

TIR – Exercise

1. Explain the term critical angle.
2. How is the critical angle related to the refractive index of a medium?
3. State the approximate value of the critical angle for glass - air surface.
4. What is the approximate critical angle for the water-air surface?
5. What is meant by the statement 'the critical angle of diamond is 24° '?
6. A light ray is incident from a denser medium on the boundary separating it from a rarer medium at an angle of incidence equal to the critical angle. What is the angle of refraction for the ray?
7. Name two factors which affect the critical angle for a given pair of media. State how these factors affect it.
8. The critical angle for glass –air is 45° for the light of yellow colour. State whether it will be less than, equal to, or more than 45° for (i) red light (ii) blue light?
9. Define the terms critical angle and total internal reflection.
10. State two conditions necessary for total internal reflection to occur.
11. Draw diagrams to illustrate critical angle and total internal reflection.
12. What is a total reflecting prism? State three actions that it can produce. Draw a diagram to show one action of the total reflecting prism.
13. Show with the help of a diagram how a total reflecting prism can be used to turn a ray of light through 90° . Name one instrument in which such a prism is used.
14. What device other than a plane mirror, can be used to turn a ray of light through 180° ? Draw a diagram in support of your answer. Name an instrument in which this device is used.
15. Mention one difference between reflection of light from a plane mirror and total internal reflection of light from a prism.
16. State one advantage of using a total reflecting prism as a reflector in place of a plane mirror.
17. Draw a neat labelled ray diagram to show the total internal reflection of a ray of light normally incident on one face of a 30° , 90° , 60° prism.
18. What is mirage in a desert? Name the phenomenon for its cause.
19. The surface of an empty test tube kept in a beaker of water shines like a mirror. Name the phenomenon responsible for it.
20. The refractive index of air with respect to glass is expressed as ${}_g\mu_a = \sin i / \sin r$.
 - (a) Write down a similar expression for ${}_a\mu_g$ in terms of the angles i and r .
 - (b) If angle $r = 90^\circ$, what is the corresponding angle i called?
 - (c) What is the physical significance of the angle i in part (b)?

