INDIAN SCHOOL NIZWA - WORKSHEET

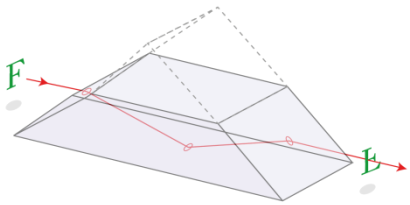
	PHYSICS	
	CH: 9 RAY OPTICS	
Name: _____	Date:_____	Class: XII Sec: A___

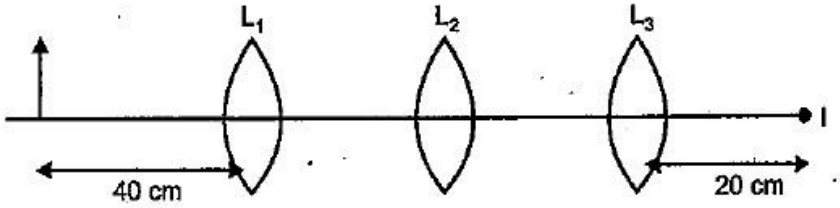
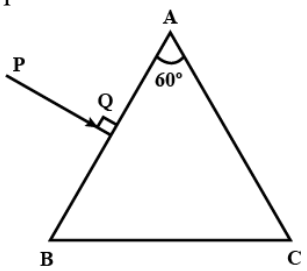
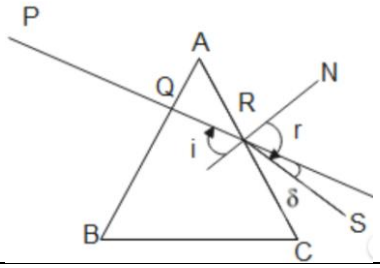
Very short answer questions

1. Do the frequency and wavelength change when light passes from a rarer medium to a denser medium?
   Ans. Wavelength changes but frequency does not change.
2. Doe the critical angle depend on colour of light? Explain
   Ans. Yes. As $i_c = 1/\mu$, i_c depend on μ ,but μ depends on wavelength. Hence it depends on the colour of light.
3. A water tank is 4m deep. A candle flame is held 6m above the water level. For water $\mu = 4/3$. Where will the image of the candle flame be formed?
   Ans. The image of the flame is formed due to reflection from water surface and not by refraction. The water surface acts like a plane mirror. The virtual image of flame is formed 6m below the water surface.
4. A fish in a water tank sees the outside world as if it is at the vertex of a cone whose circular base is at the surface of water. If the depth of the fish is d and the critical angle for water – air interface is i_c , what is the radius of the circle?
   Ans. Radius, $r = d \tan i_c$.
5. When does a convex lens behave like a concave lens?
   Ans. When the lens is placed inside a transparent medium of refractive index greater than that of its own material, it behaves as a concave lens.
6. A lens of glass is immersed in water, what will be its effect on the power of the lens?
   Ans. Power of a lens $P \alpha (\mu - 1)$. As ${}^{w}\mu_g < {}^{a}\mu_g$, so power of glass will decrease when it is immersed in water.
7. How does the focal length of a convex lens change if monochromatic red light is used instead if violet light?
   Ans. Focal length $f \alpha 1/(\mu-1)$. As $\mu_R < \mu_V$ focal length will increase when red light is used.
8. A screen is placed 90 cm from an object, the image of the object on the screen is formed by a convex lens at two different positions separated by 20cm. Determine the focal length of the lens.
9. The focal length of an equiconvex lens is equal to the radius of curvature of either face. What is the value of refractive index of the material of the lens?
10. The refractive index of a material of a concave lens is n_1. It is immersed in a medium of refractive index n_2. A parallel beam of light is incident on the lens. Trace the path of the emergent rays , when (i) $n_2 = n_1$ (ii) $n_2 > n_1$ (ii) $n_2 < n_1$.
11. A concave lens of refractive index 1.5 is immersed in a medium of refractive index 1.65. What is the nature of the lens?
12. Under what condition does a biconvex lens of glass having same refractive index act as a plane glass sheet when immersed in liquid?

13. A converging lens of refractive index 1.5 is kept in a medium having same refractive index. What is the focal length of the lens in medium?
14. Out of the blue and red light which is deviated more by the prism? Give reason.
15. A ray of light passes through glass prism such that the angle of incidence is equal to angle of emergence and each of these angles is equal to ¾ of angle of prism. What is the value of angle of deviation?
16. **Birds flying high in the air appear to be higher than in reality. Explain why?**

Assertion-Reason type (1 marks)

	(a) **Assertion and reason both are correct statements and reason is correct explanation for assertion** (b) **Assertion and reason both are correct statements but reason is not correct explanation for assertion** (c) **Assertion is correct but reason is wrong statement** (d) **Assertion is wrong statement but reason is correct statement.**
1.	Assertion: when light travels from an optically denser medium to a rarer medium, the critical angle of incidence depend on the colour of light Reason : The refractive index is different for different colour wavelength.
2.	Assertion: The focal length of lens for red light will be more than that for blue light Reason : Refractive index of red is less than blue
3.	Assertion : difference between real depth and apparent depth of a pond is due to total internal reflection. Reason : light should travel from a denser medium to a rarer medium for Total internal refection.
	Case study
1.	A **Dove prism** is a type of reflective prism which is used to invert an image. Dove prisms are shaped from a truncated right-angle prism. The Dove prism is named for its inventor, Heinrich Wilhelm Dove.  A beam of light travelling parallel to the longitudinal axis, entering one of the sloped faces of the prism undergoes total internal reflection from the inside of the longest (bottom) face and emerges from the opposite sloped face. Images passing through the prism are flipped (mirrored), and because only one reflection takes place, the image is also inverted but not laterally transposed. Answer the following questions
1.	Write the conditions to obtain total internal reflection.
2.	Name a natural phenomenon that is based on total internal reflection
3.	Write any one use of optical fibre.
4.	Write one practical example where inverting prism is used.
	Numericals (3 marks)
1.	A convex lens of focal length 20cm and a concave lens of focal length 15cm are separated by 30cm with their principal axes coincident. When an object is placed at 30cm in front of the convex lens, calculate the position of the final image formed by the combination. Would

	the result change if the object were placed 30cm infront of the concave lens? Give reason.
2.	You are given three lenses L1 and L2 and L3 each of focal engtth 20cm. An object is kept at 40cm in front of L1. The final image is formed at focus I of L3. Find the separation between L1, L2 and L3. 
3.	You are given two converging lenses of focal length 1.25cm and 5cm to design a compound microscope. If it is desired to have a magnification of 30, find out the separation between the objective and eyepiece.
4.	A small telescope has an objective lens of focal lengtn 150cm and eyepiece of focal length 5cm. what is the magnifying power of the telescope of the telescope for viewing distant objects in nomal adjustment.? If this telescope is used to view a 100m tall tower 3km away, what is the height of the image of the tower formed by the objective lens?
5.	A triangular prism of refracting angle 60 is made of a transparent material of refractive index $2\sqrt{3}$. A ray of light is incident normally on the face AB. Trace the path of the rays as it passes through the prism and calculate the angle of emergence and angle of deviation. 
6.	**An object is placed between the pole and the focus of a concave mirror produces a virtual and enlarged image. Justify using mirror formula.**
7.	**A ray of light is incident normally on one face of the prism of apex angle 30^0 and refractive index $\sqrt{2}$. Find the angle of deviation for the ray of light.** 
8.	The image of a small electric bulb fixed on the wall of a room is to be obtained on the opposite wall 3m away by means of a large convex lens. What is the maximum possible focal length of the lens required for the purpose?
9.	**A screen is placed 90cm from an object. The image of the object on the screen is formed by a convex lens at two different locations separated by 20cm. Determine the focal length of the lens.**
10.	**A small telescope has an objective lens of focal length 140cm and an eyepiece of focal length 5cm . What is the magnifying power of the telescope for viewing distant objects when:** **a. The telescope is in normal adjustment** **b. The final image is formed at the least distance of distinct vision 25cm**