Physics Assignment Grade 10 Refraction at a plane surface

Q1. Define:
- (a) Refraction
- (b) Total internal reflection
- (c) Critical angle
- (d) Refractive index

Q2. State the Snell's Law of refraction. Write the formulas for the following:
- (a) Snell's law
- (b) Absolute refractive index of a medium
- (c) Refractive index of one medium with respect to another
- (d) Principle of reversibility of light
- (e) Real depth, apparent depth
- (f) Critical angle and refractive index

Q3. The refractive index of water with respect to air is 4/3 while that of glass is 3/2. Find the refractive index of glass with respect to water.

Q4. Give reasons for the following:
- (a) Watching sunset on a beach, one can see the sun for several minutes after it has actually set
- (b) Violet colored letter of a page is raised maximum while red colored letter is raised minimum when a glass slab is placed over a differently colored page
- (c) When a lighted candle is kept in front of a thick plane glass mirror, several images can be seen, but the second image is the brightest (Also draw the diagram)
- (d) If light travels from air to glass, its wavelength decreases
- (e) Stars twinkle at night

Q5. The speed of light in diamond is 125000 km/s. What is its refractive index?

Q6. A ray of monochromatic green light enters a liquid from air, as shown. The angle 1 is 45° and angle 2 is 30°
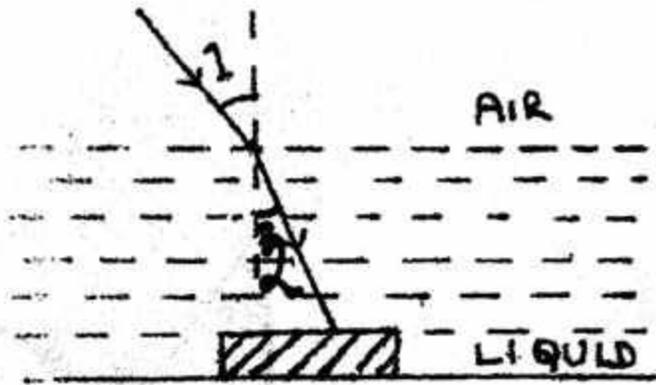
Show in the diagram the path of the ray after it strikes the mirror and re-enters air. Calculate the refractive index of the liquid. (Sin 45° = 0.7 and Sin 30° = 0.5)

Q7. A monochromatic point source of light O is seen through a rectangular glass block ABCD. Paths of two rays in and outside the block are shown in the figure below:
    (a) Does the source appear to be nearer or further with respect to the surface AB?
    (b) How does the shift depend upon the thickness AD of the block? (Draw the diagram)
    (c) For the same glass block, which color will produce maximum shift?
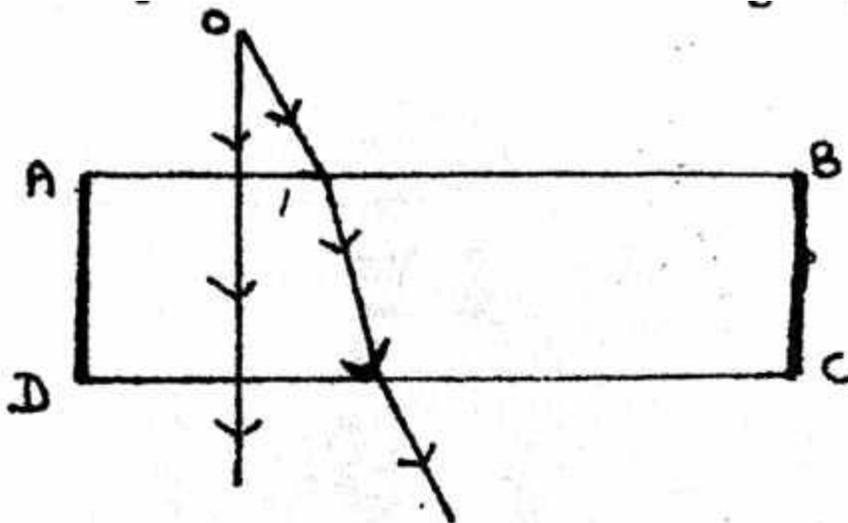
Q8. Draw a diagram to show the bending of a stick of water.
Q9. Draw a diagram to show experimental verification of the laws of refraction.

Q10. Mention two factors on which the refractive index of a medium depends.

Q11. Mention the factors on which Lateral Displacement in a glass slab depends.

Q12. A postage stamp getas raised by 7mm when placed under a rectangular glass block of refractive index 1.5. Find the thickness of the glass block.

Q13. What should be the ratio of the speed of light through the liquid to the speed through glass so that there is no refraction of the light at the boundaries of the glass block when the system is illuminated by light of a single color

Q14. A prism deviates a monochromatic ray of light through a 'δ' with 'i':
   (a) Draw a graph showing the variation of 'δ' with 'i'. On your graph, show the angle of minimum deviation.
   (b) What is the relation between the angle of incidence and the angle of emergence when the ray suffers minimum deviation?
Q15. Mention the factors affecting the angle of deviation of a prism.

Q16. Why does a point source O observed from a prism appear raised towards its refracting edge? (Show with the help of a diagram)

Q17. A light ray of yellow color is incident on an equilateral glass prism at an angle of incidence of 48º and suffers minimum deviation by an angle of 36º.
   (a) What will be the angle of emergence?
   (b) If the angle of incidence is changed to 30º, 60º, state whether the angle of deviation will be equal to, less than, more than 36º.

Q18. The refractive index of glass is 3/2. What is the critical angle for glass-air interface?

Q19. What are the essential conditions for total internal reflection to occur? Why is it beneficial to use a total reflecting prism to reflect rays back rather than a plane mirror?

Q20. What is a total reflecting prism? State three actions of such a prism.

Q21. State two factors on which the critical angle for a given pair of media depends upon.

Q22. What do you understand by the term 'optical fibre' ?

Q23. Complete each of the following diagrams and mention the application if any. (Critical Angle = 42°)