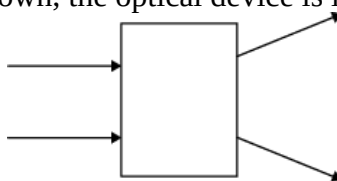


|                                                                                   |                                                                 |                                                                                     |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  | <b>INDIAN SCHOOL AL WADI AL KABIR</b>                           |  |
| <b>Class: X</b>                                                                   | <b>Department: SCIENCE 2026 – 27</b><br><b>SUBJECT: PHYSICS</b> | <b>Date: 18/04/2026</b>                                                             |
| <b>Worksheet No: 2</b><br><b>WITH ANSWERS</b>                                     | <b>CHAPTER: LIGHT REFLECTION AND REFRACTION -PART 2</b>         | <b>Note:</b><br><b>A4 FILE FORMAT</b>                                               |
| <b>NAME OF THE STUDENT</b>                                                        | <b>CLASS &amp; SEC:</b>                                         | <b>ROLL NO.</b>                                                                     |

### **OBJECTIVE TYPE QUESTIONS**

- Refractive index of diamond with respect to glass is 1.6. If the absolute refractive index of glass is 1.5, the absolute refractive index of diamond is :  
(a) 1.09      (b) 2.4      (c) 1.96      (d) 2.5
- How will the image formed by a convex lens be affected, if the upper half of the lens is wrapped with a black paper?  
(a) The size of the image formed will be one-half of the size of the image due to complete lens.  
(b) The image of upper half of the object will not be formed.  
(c) The brightness of the image will reduce.  
(d) The lower half of the inverted image will not be formed.
- The colour of light for which the refractive index of glass is minimum, is:  
(a) Red      (b) Yellow      (c) Green      (d) Violet
- The following diagram shows the use of an optical device to perform an experiment of light. As per the arrangement shown, the optical device is likely to be a:



- Concave mirror
  - Concave lens
  - Convex mirror
  - Convex lens
- An optical device 'X' is placed obliquely in the path of a narrow parallel beam of light. If the emergent beam gets displaced laterally, the device 'X' is :  
(a) plane mirror      (b) convex lens  
(c) glass slab      (d) glass prism
  - A ray of light starting from air passes through medium A of refractive index 1.50, enters medium B of refractive index 1.33 and finally enters medium C of refractive index 2.42. If this ray emerges out in air from C, then for which of the following pairs of media the bending of light least?

- (a) air-A                      (b) A-B                      (c) B-C                      (d) C-air
7. Absolute refractive index of water and glass is  $\frac{4}{3}$  and  $\frac{3}{2}$  respectively. If the speed of light in glass is  $2 \times 10^8$  m/s, the speed of light in water is :  
 (a)  $\frac{9}{4} \times 10^8$  m/s                      (b)  $\frac{7}{3} \times 10^8$  m/s                      (c)  $\frac{16}{9} \times 10^8$  m/s                      (d)  $\frac{9}{8} \times 10^8$  m/s
8. A converging lens forms a three times magnified image of an object, which can be take on a screen. If the focal length of the lens is 30 cm, then the distance of the object from the lens is?  
 a. -55cm                      b. -50cm                      c. -45cm                      d. -40cm
9. The refractive index of medium A is 1.5 and that of medium B is 1.33. If the speed of light in air is  $3 \times 10^8$  m/s, what is the speed of light in medium A and B respectively?  
 (a)  $2 \times 10^8$  m/s and  $1.33 \times 10^8$  m/s  
 (b)  $1.33 \times 10^8$  m/s and  $2 \times 10^8$  m/s  
 (c)  $2.25 \times 10^8$  m/s and  $2 \times 10^8$  m/s  
 (d)  $2 \times 10^8$  m/s and  $2.25 \times 10^8$  m/s
10. Convex lens focus a real, point sized image at focus, the object is placed  
 a. At focus                      b. Between F and 2F  
 c. At infinity                      d. At 2F
11. A divergent lens will produce  
 (a) always real image                      (b) always virtual image  
 (c) both real and virtual image                      (d) none of these
12. If the absolute refractive indices of two media X and Y are  $\frac{6}{5}$  and  $\frac{4}{3}$  respectively, then the refractive index of Y with respect to X will be :  
 (a)  $\frac{10}{9}$                       (b)  $\frac{9}{10}$                       (c)  $\frac{9}{8}$                       (d)  $\frac{8}{9}$

### **ASSERTION AND REASONING**

DIRECTION: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

- (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).  
 (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).  
 (c) Assertion (A) is true but reason (R) is false.  
 (d) Assertion (A) is false but reason (R) is true.  
 (e) Both Assertion and Reason are false.

13. **Assertion (A):** Refractive index of glass with respect to air is different for red light and violet light.

**Reason (R):** Refractive Index of a pair of medium does not depend on the wavelength of the light used.

14. **Assertion (A):** Higher is the refractive index of a medium or denser the medium, lesser is the velocity of light in that medium.

**Reason (R):** Refractive index is directly proportional to velocity.

15. **Assertion (A):** Refractive index has no units.

**Reason (R):** The refractive index is a ratio of two similar quantities.

### **TWO MARKS TYPE QUESTIONS**

16. Out of the two lenses, one concave and the other convex, state which one will diverge a parallel beam of light falling on it. Draw a ray diagram to show the principal focus of the lens. CBSE 2025
17. An object is placed at a distance of 60 cm from a concave lens of focal length 30 cm. Use lens formula to find the position of the image formed in this case.
18. Define power of a lens. Find power of a lens whose focal length is 50cm. CBSE 2024
19. Find the power of a convex lens which forms a real and inverted image of magnification -1 of an object placed at a distance of 20 cm from its optical centre.
20. A ray of light after refraction from a convex lens emerges parallel to its principal axis.  
(i) Draw a labelled ray diagram to show it.  
(ii) In this case, the incident ray before refraction from the lens passes through a point on its principal axis. Name the point. CBSE 2025

### **THREE MARKS TYPE QUESTIONS**

21. A convex lens forms an 8.0 cm long image of a 2.0 cm long object, which is kept at a distance of 6.0 cm from the optical centre of the lens. If the object and the image are on the same side of the lens, find (i) the nature of the image, (ii) the position of the image, and (iii) the focal length of the lens.
22. One student uses a lens of focal length +50 cm and another -50 cm. State the nature and find the power of each lens. Which of the two lenses will always give a virtual and diminished image irrespective of the position of the object?
23. 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 he use and why?  
(b) At what distance in terms of focal length 'F' of the lens should he place the candle flame so as to get (i) a magnified, and (ii) a diminished image respectively on the wall?  
(c) Draw ray diagram to show the formation of the image in each case?

### **FIVE MARKS TYPE QUESTIONS**

24. (i) The power of a lens 'X' is -2.5 D. Name the lens and determine its focal length in cm. For which eye defect of vision will an optician prescribe this type of lens as a corrective lens ?
- (ii) "The value of magnification 'm' for a lens is -2." Using new Cartesian Sign Convention and considering that an object is placed at a distance of 20 cm from the optical centre of this lens, state :  
(I) the nature of the image formed;  
(II) size of the image compared to the size of the object;  
(III) position of the image, and  
(IV) sign of the height of the image.
- (iii) The numerical values of the focal lengths of two lenses A and B are 10 cm and 20 cm respectively. Which one of the two will show higher degree of convergence/divergence? Give reason to justify your answer.

25. (a) (i) “In refraction of light through a rectangular glass slab, the emergent ray is always parallel to the direction of the incident ray.” Why? Explain with the help of a ray diagram. What happens when a ray of light falls normally on one of the faces of a rectangular glass prism? Draw diagram.
- (ii) An object is placed at a distance of 30 cm from the optical centre of a concave lens of focal length 20 cm. Use Lens formula to determine the position of the image formed in this case.
26. (i) Define the following terms:
- Power of a lens
  - Principal focus of a concave mirror
- (ii) Write the relationship among the object distance (u), image distance (v) and the focal length (f) of a
- Spherical lens
  - Spherical mirror
- (iii) An object is placed at a distance of 10 cm from optical centre of a convex lens of focal length 15 cm. Draw a labelled ray diagram to show the formation of image in this case.
27. State the law of refraction of light that defines the refractive index of a medium with respect to the other. Express it mathematically. How is the refractive index of any medium 'A' with respect to a medium 'B' related to the speed of propagation of light in two media A and B? State the name of this constant when one medium is vacuum or air. The refractive indices of glass and water with respect to vacuum are  $\frac{3}{2}$  and  $\frac{4}{3}$  respectively. If the speed of light in glass is  $2 \times 10^8$ , find the speed of light in (i) vacuum, (ii) water.

### **CASE STUDY QUESTIONS**

28. Analyse the following observation table showing a variation of image-distance (v) with object-distance (u) in case of a convex lens and answer the questions that follow without doing any calculations:

CBSE 2016

| S. No. | Object distance<br>u (cm) | Image distance<br>v (cm) |
|--------|---------------------------|--------------------------|
| 1      | -90                       | +18                      |
| 2      | -60                       | +20                      |
| 3      | -30                       | +30                      |
| 4      | -20                       | +60                      |
| 5      | -18                       | 90                       |
| 6      | -10                       | 100                      |

- (a) What is the focal length of the convex lens? Give a reason to justify your answer.
- (b) Write the serial number of the observation which is not correct. On what basis have you arrived at this conclusion?
- (c) Select an appropriate scale and draw a ray diagram for the observation at S.No.4. Also, find the approximate value of magnification.

29.



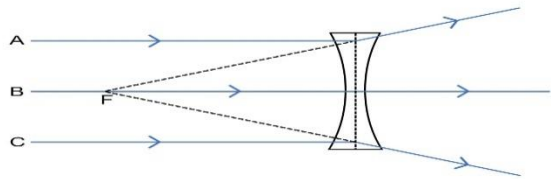
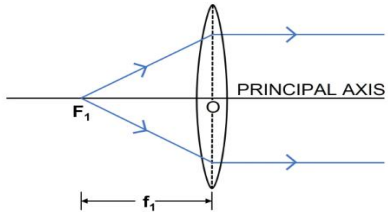
The above images are that of a specialized slide projector. Slides are small transparencies mounted in sturdy frames, ideally suited to magnification and projection, as they have a very high resolution and image quality. There is a tray where the slides are to be put into a particular orientation so that the viewers can see the enlarged erect images of the transparent slides. This means that the slides will have to be inserted upside down in the projector tray. To show her students the images of insects that she investigated in the lab, Mrs. Iyer brought a slide projector. Her slide projector produced a 500 times enlarged and inverted image of a slide on a screen 10 m away.

- (a) Based on the text and data given in the above paragraph, what kind of lens must the slide projector have?
- (b) If  $v$  is the symbol used for image distance and  $u$  for object distance then with one reason state what will be the sign for  $v$  and  $u$  in the given case?
- (c) A slide projector has a convex lens with a focal length of 20 cm. The slide is placed upside down 21 cm from the lens. How far away should the screen be placed from the slide projector's lens so that the slide is in focus?

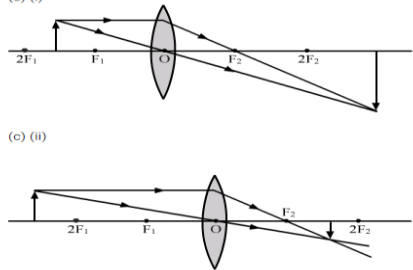
OR

- (c) When a slide is placed 15 cm behind the lens in the projector, an image is formed 3 m in front of the lens. If the focal length of the lens is 14 cm, draw a ray diagram to show image formation. (not to scale)

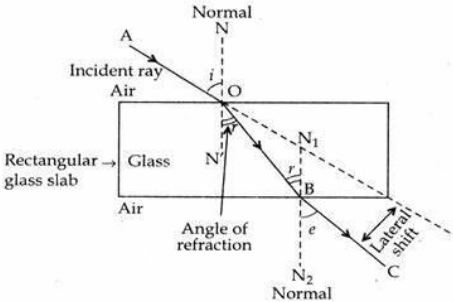
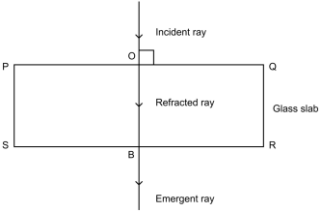
| ANSWER KEY |                                              |
|------------|----------------------------------------------|
| 1.         | (b) 2·4                                      |
| 2.         | (c) The brightness of the image will reduce. |
| 3.         | (a) Red                                      |

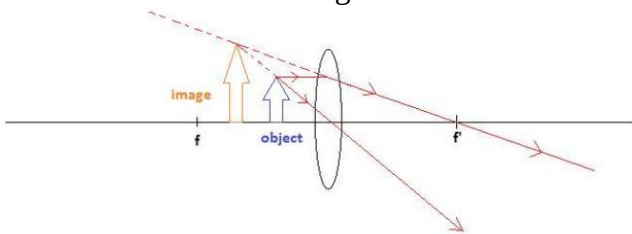
|     |                                                                                                                                                                                                                                                                                                                   |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4.  | (b) Concave lens                                                                                                                                                                                                                                                                                                  |
| 5.  | (c) glass slab                                                                                                                                                                                                                                                                                                    |
| 6.  | (b) A-B                                                                                                                                                                                                                                                                                                           |
| 7.  | (a) $9/4 \times 10^8$ m/s                                                                                                                                                                                                                                                                                         |
| 8.  | d. -40cm                                                                                                                                                                                                                                                                                                          |
| 9.  | (d) $2 \times 10^8$ m/s and $2.25 \times 10^8$ m/s                                                                                                                                                                                                                                                                |
| 10. | c. At infinity                                                                                                                                                                                                                                                                                                    |
| 11. | (b) always virtual image                                                                                                                                                                                                                                                                                          |
| 12. | (a) 10/9                                                                                                                                                                                                                                                                                                          |
| 13. | (c) Assertion (A) is true but reason (R) is false.                                                                                                                                                                                                                                                                |
| 14. | (c) Assertion (A) is true but reason (R) is false.                                                                                                                                                                                                                                                                |
| 15. | (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).                                                                                                                                                                                                        |
| 16. | <p><b>A concave lens diverges a parallel beam of light.</b></p>                                                                                                                                                                  |
| 17. | $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$ $\frac{1}{-30} = \frac{1}{v} - \frac{1}{-60}$ <p><math>v = -20\text{cm}</math></p>                                                                                                                                                                                      |
| 18. | <p>The degree of convergence and divergence provided by a lens is called the power of the lens. / The power of a lens is given by the reciprocal of its focal length.</p> <p>Concave lens</p> <p><math>P = 100/f = 100/50 = 2\text{D}</math></p>                                                                  |
| 19. | <p>A convex lens forms an image of magnification -1 when the object is placed at <math>2F</math>, . For focal length, <math>f</math>, we have,</p> <p><math>2f = 20\text{cm}</math></p> <p><math>f = 10\text{cm} = 0.1\text{m}</math></p> <p>Power of lens,</p> <p><math>P = 1/f = 1/0.1 = 10\text{ D}</math></p> |
| 20. | <p>(a)</p>                                                                                                                                                                                                                     |

|                                                                     | (b) The point through which the incident ray passes is known as the first focus.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                           |                            |                                                                     |                                                                     |
|---------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------|
| 21                                                                  | <p>(a) virtual and erect</p> <p><math>h_o = 2.0 \text{ cm}, h_i = 8.0 \text{ cm}</math></p> <p>So,</p> $m = \frac{h_i}{h_o} = \frac{8.0}{2.0} = 4.0$ <p>Given <math>u = -6.0 \text{ cm}</math> (by convention)</p> $m = \frac{v}{u} \Rightarrow v = m \times u = 4.0 \times (-6.0) = -24.0 \text{ cm}$ $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$ <p>Substitute values:</p> $u = -6.0 \text{ cm}, v = -24.0 \text{ cm}$ $\frac{1}{f} = \frac{1}{-24.0} - \frac{1}{-6.0} = -\frac{1}{24} + \frac{1}{6}$ <p>Finding a common denominator:</p> $\frac{1}{6} = \frac{4}{24}$ <p>So:</p> $\frac{1}{f} = -\frac{1}{24} + \frac{4}{24} = \frac{3}{24} = \frac{1}{8}$ <p>Thus:</p> $f = 8.0 \text{ cm}$                                                                                                                                                                                                                                                                                                  |                           |                            |                                                                     |                                                                     |
| 22.                                                                 | <p>Ans:- The first lens of focal length <math>f = +50 \text{ cm}</math>, is a <b>convex</b> lens.<br/> The second lens of focal length <math>f = -50 \text{ cm}</math> is a <b>concave</b> lens.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="padding: 5px;">Power of the convex lens,</th><th style="padding: 5px;">Power of the concave lens,</th></tr> </thead> <tbody> <tr> <td style="padding: 10px; text-align: center;"> <math display="block">P_1 = \frac{1}{f_1}</math> <math display="block">= \frac{1}{+0.5 \text{ m}}</math> <math display="block">= +2 \text{ D}</math> </td><td style="padding: 10px; text-align: center;"> <math display="block">P_2 = \frac{1}{f_2}</math> <math display="block">= \frac{1}{-0.5 \text{ m}}</math> <math display="block">= -2 \text{ D}</math> </td></tr> </tbody> </table> <p>The <b>concave</b> lens always gives a virtual and diminished image irrespective of the object's position.</p> | Power of the convex lens, | Power of the concave lens, | $P_1 = \frac{1}{f_1}$ $= \frac{1}{+0.5 \text{ m}}$ $= +2 \text{ D}$ | $P_2 = \frac{1}{f_2}$ $= \frac{1}{-0.5 \text{ m}}$ $= -2 \text{ D}$ |
| Power of the convex lens,                                           | Power of the concave lens,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                           |                            |                                                                     |                                                                     |
| $P_1 = \frac{1}{f_1}$ $= \frac{1}{+0.5 \text{ m}}$ $= +2 \text{ D}$ | $P_2 = \frac{1}{f_2}$ $= \frac{1}{-0.5 \text{ m}}$ $= -2 \text{ D}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                           |                            |                                                                     |                                                                     |

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|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 23. | <p><b>Ans:-</b> a) The student should use a convex lens because with the help of convex lens, he would be able to project image on the walls because convex lens will form a real image.</p> <p>b) (i) In order to form a magnified image on the wall, the candle flame should be placed between F and 2F from the lens.<br/> (ii) In order to form a diminished image on the wall, the candle flame should be placed at a distance greater than 2F from the lens.</p> <div style="text-align: center;">  </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 24. | <p>i.</p> <p>Determine the focal length,</p> <p>The power P of a lens is related to its focal length f (in meters) by the equation:</p> $\therefore P = \frac{1}{f}$ $\therefore f = \frac{1}{-2.5}$ $= -0.4 \text{ m}$ $= -40 \text{ cm (or 40 cm in magnitude)}$ <p>The negative sign of the power indicates that the lens is a diverging (concave) lens.</p> <p>A concave lens is typically prescribed to correct myopia (nearsightedness). In myopia, the eye focuses images in front of the retina. A concave lens diverges the incoming light rays, moving the focal point back onto the retina for clear vision.</p> <p>ii.</p> <ul style="list-style-type: none"> <li>- Magnification, <math>M = -2</math></li> <li>- Object distance, <math>u = -20 \text{ cm}</math></li> </ul> $M = \frac{v}{u} \implies v = M \times u = -2 \times (-20) = 40 \text{ cm}$ <p><math>v = +40 \text{ cm}</math> means the image is formed 40 cm on the right side of the lens (real side, as per Cartesian Sign Convention).</p> <p>Since the image is real (image distance positive) and magnification is negative, the lens must be converging (convex) because only convex lenses produce real images.</p> <p>The magnification magnitude is 2, meaning the image size is twice the size of the object. Since magnification <math>M = \frac{h_i}{h_o} = -2</math>, the negative sign shows image height <math>h_i</math> is negative if object height <math>h_o</math> is positive. This means the image is inverted relative to the object.</p> <ol style="list-style-type: none"> <li>Nature of the lens: Converging (Convex) lens</li> <li>Size of the image compared to the object: Image is 2 times larger than the object</li> <li>Position of the image: 40 cm on the right side of the lens (real image)</li> <li>Sign of height of the image: Negative (image is inverted)</li> </ol> |

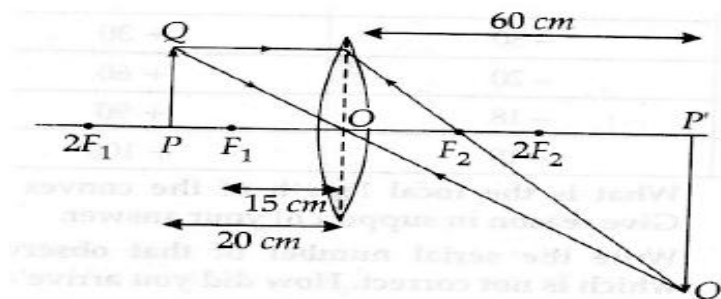


|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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|     | <p>iii. The focal lengths of the two lenses: A = 10 cm, B = 20 cm.<br/> The shorter focal length indicates a stronger convergence/divergence effect.<br/> since 10 cm (A) &lt; 20 cm (B), lens A has a higher degree of convergence/divergence.<br/> Lens A will show a higher degree of convergence/divergence than lens B.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 25. | <p>i.</p>  <p>The emergent ray is always parallel to the incident ray due to the parallel faces of the glass slab causing equal angles of incidence and emergence.<br/> When a ray of light falls normally on one of the faces of a rectangular glass prism, it passes straight through without bending.</p>  <p>iii.</p> <p>Identify the given values: Object distance <math>u = -30</math> cm (negative because the object is placed on the left side of the lens) and focal length <math>f = -20</math> cm (negative for concave lens).</p> $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$ $\frac{1}{-20} = \frac{1}{v} - \frac{1}{-30}$ $\frac{1}{v} = \frac{1}{-20} - \frac{1}{-30} = \frac{-3 + 2}{60} = \frac{-1}{60}$ <p>∴ thus <math>v = -60</math> cm.</p> |
| 26. | <p>i. a) The power of a lens is defined as the reciprocal of the focal length.<br/> b) Light rays that are parallel to the principal axis of a concave mirror converge at a specific point on its principal axis after reflecting from the mirror. This point is known as the principal focus of the concave mirror.</p> <p>ii. a. <math>1/f = 1/v - 1/u</math><br/> b. <math>1/f = 1/v + 1/u</math></p> <p>iii. Given:<br/> <math>u = -10</math> cm<br/> <math>f = 15</math> m</p> <p>Now the distance of the image formed:<br/> <math>1/f = 1/v - 1/u</math></p>                                                                                                                                                                                                                                                                                                                                                                 |

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     | <p><math>1/15 = 1/v + 1/10</math></p> <p><math>v = -30\text{cm}</math> negative sign denotes that the image is formed on the same side of the object and is virtual erect and magnified</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 27. | <p>Ans:-The second law of refraction is also known as Snell's law of refraction and it states that the ratio of sine of the angle of incidence to the sine of refraction is constant for a given pair of media. It establishes a relation between angle of incidence and angle of refraction.</p> <p>It can be expressed mathematically as follows :</p> $\frac{\sin i}{\sin r} = n$ <p><math>n</math> is constant and is known as refractive index.</p> <p>The refractive index of any medium 'A' with respect to a medium 'B' related to the speed of propagation of light in two media A and B can be written as follows:</p> ${}^B n_A = \frac{v_B}{v_A}$ <p>Let, absolute refractive index of glass, <math>n_g = \frac{3}{2}</math>.</p> <p>Absolute refractive index of water, <math>n_w = \frac{4}{3}</math></p> <p>Speed of light in glass, <math>v_g = 2 \times 10^8 \text{ m/s}</math></p> <p>(i) Speed of light in vacuum, <math>n_g = \frac{c}{v_g}</math></p> $c = n_g \times v_g = \frac{3}{2} \times 2 \times 10^8 = 3 \times 10^8 \text{ m/s.}$ <p>(ii) Speed of light in water, <math>n_w = \frac{c}{v_w}</math></p> $v_w = \frac{c}{n_w} = \frac{3 \times 10^8}{\left(\frac{4}{3}\right)} = 2.25 \times 10^8 \text{ m/s.}$ |
| 28. | <p>(a) From S. No- 3, we can say that the radius of curvature of the lens is 30 cm because when an object is placed at the centre of curvature of a convex lens, its image is formed on the other side of the lens at the same distance from the lens. And, we know that focal length is half of the radius of curvature. Thus, the focal length of the lens is +15 cm.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

(b) S. No- 6 is not correct as the object distance is between focus and pole so for such lenses the image formed. is always virtual but in this case, a real image is forming as the image distance is positive.

(c) Approximate value magnification for distance object - 20 cm and image distance +60 cm is 3.



29.

(a) Convex Lens (1mark)

(b) Negative as the image is real and inverted. (1mark)

(c)  $1/f = 1/v - 1/u$

$$1/20 = 1/v - 1/-20$$

$$1/v = 1/20 - 1/21$$

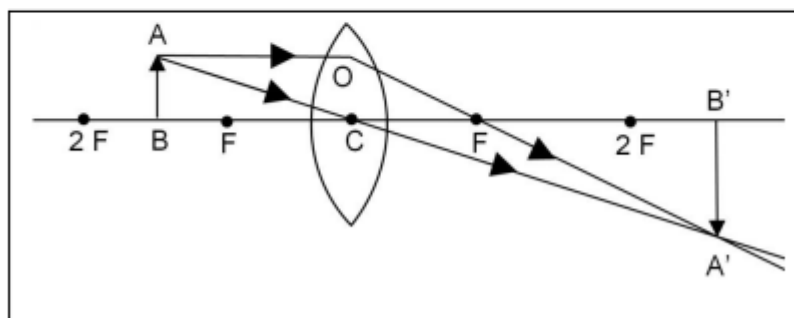
$$= (21 - 20)/420$$

$$= 1/420$$

$$v = 420 \text{ cm} \quad (2 \text{ marks})$$

OR

(c)



(2 marks)

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