CBSE Important Questions for Class 10 Science Chapter 10: CBSE Important Questions for Class 10 Science Chapter 10 Light Reflection and Refraction" covers the fundamental concepts of how light behaves when it reflects off surfaces and passes through different mediums. The chapter focuses on key topics like the laws of reflection, the concept of the focal point, image formation in concave and convex mirrors, refraction of light through lenses, and Snell's law.

Important questions often test students' understanding of ray diagrams, mirror and lens formulae, and real-life applications like optical instruments. Practice of numerical problems and conceptual questions is crucial for mastering this chapter.

CBSE Important Questions for Class 10 Science Chapter 10 Overview

CBSE Important Questions for Class 10 Science Chapter 10 Light Reflection and Refraction is a crucial chapter as it forms the foundation for understanding optical phenomena and their applications in real life. The chapter explains how light behaves when it interacts with mirrors and lenses, which is essential for students to grasp concepts like image formation, the working of optical devices (such as cameras, telescopes, and microscopes), and vision correction.

It is a highly scoring chapter with frequent appearances of numerical problems based on mirror and lens formulae, ray diagrams, and refraction laws. This chapter also lays the groundwork for more advanced topics in higher classes, making it an indispensable part of the curriculum for science students aiming to excel in board exams.

CBSE Important Questions for Class 10 Science Chapter 10 Light Reflection and Refraction

Below is the CBSE Important Questions for Class 10 Science Chapter 10 Light Reflection and Refraction -

Long Answer Questions (5 Marks)

1. A convex lens has a focal length of 10 cm. At what distance from the lens should the object be placed so that it forms a real and inverted image 20 cm. away from the lens? What would be the size of the image formed if the object is 2 cm high? With the help of a ray, the diagram shows the formation of the image by the lens in this case?

Ans: Given, the focal length of the convex lens,

$\Rightarrow f = +10$ cm

Also, given the image formed is real and inverted with the image distance as 20 cm.

$\Rightarrow v = +20$ cm

From the lens formula, we have:

$$\Rightarrow \frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$
$$\Rightarrow \frac{1}{10} = \frac{1}{20} - \frac{1}{u}$$
$$\Rightarrow \frac{1}{u} = \frac{1}{20} - \frac{1}{10}$$
$$\Rightarrow \frac{1}{u} = \frac{-1}{20}$$
$\Rightarrow u = -20$ cm.

$\therefore$ The object is placed at a distance of 20 cm.

Magnification is given as,

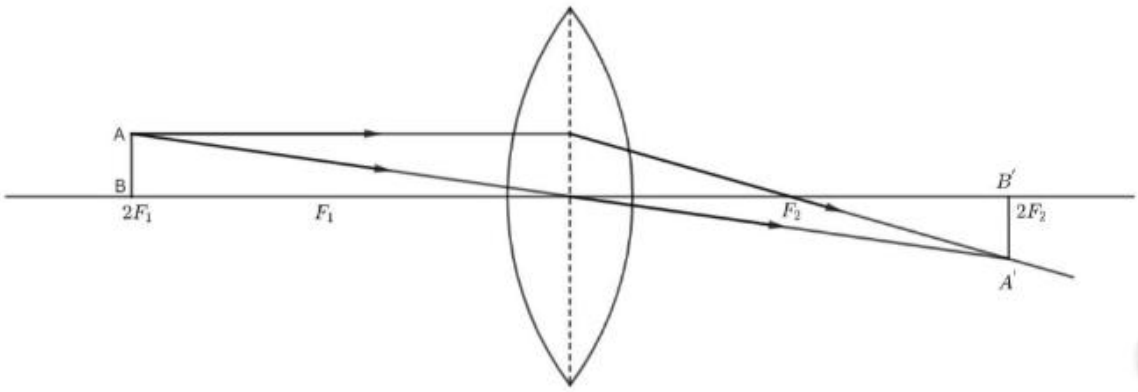
$$\Rightarrow m = -\frac{v}{u}$$
$$\Rightarrow m = -\frac{20}{(-20)}$$
$$\Rightarrow m = +1$$

Also, magnification is given by, $m = \frac{Height \text{ of the image}}{Height \text{ of the object}}$.

$$\therefore m = \frac{Height \text{ of the image}}{2}$$
$$\Rightarrow 1 = \frac{Height \text{ of the image}}{2}$$
$$\Rightarrow Height \text{ of the image} = 2 \text{ cm}.$$

Thus, the image is of the same size as that of the object and it is real and inverted.

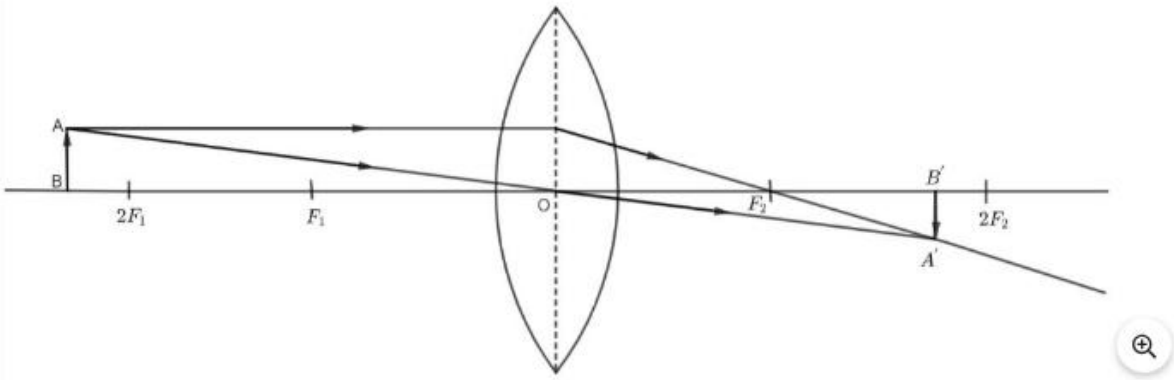
The ray diagram representing the formation of the image by the lens in this case is:



2. Draw a ray diagram to show the use of a convex lens for the formation of images having the following characteristics.

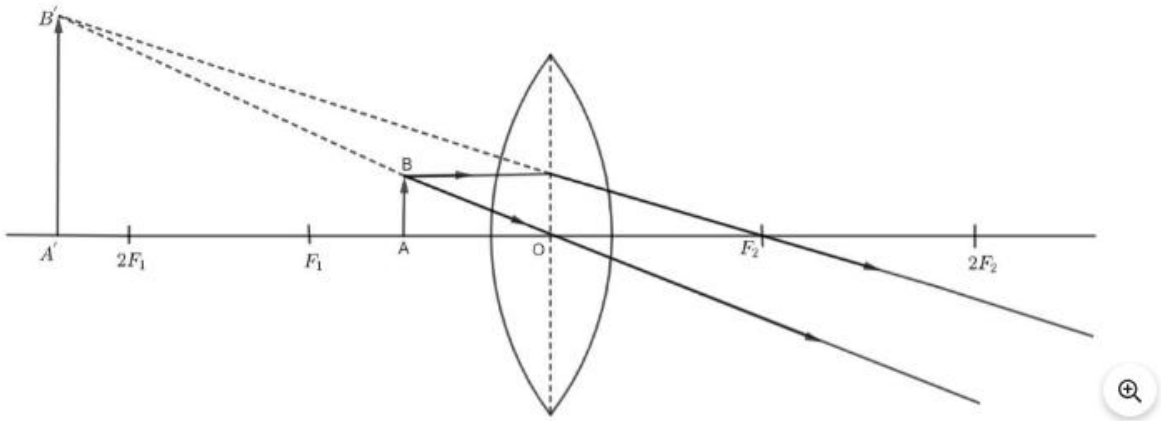
a. Real & inverted and diminished

Ans: A ray diagram representing a real & inverted and diminished image is given below.



b. Virtual, erect & magnified.

Ans: A ray diagram representing a virtual, erect, and magnified image is given below.



3. A convex lens forms a real and inverted image of a needle at a distance of 5050 cm. from it. Where is the needle placed in front of the convex lens if the image is equal to the size of objects? Also, find the power of the lens.

Ans: Given, the image is real and inverted at a distance of 5050 cm.

⇒v=+50 cm

Also given, Height of image == Height of object

We know, magnification is given as,

$$\Rightarrow m = -\frac{v}{u}$$

Also, magnification is given by, $m = \frac{Height \text{ of the image}}{Height \text{ of the object}}$.

$$\therefore -\frac{v}{u} = \frac{Height \text{ of the image}}{Height \text{ of the object}}$$

Since, Height of image = Height of object and $v = +50$ cm

$$\Rightarrow -\frac{50}{u} = 1$$

$$\Rightarrow u = -50 \text{ cm}$$

From the lens formula, we have:

$$\Rightarrow \frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\Rightarrow \frac{1}{f} = \frac{1}{50} - \frac{1}{-50}$$

$$\Rightarrow f = 25 \text{ cm}$$

$$\Rightarrow f = 0.25 \text{ m}$$

The power of a lens is given by,

$$\Rightarrow P = \frac{1}{f}$$

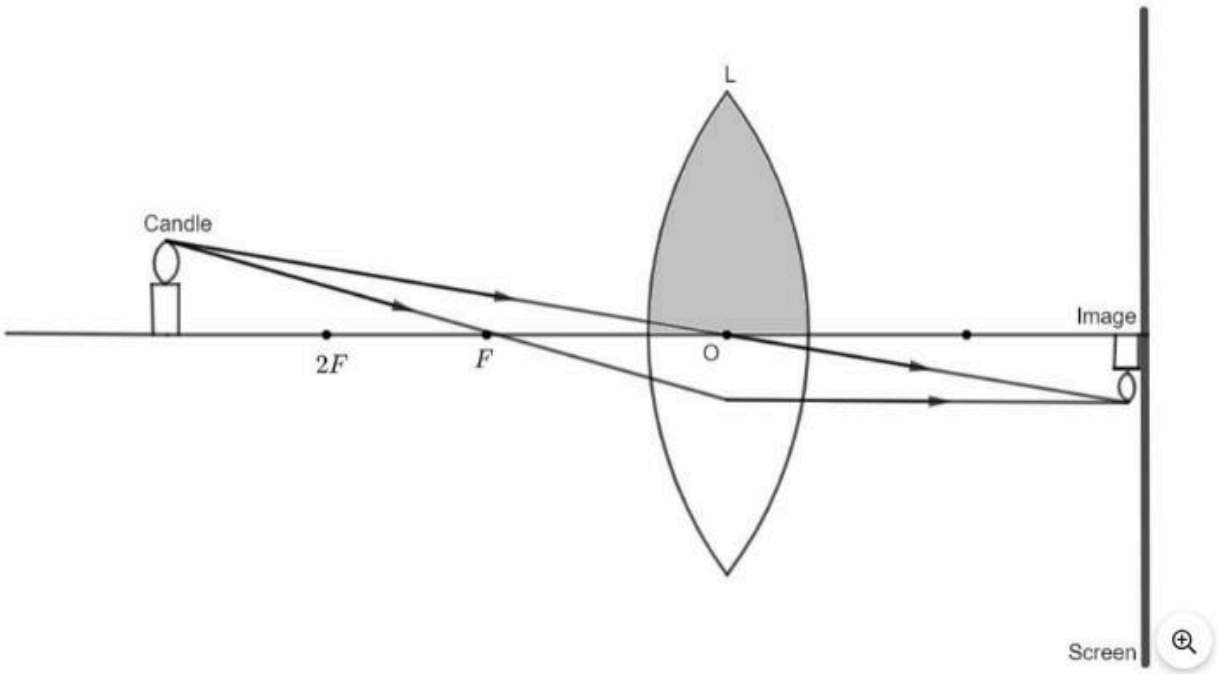
$$\Rightarrow P = \frac{1}{0.25} \text{ m}$$

$$\Rightarrow P = +4 \text{ D}$$

4. One-half of a convex lens is covered with black paper. Will this lens produce a complete image of the object? Verify your answers experimentally. Explain your observations.

Ans: If we cover one-half of a convex lens with black paper it is observed that it produces a complete image of the object.

Representing the given situation with a ray diagram.



Let us consider a convex lens that has a black paper coating on half of it. We maintain a screen on one side of the lens and a burning candle on the other.
The burning candle should be positioned such that its picture appears on the screen that is attached to the opposite side of the lens.

The image of the burning candle appears fully on the screen.

Based on the aforementioned observation, we can thus conclude that while the length of the lens has no effect on the formation of an image, it does have an effect on the brightness of the image that is generated on the screen because half of the lens is covered in black paper, which reduces the quantity of rays going through it.

5. An object 55 cm in length is held 2525 cm away from a converging lens of focal length 1010 cm. Draw the ray diagram and find the position, size, and nature of the image formed.

Ans: Given focal length of the lens, $f = +10$ cm.

Object distance from the converging lens is given to be 25 cm and the height of the object (ho) is given to be 5 cm.

Thus,

$\Rightarrow u = -25$ cm

$\Rightarrow ho = 5$ cm

From the lens formula, we have:

$$\Rightarrow \frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\Rightarrow \frac{1}{10} = \frac{1}{v} - \frac{1}{-25}$$

$$\Rightarrow \frac{1}{v} = \frac{1}{25} - \frac{1}{10}$$

$$\Rightarrow v = \frac{50}{3} \text{ cm}$$

$$\Rightarrow v = 16.7 \text{ cm}$$

Thus, we conclude that the image formed is real and inverted and is formed at a distance of 16.7 cm on the other side of the lens.

We know, magnification is given as,

$$\Rightarrow m = -\frac{v}{u}$$

Also, magnification is given by, $m = \frac{Height \text{ of the image}}{Height \text{ of the object}} = \frac{hi}{ho}$.

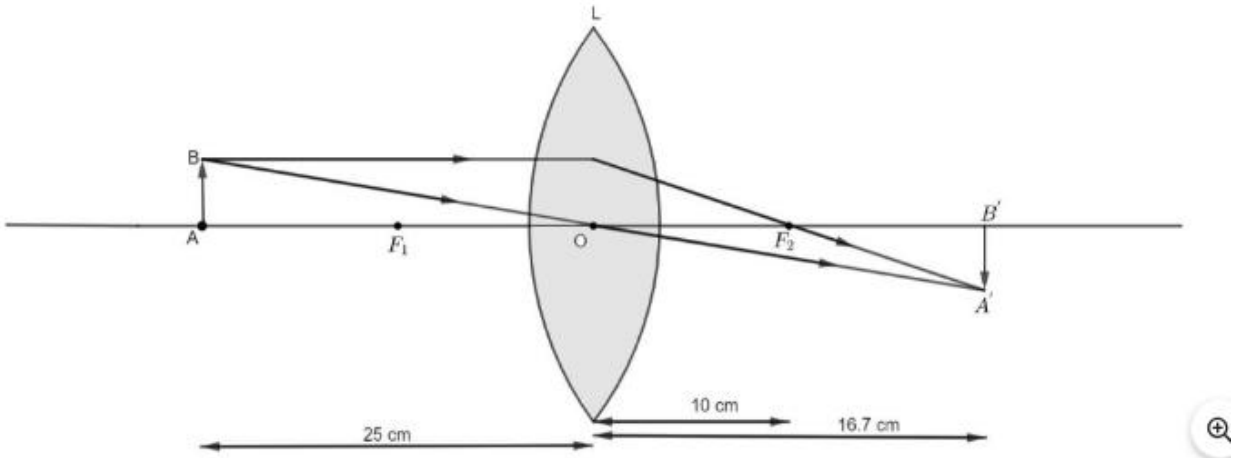
$$\therefore -\frac{v}{u} = \frac{hi}{ho}$$

$$\Rightarrow \frac{16.7}{-25} = \frac{hi}{5}$$

$$\Rightarrow hi = -\frac{10}{3} \text{ cm}$$

Hence, the image is diminished.

The ray diagram representing the above situation is drawn below.



6. A convex lens of focal length 15 cm formed an image 10 cm from the lens. How far is the object placed from the lens? Draw the ray diagram.

Ans: Given focal length of the lens, $f = 15$ cm.

Image distance from the converging lens is given to be 10 cm.

Thus,

$\Rightarrow v = -10$ cm

We observe that the image distance is less than the focal length, hence the image formed would be virtua and erect.

From the lens formula, we have:

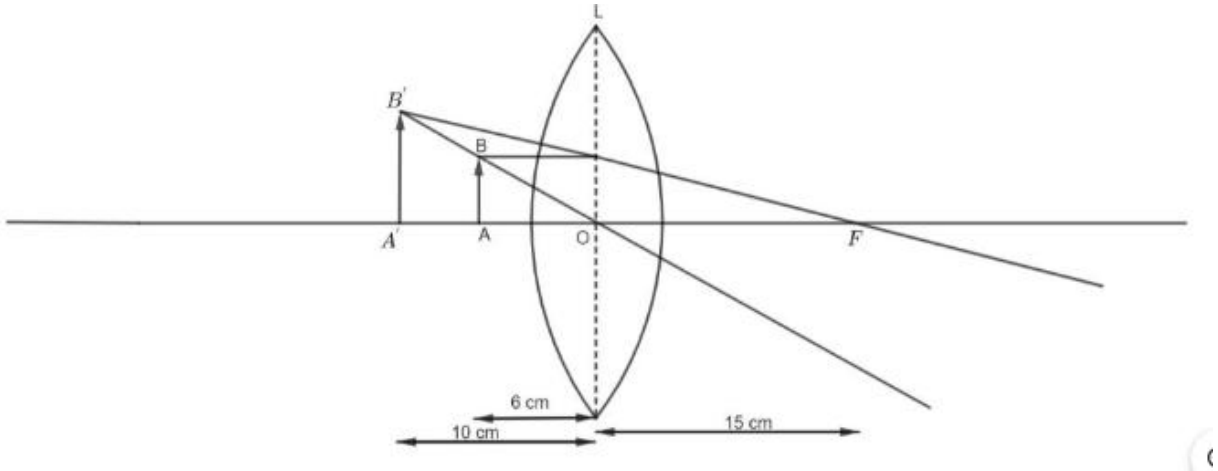
$$\Rightarrow \frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\Rightarrow \frac{1}{15} = \frac{1}{-10} - \frac{1}{u}$$

$$\Rightarrow \frac{1}{u} = -\frac{1}{10} - \frac{1}{15}$$

$\Rightarrow u = -6$ cm

The ray diagram representing the above situation is drawn below.



Benefits of CBSE Important Questions for Class 10 Science Chapter 10

CBSE Important Questions for Class 10 Science Chapter 10 "Light - Reflection and Refraction" provide numerous benefits for students, helping them prepare efficiently for exams. Here are some key advantages:

Focused Learning: These important questions focus on key concepts from the chapter, such as laws of reflection, refraction, the nature of images formed by lenses and mirrors, and the applications of these phenomena, allowing students to concentrate on essential topics.

Exam-Oriented Preparation: The questions are curated based on previous years' papers and the CBSE exam pattern, ensuring that students practice the types of questions that are likely to appear in exams.

Clear Understanding of Concepts: By attempting these questions, students can reinforce their understanding of critical concepts, especially tricky topics like the calculation of focal length, magnification, and the behavior of light rays in various mediums.

Time Management: Practicing these important questions helps students improve their speed and accuracy, enabling them to manage time effectively during exams.

Self-Assessment: Students can assess their level of preparation by solving these questions and identifying areas that need more attention.