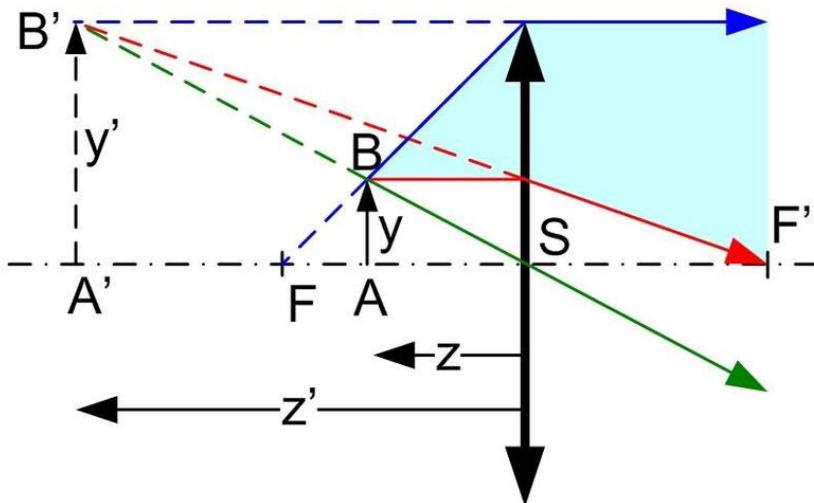


QUESTION:

A spherical concave lens has a focal length of 20 cm, and an object is placed 15 cm from the lens. What are the image distance and the image characteristics?

SOLUTION:

Let's draw a sketch



Here the image ($A'B'$) is virtual, and image distance z' is negative.

For a thin lens, the object (z) and image (z') distances are related by the equation:

$$\frac{1}{z} - \frac{1}{z'} = \frac{1}{f}$$

$$\frac{1}{z'} = \frac{1}{z} - \frac{1}{f}$$

$$\frac{1}{z'} = \frac{f-z}{fz}$$

$$z' = \frac{fz}{f-z}$$

$$z' = \frac{20 \cdot 15}{20 - 15}$$

$$z' = 60 \text{ cm}$$

Image's height and object's height are related by the equation

$$\frac{y'}{y} = \frac{z'}{z}$$

$$y' = \frac{z'}{z} y$$

$$y' = \frac{60}{20} y$$

$$y' = 3y$$

ANSWER

$$z' = 60 \text{ cm}$$

Image is virtual, erect and 3-times higher than object