25 cm

Supporting Materials

Physical Constants