



# INDIAN SCHOOL DARSAIT

## Class X -Physics

### Topic: Light –Reflection and Refraction

Worksheet : 2

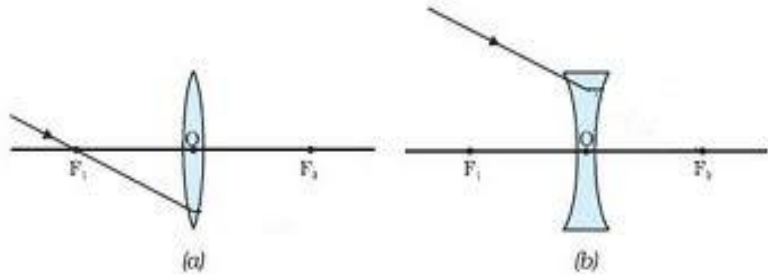
Name of the student :

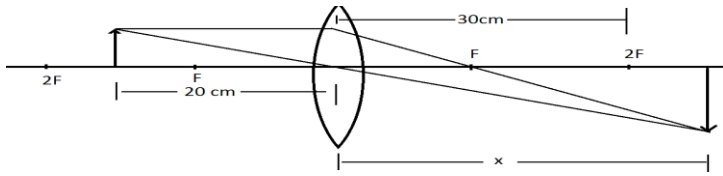
Resource person: Sujisha Sumith

Date : 13/5/2019

Class : X

<b><i>Laws of refraction, refractive index</i></b>														
1.	A ray of light travels from one medium to another medium .Under what circumstances there will be no bending of light?	1												
2.	A coin placed in a water bowl appears raised. Why?	1												
3.	Define absolute refractive index of a medium.	1												
4.	The absolute refractive indices of media X, Y and Z are 2.5, 1.25 and 1.75 respectively. Arrange the speed of light in these media in ascending order.	1												
5.	The refractive index of light going from air to glass is 1.5, what will be the refractive index of light going from glass to air?	1												
6.	A beam of light passes from air into a substance X if the angle of incidence be $45^\circ$ and the angle of refraction be $30^\circ$ . Calculate the refractive index of the substance X.(Given $\sin 30^\circ = 0.5, \sin 45^\circ = 0.707$ ).	2												
7.	State and explain the laws of refraction of light with the help of a labeled ray diagram.	2												
8.	What happens when a ray of light when it travels from rarer to denser medium and from denser to rarer medium? Support your answer with a diagram.	2												
9.	A ray of light travelling in air is incident on a rectangular glass block obliquely. It emerges out into air from the opposite face. Draw ray diagram to show the complete path of this ray of light.	2												
10.	The following table gives the value of refractive indices of a few media. <table border="1" data-bbox="284 1669 1221 1822"><thead><tr><th>Medium</th><th>Water</th><th>Crown glass</th><th>Rock salt</th><th>Ruby</th><th>Diamond</th></tr></thead><tbody><tr><td>Refractive index</td><td>1.33</td><td>1.52</td><td>1.54</td><td>1.71</td><td>2.42</td></tr></tbody></table> <p>Use this table to give an example of: (i) A pair of media so that light speeds up when it goes from one of these media to another.</p>	Medium	Water	Crown glass	Rock salt	Ruby	Diamond	Refractive index	1.33	1.52	1.54	1.71	2.42	3
Medium	Water	Crown glass	Rock salt	Ruby	Diamond									
Refractive index	1.33	1.52	1.54	1.71	2.42									

	(ii) Compare the speed of light in ruby and diamond. (Velocity of light in air = $3 \times 10^8$ m/s.) (iii) In which medium light travels with comparatively very low speed?	
11.	The speed of light in water is $2.25 \times 10^8$ m/s and that of glass is $2 \times 10^8$ m/s. Calculate the refractive index of glass with respect to water.	3
	<b><u>Spherical lenses</u></b>	
12.	Define the principal focus of concave lens.	1
13.	Complete the following ray diagrams:  	1
14.	A girl was playing with a thin beam of light from her laser torch by directing it from different directions of a convex lens held vertically she was surprised to see that in one particular direction beam of light continuous to move along the same direction without any deviation after passing through the lens. State the reason for this observation.	1
15.	Suppose an erect image of an object has to be obtained by using a convex lens of focal length 15 cm. What should be the range of distance of the object from the lens? What is the nature of image? Is it larger or smaller than the object? Draw a ray diagram to show the image formation in this case?	2
16.	A student wants to project the image of a candle flame on the walls of school laboratory by using a lens:  a. Which type of lens should be used? Why?  b. At what distance in terms of focal length of the lens should be place the candle flame so as to get (i) a magnified and (ii) a diminished image respectively on the wall?  c. Draw a ray diagram to show the formation of image in each case.	2
	<b>Lens Formula &amp; magnification</b>	
17.	A diverging lens of focal length 15cm forms an image 10 cm from the lens. How far is the object placed from the lens?	2
18.	An object 5 cm in length is held 25 cm away from a converging lens of focal length 10 cm. Draw the ray diagram and find the position, size and nature of the image formation.	2

19.	<p>Use lens formula to find the distance 'x' in the given diagram.</p> 	2																					
20.	<p>A student focused the image of a candle flame on a white screen by placing the flame at various distances from the convex lens. He noted his observation in the following table.</p> <table border="1" data-bbox="393 583 1107 970"> <thead> <tr> <th>Sl .NO</th> <th>Distance of the object from the lens(cm)</th> <th>Distance of the screen from the lens(cm)</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>-100</td> <td>+25</td> </tr> <tr> <td>2.</td> <td>-60</td> <td>+30</td> </tr> <tr> <td>3.</td> <td>-40</td> <td>+40</td> </tr> <tr> <td>4.</td> <td>-30</td> <td>+60</td> </tr> <tr> <td>5.</td> <td>-25</td> <td>+100</td> </tr> <tr> <td>6.</td> <td>-15</td> <td>+120</td> </tr> </tbody> </table> <p>Analyse the above table and give the answers for the following questions:</p> <p>a) What is the focal length of the convex lens? Give reason to justify your answer.</p> <p>b) Which set of observation is incorrect and why?</p> <p>c) Draw the ray diagram to show the image formation for the observation at Sl no 4. Also find the magnification for this set of observation.</p>	Sl .NO	Distance of the object from the lens(cm)	Distance of the screen from the lens(cm)	1.	-100	+25	2.	-60	+30	3.	-40	+40	4.	-30	+60	5.	-25	+100	6.	-15	+120	3
Sl .NO	Distance of the object from the lens(cm)	Distance of the screen from the lens(cm)																					
1.	-100	+25																					
2.	-60	+30																					
3.	-40	+40																					
4.	-30	+60																					
5.	-25	+100																					
6.	-15	+120																					
21.	<p>The image of a candle flame placed at a distance of 40cm from a spherical lens is formed on a screen placed on the other side of the lens at a distance of 40 cm from the lens. Identify the type of lens and write its focal length. What will be the nature of the image formed if the candle flame is shifted 25cm towards the lens? Draw ray diagram to justify.</p>	3																					
22.	<p>An image <math>\frac{2}{3}</math> size of the object is formed by convex lens at a distance of 12 cm from it. Find the focal length of the lens.</p>	3																					
<b><u>Power of lens</u></b>																							
23.	<p>A student uses a lens of focal length -50 cm .What is the nature of lens and its power?</p>	1																					
24.	<p>Define one dioptr.</p>	1																					
25.	<p>Two lenses have power of (i)+2D and (ii) -4D What is the nature and focal length of each lens?</p>	1																					

26.	A doctor prescribed corrective lens of power +1.5D . Find the focal length of the lens.is the prescribed lens is converging or diverging?	1
27.	A lens has power +2D. Find the focal length and nature of this lens. An object is placed at a distance of 100cm from this lens.Where will the image be formed and what will be the nature.	2
28.	A needle placed 45cm from a lens forms an image on a screen placed 90cm on the other side of the lens.Identify the type of lens.Determine its focal length and power.What is the size of image if the needle is 5 cm in height.	2
29.	A convex lens of focal length 40 cm and a concave lens of focal length 50 cm are placed in contact with each other.Find power of the combination.	2

### Sign convention at a glance

Parameter	Sign
<b>Object distance, u</b>	<b>Negative</b>
<b>Focal length of concave lens and concave mirror</b>	<b>Negative</b>
<b>Focal length of convex lens convex mirror</b>	<b>Positive</b>
<b>Magnification for real image</b>	<b>Negative</b>
<b>Magnification for virtual image</b>	<b>Positive</b>
<b>Height of object</b>	<b>Positive</b>
<b>Height of virtual and erect image</b>	<b>Positive</b>
<b>Height of real and inverted object</b>	<b>Negative</b>