Geometric Optics Practice Items

1. When an object is placed before a plane mirror the image created is

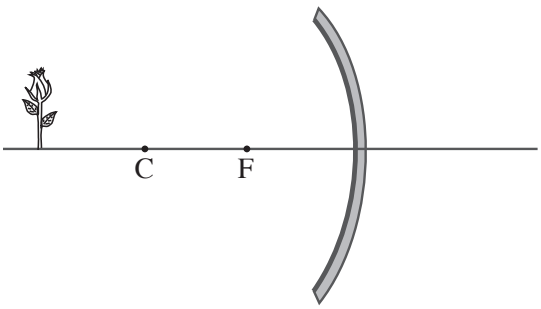
A. inverted, real, diminished
B. upright, real, the same size
C. inverted, virtual, the same size
D. upright, virtual, the same size

2. Which of these in a single lens or mirror system could produce a virtual image with a magnification of 0.7?

A. convex mirror
B. concave mirror
C. converging lens
D. convex lens

3. A flower is placed before a concave mirror as shown in the figure below. The image produced by the mirror is

A. virtual, upright, diminished
B. real, upright, enlarged
C. real, inverted, diminished
D. virtual, inverted, enlarged

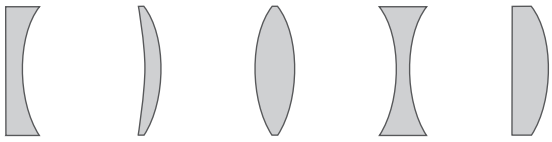


4. An object is placed at the center of the curvature, C, in front of a concave mirror with focal length, F. The image is located

A. the distance I = C
B. the distance I < F
C. the distance I = F
D. no image is formed

5. Which of the lenses shown in the figure above are converging lenses?

A. **I** and **IV**
B. **II**, **III** and **V**
C. **I** only
D. **III** and **V**



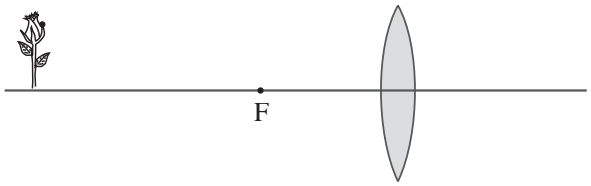
I **II** **III** **IV** **V**

6. Referring to the same figure above as in the preceding question, which of the lenses are diverging lenses?

A. **I** and **IV**
B. **II**, **III** and **V**
C. **I** only
D. **III** and **V**

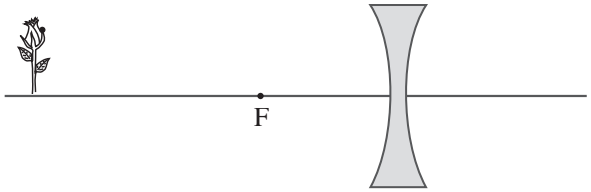
7. A flower is placed before a converging lens as shown in the figure below. The image produced by the lens is

A. virtual, upright, diminished
B. real, upright, enlarged
C. real, inverted, diminished
D. virtual, inverted, enlarged



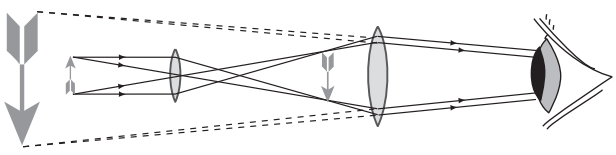
8. A flower is placed before a diverging lens as shown in the figure below. The image produced by the lens is

A. virtual, upright, diminished
B. real, upright, enlarged
C. real, inverted, diminished
D. virtual, inverted, enlarged



9. What type of optical instrument is represented by the ray diagram below?

A. compound microscope
B. simple magnifier
C. astronomical telescope
D. slide projector



10. A converging lens has a focal length of F. An object is placed at distance F from the lens on the axis. The image formed is

A. F distance from the lens.
B. 2F distance from the lens.
C. between F and 2F distance from the lens.
D. at infinity.

11. An object is placed at a distance of 8 cm from a 25 diopter positive lens. The magnification of the image is

A. –0.32
B. –1.0
C. +32
D. +200

12. Examining the scene in the conservatory, the detective holds the magnifying glass 20cm over the candlestick, magnifying a fingerprint 5×. What is the focal length of the magnifier?

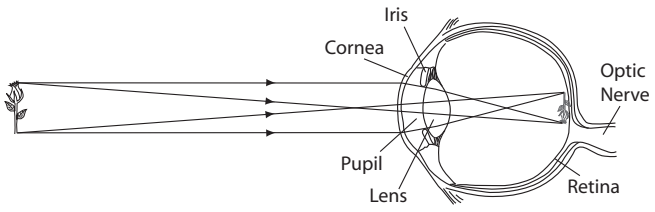
A. 4 cm
B. 10 cm
C. 25 cm
D. 100 cm

13. Chromatic aberration is a common problem with

A. convex mirrors.
B. lenses made with homogeneous glass.
C. lenses made with layers of salt glass and crown glass.
D. concave mirrors.

The following passage pertains to questions # - #.

The total optical power of the relaxed human eye is approximately 60 diopters. The cornea accounts for approximately two thirds of this refractive power and the crystalline lens contributes the remaining third. In focusing, the ciliary muscle contracts to reduce the tension or stress transferred to the lens by the suspensory ligaments. This results in increased convexity of the lens which in turn increases the optical power of the eye. As humans age, the amplitude of accommodation reduces from approximately 15 to 20 diopters in the very young, to about 10 diopters at age 25, to around 1 diopter at 50 and over.



The fact that optical powers are approximately additive enables an optometrist to prescribe corrective lenses as a simple correction to the eye's optical power, rather than doing a detailed analysis of the entire optical system (the eye and the lens).

However, the design of a proper optical treatment may be complicated if the patient suffers from astigmatism. Astigmatism is an optical defect in which vision is blurred due to the inability of the optics of the eye to focus a point object into a sharp focused image on the retina. This may be due to an irregular or toric curvature of the cornea or lens. The two types of astigmatism are regular and irregular. Irregular astigmatism is often caused by a corneal scar or scattering in the crystalline lens, and cannot be corrected by standard spectacle lenses, but can be corrected by contact lenses. The more common regular astigmatism arising from either the cornea or crystalline lens can be corrected by eyeglasses or toric lenses. A 'toric' surface resembles a section of the surface of a football where there are two regular radii, one smaller than the other one. This optical shape gives rise to astigmatism in the eye.

The refractive error of the astigmatic eye stems from a difference in degree of curvature refraction of the two different meridians (i.e., the eye has different focal points in different planes). For example, the image may be clearly focused on the retina in the horizontal plane, but not in the vertical plane. Astigmatism causes difficulties in seeing fine detail resulting in blurred vision. Three options exist for the treatment of astigmatism: spectacles, contact lenses (either hard contact lenses or toric contact lenses), and refractive surgery.

14. According to the information in the passage which of the following represents an approximate value of the focal length of the relaxed human eye?

A. 6 mm
B. 15 mm
C. 24 mm
D. 30 mm

15. Hyperopia, also known as farsightedness, is often caused by

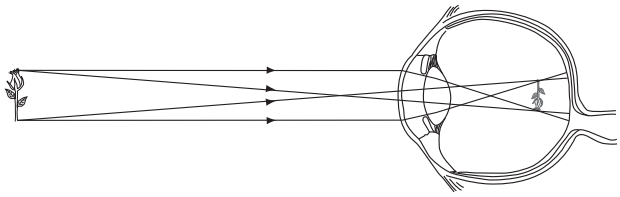
A. a cornea that is too rounded.
B. edematous swelling of the lens.
C. excessive contraction of the ciliary body.
D. an eye that is too short.

16. Ciliary muscle contraction

A. decreases the refractive power of the lens.
B. permits the eye to focus on more distant objects.
C. increases the radius of curvature of the lens.
D. allows the lens to obtain a more rounded shape.

17. The figure below shows an eye that suffers from the condition of

A. presbyopia
B. myopia
C. hyperopia
D. astigmatism



18. If a person with normal vision looked through a pair of glasses designed to correct astigmatism where the curvature of the horizontal meridian of the eye is too great (like a football lying on its side), they would see

A. aio

B. aio

C. aio

D. aio

19. Typical glasses for mild myopia will have a power of

A. –1.0 to –3.0 diopters
B. 1.0 to 5.0 diopters
C. 10 to 20 diopters
D. 20 to 60 diopters