

Mirrors and Prisms

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Attempt: 1 / 3

Out of: 16

Started: July 10, 2003 3:17pm

Finished: July 15, 2003 6:40pm

Time spent: 123 hr,
22 min., 34 sec.

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Question 1 (1 point)

A virtual object is 78 cm from a convex mirror with a radius of curvature of 61 cm. Where is the image formed (in cm)?

Student response 22.9

Correct answer -50.1

General feedback

A convex mirror has diverging power.

A negative answer indicates a virtual image, "behind the mirror"

Score 0 / 1

Question 2 (1 point)

A lens clock (calibrated for $n = 1.52$) is placed on a mirror.

If the clock reads 13, what is the reflecting power of the surface (in D)?

Student response 4.3%

Correct answer -50.0

General feedback

The reflecting power of the mirror will be the opposite to the sign on the lens clock. Calculate the radius using the clock reading and the formula for a spherical refracting surface.

Use this radius to calculate the power of the reflecting surface.

Score 0 / 1

Question 3 (1 point)

An uncoated spectacle lens has a refractive index of 1.73. What percentage of light is reflected from each surface of the lens?

Student response 7.44%

Correct answer 7.15

General feedback

Use Fresnel's law (remembering to convert to %).

Score 1 / 1

Question 4 (1 point)

A cornea has a reflecting power of -199 D. If the refractive index of the cornea is 1.376, what is the refracting power in diopters?

Student response 72.31

Correct answer 37.4

General feedback

Calculate the radius first using the mirror formula.

Use this radius to calculate the power of the refracting surface.

Your answer should have the opposite sign to the one in the question.

Score 0 / 1

Question 5 (1 point)

An 6 mm object is -84 cm from a mirror with a radius of curvature of -11 cm. What is the height of the image (in mm)?

Note: if the object distance has no sign, assume that it is positive and virtual.

Student response 6.39

Correct answer -0.42

General feedback

Note that a minus value denotes an inverted image.

Calculate the Power of the mirror ($= -2/r$)

Calculate the object vergence ($= 1/\text{object distance}$)

Calculate the image vergence = object vergence + power

The magnification = object vergence/image vergence

Score 0 / 1

Question 6 (1 point)

An emmetrope stands 27 cm from a plano mirror. What is the accommodative demand (in D)?

Student response 1.85

Correct answer 1.9

General feedback

A virtual image is formed at the same distance behind mirror. Therefore, the real object distance for the eye is twice this value.

Score 1 / 1

Question 7 (1 point)

An emmetrope stands 23 cm from a convex mirror with a radius of curvature of 85 cm. What is the accommodative demand (in D)?

Student response 2

Correct answer 2.6

General feedback

The real object and convex mirror combine to form a virtual image.

This becomes a real object distance for the eye.

Accommodative demand = refractive error - object vergence Don't forget to factor in the distance from the mirror to the eye.

Score 0 / 1

Question 8 (1 point)

A real object is 28 cm from a concave mirror with a radius of curvature of 36 cm.

Where is the image formed (in cm)?

Student response -11

Correct answer 50.4

General feedback

A concave mirror has converging power.

A negative answer indicates a virtual image, "behind the mirror"

Score 0 / 1

Question 9 (1 point)

A prism has an apical angle of 13 degrees and a refractive index of 1.4. For an initial angle of incidence of 38 degrees, what is the total deviation in degrees?

Student response 5.2

Correct answer 6.5

General feedback

You can calculate this exactly:

1. Use Snell's law at the first surface
2. Calculate incidence at second surface ($A - r_1$)
3. Use Snell's law at the second surface
4. Calculate the deviation ($i_1 + r_2 - A$)

You can sometimes get a good estimate from the thin prism formula (try it!)

Score 0 / 1

Question 10 (1 point)

A prism has an apical angle of 21 degrees and a refractive index of 1.4. What is the minimum deviation in degrees?

Student response 8.4

Correct answer 8.6

General feedback

You should be able to obtain a really good estimate from the thin prism formula. You could use the longer approach if your answer doesn't look good.

Score 1 / 1

Question 11 (1 point)

A 17° prism base up is combined with a 15° prism base in. What is the value of the resultant prism in degrees?

Student response 22.7

Correct answer 22.7

General feedback

These prisms are 90 degrees apart so simple Pythagoras is needed. Figure out the angle too, for practice.

Score 1 / 1

Question 12 (1 point)

A 5 Δ prism is placed in front of the left eye with its base at 198 degrees (using the contraocular system).

What is the horizontal component of the prism in Δ?

If your answer is **base out**, put a **negative** sign in front of your answer.

If your answer is **base in**, put a **positive** sign in front of your answer.

Student response 4.76

Correct answer 4.8

General feedback

Remember that zero degrees is the left ear!

Draw a good diagram and all you need to do is hit the correct function (sine or cosine) on your NBEO-approved calculator.

Tip: Punch in the axis and use cosine to find the horizontal component and sine to find the vertical component.

Score 1 / 1

Question 13 (1 point)

A patient requires the following prescription in front of her left eye:

-4.00 -6.00 x 180 with 19 base out

How much must the lens be decentered in cm (out = positive, in = negative)?

Student response -4.75

Correct answer -4.75

General feedback

Did you incorporate the cylinder?

Did you draw a power cross?

Score 1 / 1

Question 14 (1 point)

A patient looks 7 mm below the optical center of the following lens:

+1.00 x 2

What is the total prismatic effect (no sign necessary)?.

Student response .7

Correct answer 0.70

General feedback

Draw a power cross

Draw a line to indicate the direction of gaze

Now you have to figure out which angle to use and whether to use sine or cosine

Either the answer is lower than it would be for a sphere

Score 1 / 1

Question 15 (1 point)

A thin prism has an apical angle of 10 degrees and a refractive index of 1.5. What is the deviation in degrees?

Student response 5

Correct answer 5.0

General feedback

Thin prism formula: $d = (n-1)A$

Score 1 / 1

Question 16 (1 point)

A prism has an apical angle of 25 degrees and a refractive index of 1.8. What is the critical angle?

Student response 53.13

Correct answer 33.6

General feedback

$$= \arcsin(1/n)$$

A nastier version of this question would be for neither index to be 1:

$$= \arcsin(n_1/n_2)$$

Score 0 / 1

Total score 8 / 16 = 50.0%
