Make the coin disappeared

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Illustrative Experiment Based on the concept : Total Internal Reflection (Secondary Level)

1. Title of the experiment : Make the coin disappeared
2. Objective : To study total internal reflection of light.
3. Material Required : A transparent glass bottle with a lid, coin and water
4. Concepts covered through the experiment : i. Denser and rarer medium
   ii. Total internal reflection
5. Time required to show the experiment in the classroom : 3 to 5 minutes. Teacher can show this experiment easily by going at students' place.
6. Procedure :

   (A) Place a coin on the table. Keep transparent glass bottle on it. Close the bottle with its lid.
   (B) Ask students to see the coin.
   (C) Now open the lid of bottle and fill the bottle with water. Close the lid.
   (D) Ask students to locate the coin which is still placed below the bottle.
7. Photograph :

Coin kept below the bottle Coin disappeared

8. Observation : When the coin is kept below bottle, it can be seen as the glass bottle is transparent. However, when the bottle is filled with water, even if the glass bottle and water both are transparent, coin kept below the bottle cannot be seen.
9. Theory : When rays of light get reflected from any object and enter in our eyes, image of that object is formed on the retina and we can perceive that object.
   Total internal reflection of light is also an important property of light like that of reflection. Total internal reflection occurs at the interface of two transparent media of different densities.
   When light goes from a denser medium to a rarer medium, and the angle of incidence is larger than a critical value, called critical angle, then entire light gets internally reflected at the surface. (In particular, if we consider air and glass as two transparent media then critical angle for these media for total internal reflection to take place is 48.5^{o}).
   If the angle of incidence is smaller than the critical angle, part of the light is reflected and part of it is refracted.
   In the above experiment, light reflected from the coin gets reflected internally and therefore can not come out of the bottle. So we can not see the coin.
10. Learning outcome : (1) Explain total internal reflection of light.
    (2) Reason out the events observed in day to day life like fiber optics, rainbow.