Answer on Question 52754, Physics, Optics

Question:

The critical angle for total internal reflection at an air-water interface is approximately 48°. In which of the following situations will total internal reflection occur?

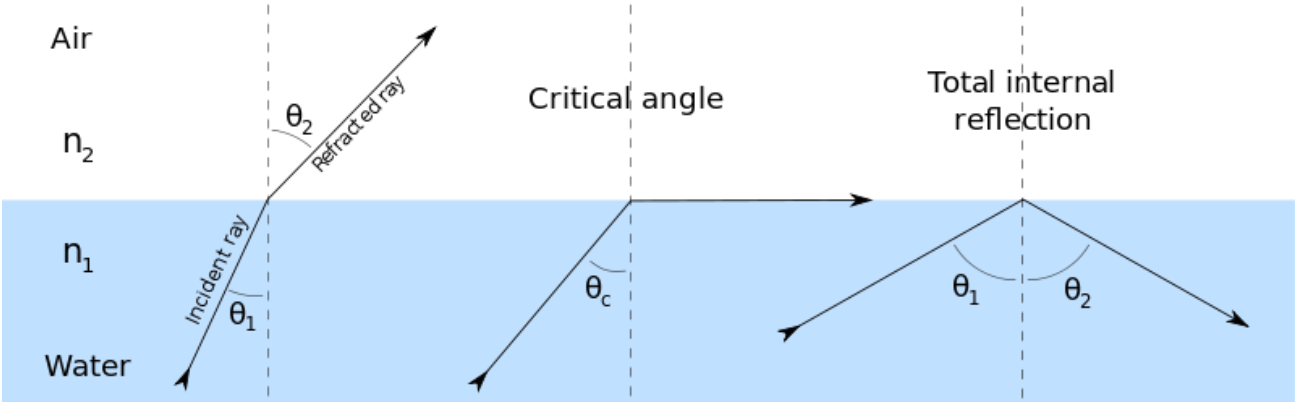
a) light incident in water at 40°

b) light incident in water at 55°

c) light incident in air at 40°

d) light incident in air at 55°

Solution:



The total internal reflection occurs when light attempts to move from a denser medium to a rarer medium (for example, from water with $n_1 = 1.33$ to air with $n_2 = 1.0$). As we can see in the picture, if we keep on increasing the angle of incidence, there comes an angle of incidence where the ray does not enter the second medium, but grazes its surface (thus, the angle of refraction is 90°). The angle of incidence for which the angle of refraction is 90° is called the critical angle θ_c. Beyond the critical angle (i.e. when $\theta_1 > \theta_c$), the ray of light will get reflected back in the same medium. Thus, in order to occur the total internal reflection we need b) light incident in water at 55°.

Answer:

b) light incident in water at 55°.