# Refraction and Total Internal Reflection Worksheet

1. Light travels (fastest, slowest) in media with a less optical density.

2. Light travels   (fastest, slowest) in media with a lower index
    of refraction value.

3. When light passes into a medium in which it travels slower, the light will refract (away from,
    toward) the normal.

4. When light passes into a medium that is less optically dense, the light will refract (away from,
    toward) the normal.

5. A ray of light is shown passing through three consecutive *layered* materials. Observe the
    direction of bending at each boundary and rank the three materials (A, B and C) in order of
    increasing index of refraction.
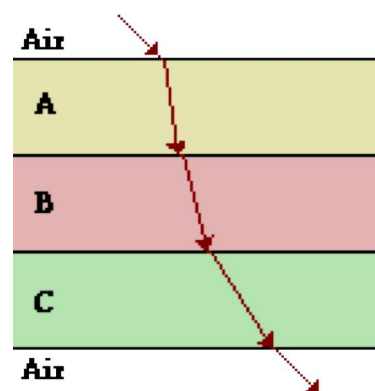
6. An incident ray in air (n=1.0) is approaching the boundary with an unknown material at an
    angle of incidence of 65.6°. The angle of refraction is 41.4°. Determine the index of refraction
    of the unknown material.

7. What is the speed of light in a material with an index of refraction of 1.75?

8. What will the wavelength of a blue ray of light (λ = 450 nm) be when it leaves air and goes into
    water which has an index of refraction of 1.33?

9. Light will undergo total internal reflection only when it is _____. Choose two.

    a.   in the more dense medium traveling towards the less dense medium
    b.   in the less dense medium traveling towards the more dense medium
    c.   in the medium where it travels slowest, moving towards the medium where it travels fastest
    d.   in the medium where it travels fastest, moving towards the medium where it travels slowest

10. Total internal reflection is most likely to occur when _____.

    a.   the angles of incidence are smaller (e.g., close to 0 degrees)
    b.   the angles of incidence are greatest (e.g., close to 90 degrees)

11. Calculate the critical angle for the boundary between glass (n = 1.50) and water (n = 1.33).