Short Answer

16.1 Reflection   30.

Distinguish between reflection and refraction in terms of how a light ray changes when it meets the interface between two media.

a. Reflected light penetrates the surface whereas refracted light is *bent* as it travels from one medium to the other.
b. Reflected light penetrates the surface whereas refracted light travels along a curved path.
c. Reflected light *bounces* from the surface whereas refracted light travels along a curved path.
d. Reflected light *bounces* from the surface whereas refracted light is *bent* as it travels from one medium to the other.

31.

Sometimes light may be both reflected and refracted as it meets the surface of a different medium. Identify a material with a surface that when light travels through the air it is both reflected and refracted. Explain how this is possible.

a. Light passing through air is partially reflected and refracted when it meets a glass surface. It is reflected because glass has a smooth surface; it is refracted while passing into the transparent glass.
b. Light passing through air is partially reflected and refracted when it meets a glass surface. It is reflected because glass has a rough surface, and it is refracted while passing into the opaque glass.
c. Light passing through air is partially reflected and refracted when it meets a glass surface. It is reflected because glass has a smooth surface; it is refracted while passing into the opaque glass.
d. Light passing through air is partially reflected and refracted when it meets a glass surface. It is reflected because glass has a rough surface; it is refracted while passing into the transparent glass.

32.

A concave mirror has a focal length of 5.00 cm. What is the image distance of an object placed 7.00 cm from the center of the mirror?

a. −17.5 cm
b. −2.92 cm
c. 2.92 cm
d. 17.5 cm

33.

An 8.0 -cm tall object is placed 6.0 cm from a concave mirror with a magnification of –2.0. What are the image height and the image distance?

a. $h_i = -16$ cm, $d_i = -12$ cm

b. $h_i = -16$ cm, $d_i = 12$ cm
c. $h_i = 16$ cm, $d_i = -12$ cm
d. $h_i = 16$ cm, $d_i = 12$ cm

16.2 Refraction   34.

At what minimum angle does total internal reflection of light occur if it travels from water (n = 1.33) toward ice (n = 1.31)?

a. 44.6°
b. 26.5°
c. 13.3°
d. 80.1°

35.

Water floats on a liquid called *carbon tetrachloride*. The two liquids do not mix. A light ray passing from water into carbon tetrachloride has an incident angle of 45.0° and an angle of refraction of 40.1°. If the index of refraction of water is 1.33, what is the index of refraction of carbon tetrachloride?

a. 1.60
b. 1.49
c. 1.21
d. 1.46

36.

Describe what happens to a light ray when it is refracted. Include in your explanation comparison of angles, comparison of refractive indices, and the term *normal.*

a. When a ray of light goes from one medium to another medium with a different refractive index, the ray changes its path as a result of interference. The angle between the ray and the normal (the line perpendicular to the surfaces of the two media) is greater in the medium with the greater refractive index.
b. When a ray of light goes from one medium to another medium with a different refractive index, the ray changes its path as a result of refraction. The angle between the ray and the normal (the line perpendicular to the surfaces of the two media) is less in the medium with the greater refractive index.
c. When a ray of light goes from one medium to another medium with a different refractive index, the ray does not change its path. The angle between the ray and the normal (the line parallel to the surfaces of the two media) is the same in both media.
d. When a ray of light goes from one medium to another medium with a different refractive index, the ray changes its path as a result of refraction. The angle between the ray and the normal (the line perpendicular to the

surfaces of the two media) is less in the medium with the lower refractive index.

16.3 Lenses 37.

What are two equivalent terms for a lens that always causes light rays to bend away from the principal axis?

- a. a diverging lens or a convex lens
- b. a diverging lens or a concave lens
- c. a converging lens or a concave lens
- d. a converging lens or a convex lens

38.

Define the term *virtual image.*

- a. A virtual image is an image that cannot be projected onto a screen.
- b. A virtual image is an image that can be projected onto a screen.
- c. A virtual image is an image that is formed on the opposite side of the lens from where the object is placed.
- d. A virtual image is an image that is always bigger than the object.

39.

Compare nearsightedness (myopia) and farsightedness (hyperopia) in terms of focal point.

- a. The eyes of a nearsighted person have focal points beyond the retina. A farsighted person has eyes with focal points between the lens and the retina.
- b. A nearsighted person has eyes with focal points between the lens and the retina. A farsighted person has eyes with focal points beyond the retina.
- c. A nearsighted person has eyes with focal points between the lens and the choroid. A farsighted person has eyes with focal points beyond the choroid.
- d. A nearsighted person has eyes with focal points between the lens and the retina. A farsighted person has eyes with focal points on the retina.

40.

Explain how a converging lens corrects farsightedness.

- a. A converging lens disperses the rays so they focus on the retina.
- b. A converging lens bends the rays closer together so they do not focus on the retina.
- c. A converging lens bends the rays closer together so they focus on the retina.
- d. A converging lens disperses the rays so they do not focus on the retina.

41.

Solve the equation $\frac{1}{d_\text{o}} + \frac{1}{d_\text{i}} = \frac{1}{f}$ for f in such a way that it is not expressed as a reciprocal.

   a. $f = \frac{d_\text{o} + d_\text{i}}{d_\text{o} \, d_\text{i}}$
   b. $f = \frac{d_\text{o} \, d_\text{i}}{d_\text{i} + d_\text{o}}$
   c. $f = \left(d_\text{i} + d_\text{o} \right)$
   d. $\text{f} = \text{d}_\text{o} \, \text{d}_\text{i}$

42.

What is the magnification of a lens if it produces a 12-cm-high image of a 4 -cm -high object? The image is virtual and erect.

   a. -3.00
   b. $-\frac{1}{3.00}$
   c. $\frac{1}{3.00}$
   d. 3.00