


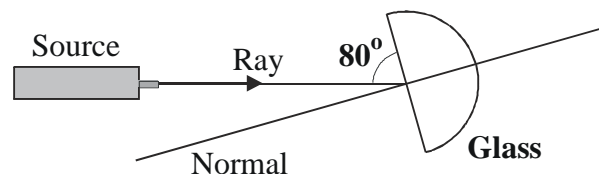
<b>PHYSICS 534</b>	 Ernest Walton was awarded the 1951 prize for physics for his pioneer work on the transmutation of atomic nuclei.
<b>EXERCISE-55</b>	<b>Optics Review</b>

1. A *translucent* material:
  - a) absorbs the light rays it receives
  - b) converges the incident light rays to a point
  - c) reflects the light rays it receives
  - d) transmits the light rays straight through
  - e) transmits the light rays, but scatters them
  
2. A virtual image can *never* be:
  - a) located by correcting for parallax
  - b) smaller than the object
  - c) larger than the object
  - d) upright if the object is upright
  - e) captured on a paper screen
  
3. Marco and David are each 1.5 m tall. David stands 3.0 m from a vertical plane mirror. Marco stands slightly to one side of David and 6.0 m from the mirror. The size of David's image compared to Marco's image is:
  - a) the same size
  - b) one-quarter as great
  - c) half as great
  - d) twice as great
  - e) four times as great
  
4. A light ray traveling parallel and to one side of the principal axis of a converging spherical mirror hits the mirror. It will be:
  - a) reflected through the vertex V
  - b) reflected through the center of curvature C
  - c) reflected along the principal axis
  - d) reflected through the principal focus F
  - e) reflected directly back along its original path



5. Rays of light directed towards the principal focus of a *convex* spherical mirror will, after reflection:
- pass through the principal focus, F
  - travel through the vertex, V
  - travel through the center of curvature, C
  - d) travel parallel to the principal axis
  - come to a focus at the principal focus, F
6. Which of the following statements is *true* for the speed of light?  
The speed of light is:
- least in a vacuum
  - the same in all media
  - c) slightly less in air than in a vacuum
  - slightly more in air than in a vacuum
  - exactly the same in air as in a vacuum
7. If the ratio of the speed of light in air to that in a transparent medium is  $3/2$ , then the index of refraction of the material is:
- a)  $3/2$     b)  $2/3$     c)  $9/4$     d)  $\sin 3 / \sin 2$     e)  $\sin 2 / \sin 3$

8. A ray box and a semi-circular glass slab are placed on a piece of paper as illustrated on the right. The ray strikes the glass at an angle of  $80^\circ$  to the surface of the slab.

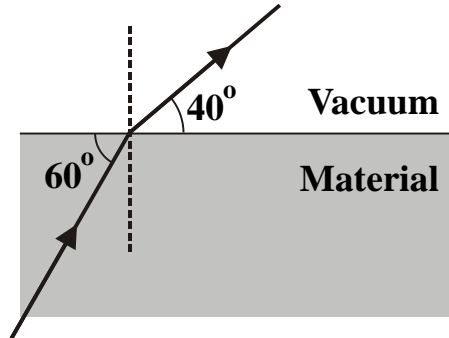


Which one of the following statements is *true*?

- a) The incident ray is refracted toward the normal and slows down.
- b) The incident ray is refracted away from the normal and slows down.
- c) The incident ray is refracted away from the normal and speeds up.
- d) The incident ray is totally reflected from the surface of the slab with no permanent change in speed.
- e) No reflection, refraction, or change in speed of the incident ray occurs due to the small angle of incidence.

9. The critical angle for water is  $49^\circ$ . Total internal reflection occurs when light is incident on the:
- air to water boundary at an angle of incidence equal to  $49^\circ$ .
  - air to water boundary at an angle of incidence greater than  $49^\circ$ .
  - water to air boundary at an angle of incidence equal to  $49^\circ$ .
  - water to air boundary at an angle of incidence less than  $49^\circ$ .
  - e) water to air boundary at an angle of incidence greater than  $49^\circ$ .

10. A ray of light travels from a material medium to a vacuum as shown on the right. The angle of refraction for the light ray is:

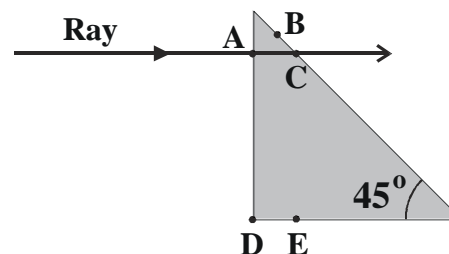


- $30^\circ$
- $40^\circ$
- $50^\circ$
- $60^\circ$
- $90^\circ$

11. A ray of light traveling in a medium with an index of refraction  $n_1$  is incident on the boundary with a medium of index of refraction  $n_2$ . If  $n_1 > n_2$ , what is the correct expression for finding the sine of the critical angle?

- $n_2 \sin i^\circ / n_1$
- $n_2 \sin 90^\circ / n_1$
- $n_2 \times n_1 \sin 90^\circ$
- $n_1 \sin i^\circ / n_2$
- $n_1 \sin 90^\circ / n_2$

12. An incident ray meets a glass prism as shown in the diagram on the right. At what point will the ray emerge from the prism?



- A
- B
- C
- D
- E

13. An object is placed 30 cm in front of a converging lens. If the focal length of the lens is 20 cm, the image position will be:
- a) 8 cm from the lens
  - b) 10 cm from the lens
  - c) 20 cm from the lens
  - d) 40 cm from the lens
  - e) 60 cm from the lens
14. A lens with a focal length of 20 cm is placed between an object and a screen that are 80 cm apart. How far from the screen should the lens be placed to produce a real image on the screen?
- a) 50 cm
  - b) 40 cm
  - c) 30 cm
  - d) 25 cm
  - e) 20 cm
15. The index of refraction of light in zircon is 1.92. If the speed of light in a vacuum is  $3.0 \times 10^8$  m/s, the speed of light in zircon is:
- a)  $5.76 \times 10^8$  m/s
  - b)  $3.00 \times 10^8$  m/s
  - c)  $1.92 \times 10^8$  m/s
  - d)  $1.56 \times 10^8$  m/s
  - e)  $1.08 \times 10^8$  m/s
16. A pencil 10 cm long is placed 30 cm in front of a mirror of focal length +50 cm. The image is:
- a) 2.5 cm long and upright
  - b) 25 cm and upright
  - c) 250 cm long and upright
  - d) 25 cm long and inverted
  - e) 2.5 cm long and inverted

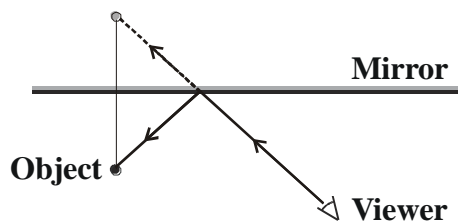
17. An object is located 12 cm from a *converging* lens of focal length 10 cm. The image distance is:

- a) +5.45 cm
- b) -5.45 cm
- c) +60 cm
- d) -60 cm
- e) -40 cm




18. A *negative* magnification signifies an image that is:

- a) smaller than the object
- b) larger than the object
- c) upright
- d) inverted
- e) none of these

19. The diagram on the right illustrates a point object in front of a plane mirror. Find, geometrically, the location on the mirror where the beam of light from the object is reflected to the viewer's eye.



20. Which of the following lenses can be used to correct *myopia*?

- a) 
- b) 
- c) 
- d) 