- Light rays refract, which means that they change direction in a predictable way when they pass through transparent materials that differ in density.

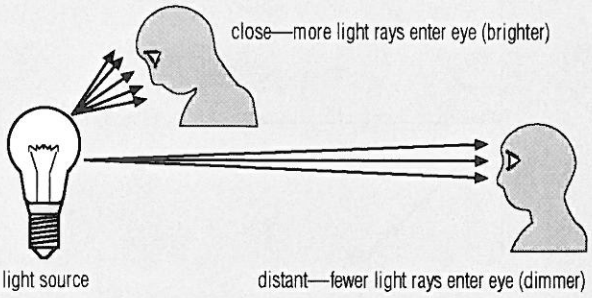
2. Convex Mirrors
   - A convex mirror is a mirror that curves outwards.
   - Parallel light rays that strike a convex mirror diverge, which means the rays spread out and do not meet.
   - Reflected images appear smaller than they are.
   - Security mirrors and side-view mirrors on cars are convex because they make it possible to see a larger area than a flat mirror of the same size.
3. Concave Mirrors
   - A concave mirror is a mirror that curves inwards.
   - Parallel light rays that strike a concave mirror converge, which means that they meet at one point, called the focal point, and then spread out again.
   - An image never forms exactly at the focal point.
   - Objects located beyond the focal point form an image that is inverted and is produced in front of the mirror.
   - Objects located between the focal point and the mirror form an image that is larger than the object and appears to be behind the mirror.
4. Convex Lenses
   - Convex lenses are lenses that are thicker in the middle than at the edge.
   - When parallel light rays pass through a convex lens, they converge, which means they come together at a point called the focal point.
   - Depending on the distance of the object from the lens, the image may be larger or smaller than the object and either upright or inverted.
   - A distant object (more than two focal lengths away from the mirror) forms an image on the other side of the lens that is smaller than the object and is also inverted.
5. Concave Lenses
   - Concave lenses are thinner in the middle than at the edge.
   - The rays are refracted outward and never meet at a point.

CHAPTER REVIEW ANSWERS

Checking Concepts

1. The law of reflection states that the angle of the incident ray equals the angle of the reflected ray.

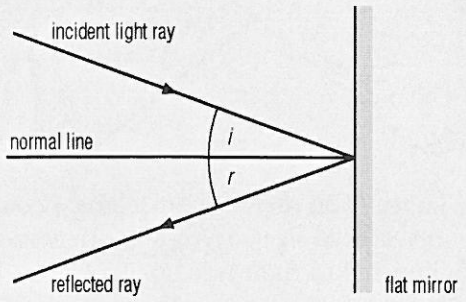
2.



3. In reflection the incident light rays reverse direction and stay on the same side of the material as the incident ray. In refraction, the light rays pass through the material.
4. An opaque object does not transmit any light, while a translucent object permits light to pass through, but scatters the light rays.
5. As light passes from air into water, which is denser than air, the light bends towards the normal.
6. (a) Three basic mirror shapes are flat or plane, convex, and concave.
   (b) Concave mirrors cause light rays to converge.
7. The light rays reflecting off a convex mirror are diverging, which means that they seem to be coming from an object placed behind the mirror that is smaller than the real object.

Understanding Key Ideas

8.



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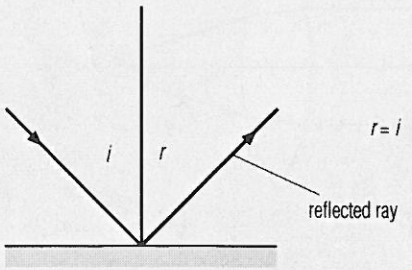
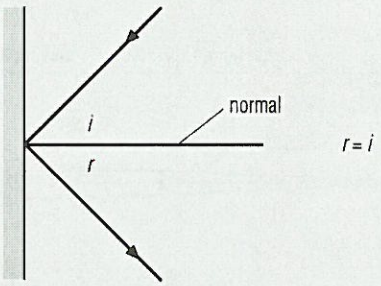
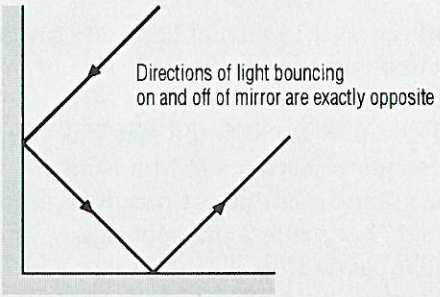
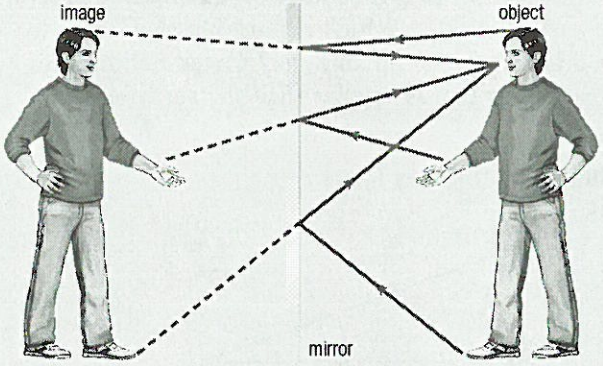


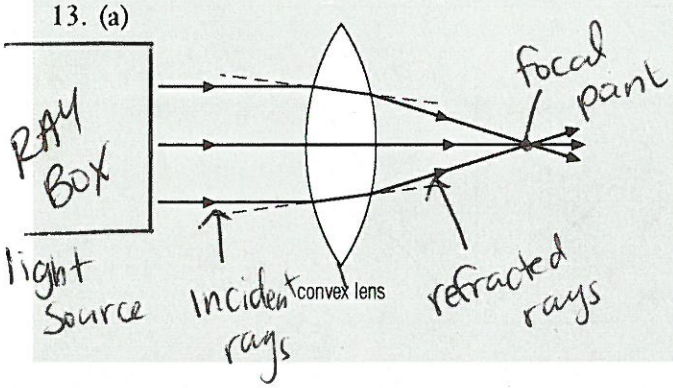


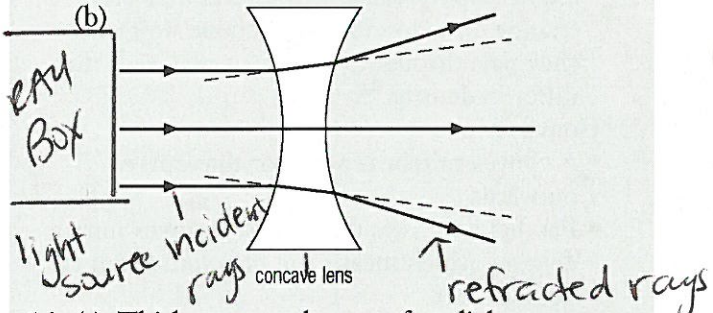


10. (a) A light ray is bent toward the normal as it goes from air into water.
    (b) A light ray is bent away from the normal as it goes from glass into air.
11. Sample diagram:

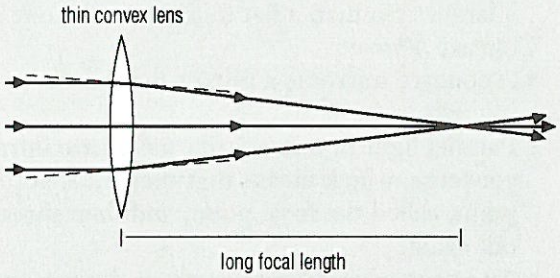


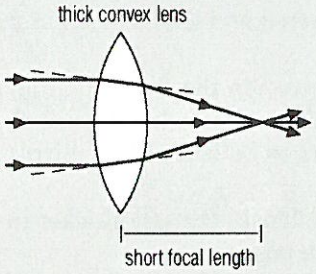
12. The image of an object approaching a convex lens increases in size and flips in orientation from inverted to right side up.
13. (a)





14. (a) Thicker convex lenses refract light to a greater degree than do thinner convex lenses.
    (b)





15.