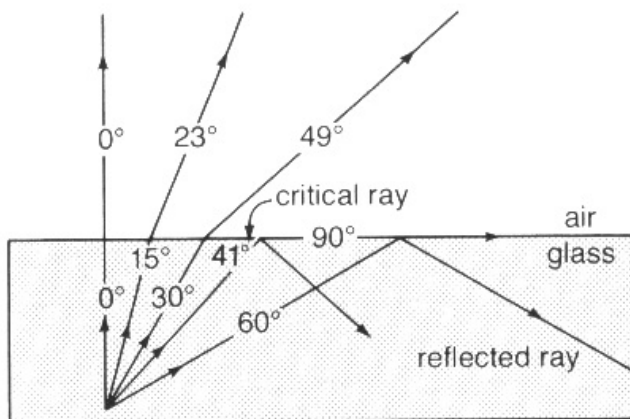
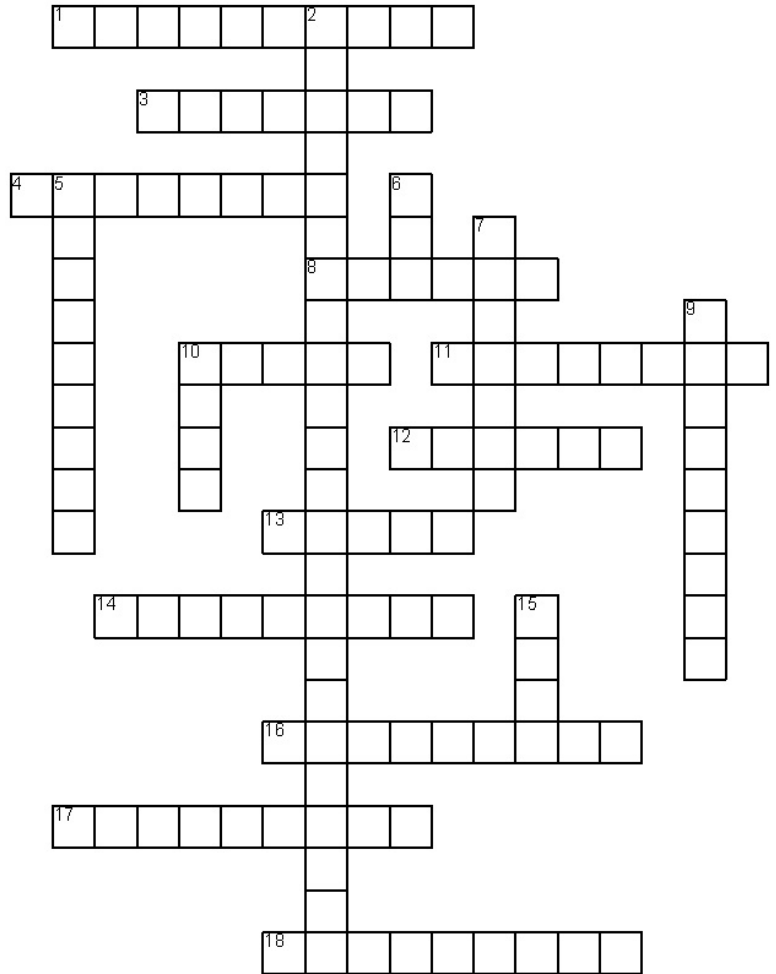


**Question:**

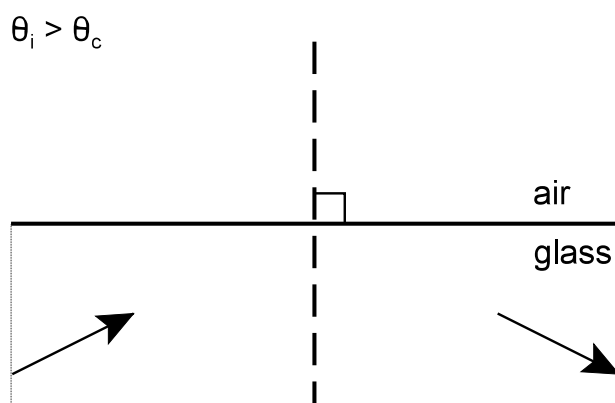
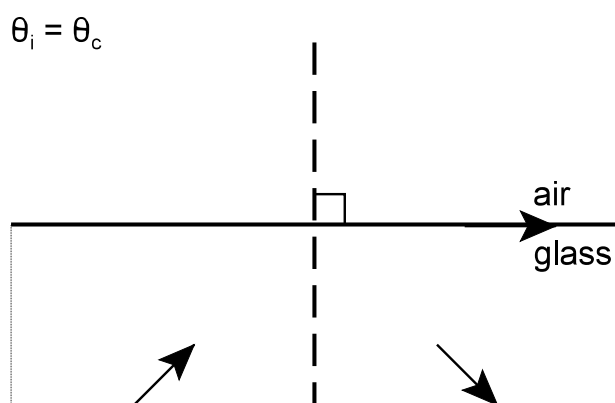
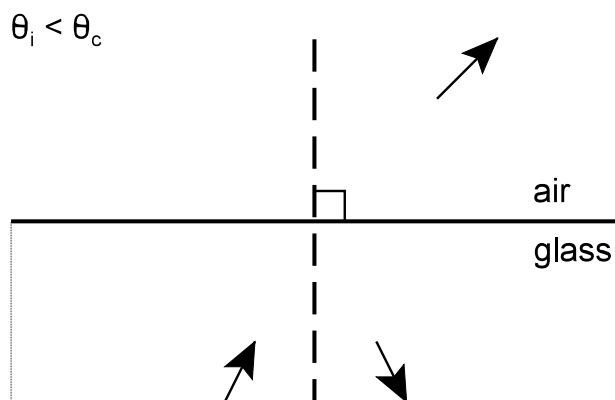
What happens when light travels from a slower medium, like glass, into a faster medium, like air?

**Instructions:**

1. Read P.442 & 443
2. Complete each statement below by using the list of words and crossword puzzle clues given (the numbers indicate the puzzle position, the letters indicate "across" or "down").
  - air
  - fast
  - greater
  - increases
  - partial
  - refracted (X2)
  - slow
  - stronger
  - total internal reflection
  - critical
  - glass
  - incidence
  - normal
  - reflected (X2)
  - refraction
  - speed
  - weaker
3. Complete each diagram (the rays have been started for you). Be sure to label the light rays and angles - incident, reflected, refracted, ...
4. Answer the analysis questions.



As you learned in WS#4 when light travels from one medium to another in which its (10a) changes, some of the light is (17a) and some is (16a). This property of light was referred to as (7d) reflection /refraction.



So, when a light ray travels from a slower medium to a faster medium (ie from (13a) to (6d)), the light ray speeds up and bends away from the (8a). As a result, the angle of (1a) (R) is greater than the angle of (14a) (i).

As the angle of incidence (18a), so too does the angle of refraction, eventually reaching a maximum angle of  $90^\circ$ . The angle of incidence that produces an angle of refraction of  $90^\circ$  is called the (4a) angle.

**Note:**

We also notice that as the angle of incidence increases, the intensity of the reflected ray becomes (11a) while the intensity of the refracted ray becomes (12a).

When the angle of incidence is greater than the critical angle, the light ray is no longer (9d). Instead, all the incident light is (5d) at the boundary, back into the slower medium (ie the glass). This is called (2d) (TIR). It can only occur when:

- ① the light rays travel from a (10d) medium into a (15d) medium
- ② the angle of incidence is (3a) than the critical angle.

**Analysis**

1. Explain why total internal reflection is only possible for light travelling from water into air, and not for light travelling from air into water. You may want to use a diagram in your answer.
2. Read "A Wall of Water?" / P.497 and then answer the following:
  - (a) What is a "superior" mirage? How is it formed? What is an "inferior" mirage? How are they different?
  - (b) What were the Vikings writing about when they described "sea fences higher than lofty mountains"?