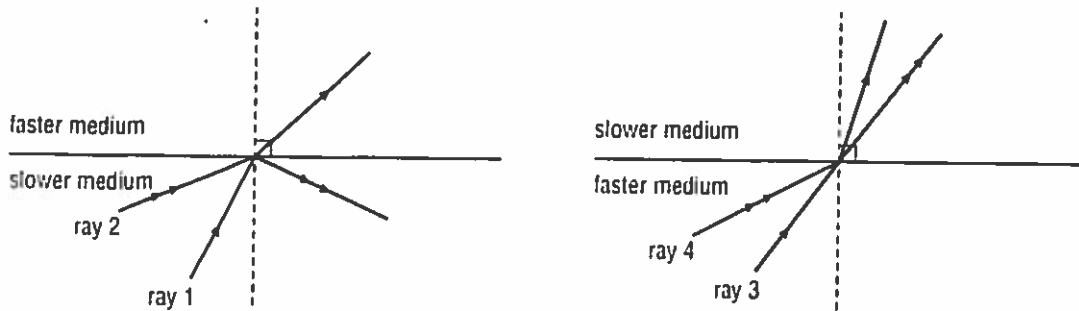


✓ CHECK YOUR LEARNING

Suggested Answers

1. The speed of light in the medium containing the incident light ray must be slower than in the second medium. The angle of incidence must exceed the critical angle.
2. Light has to travel more slowly in the first medium because as it speeds up, it bends away from the normal (ray 1). If it bends far enough away from the normal, total internal reflection occurs (ray 2). If light were to travel more slowly in the second medium, it would bend toward the normal (rays 3 and 4), which is in the direction opposite to what would allow total internal reflection.



3. (a) no (c) yes
(b) yes (d) no
4. Prisms transmit more light than mirrors, and, unlike mirrors, their reflective coatings do not deteriorate over time.
5. A smaller critical angle results in more total internal reflection because any angle of incidence that exceeds the critical angle produces total internal reflection.
6. Sample answer: Flexible posts with retro-reflectors on them could be placed along the edges of the road to outline curves. Retro-reflectors could also be laid on the centre line of the road to show traffic lanes.
7. Sample answers: Diamonds are cut so that much of the light that enters the sides undergoes total internal reflection and exits at the top, making the diamond sparkle. Optical fibre cables use total internal reflection to carry communications encoded in light rays. Triangular prisms use total internal reflection to redirect light in periscopes and binoculars.
8. Total internal reflection would be possible in (b) and (c)—in both (b) and (c) the refracted ray bends away from the normal; diagram (c) is actually just diagram (b) rotated by 90° .
9. Total internal reflection is only possible in examples (b) and (c) since these are the only diagrams in which the refracted ray bends away from the normal. If the angles of incidence were increased, then total internal reflection would occur in medium B in diagram (b), and in medium A in diagram (c).