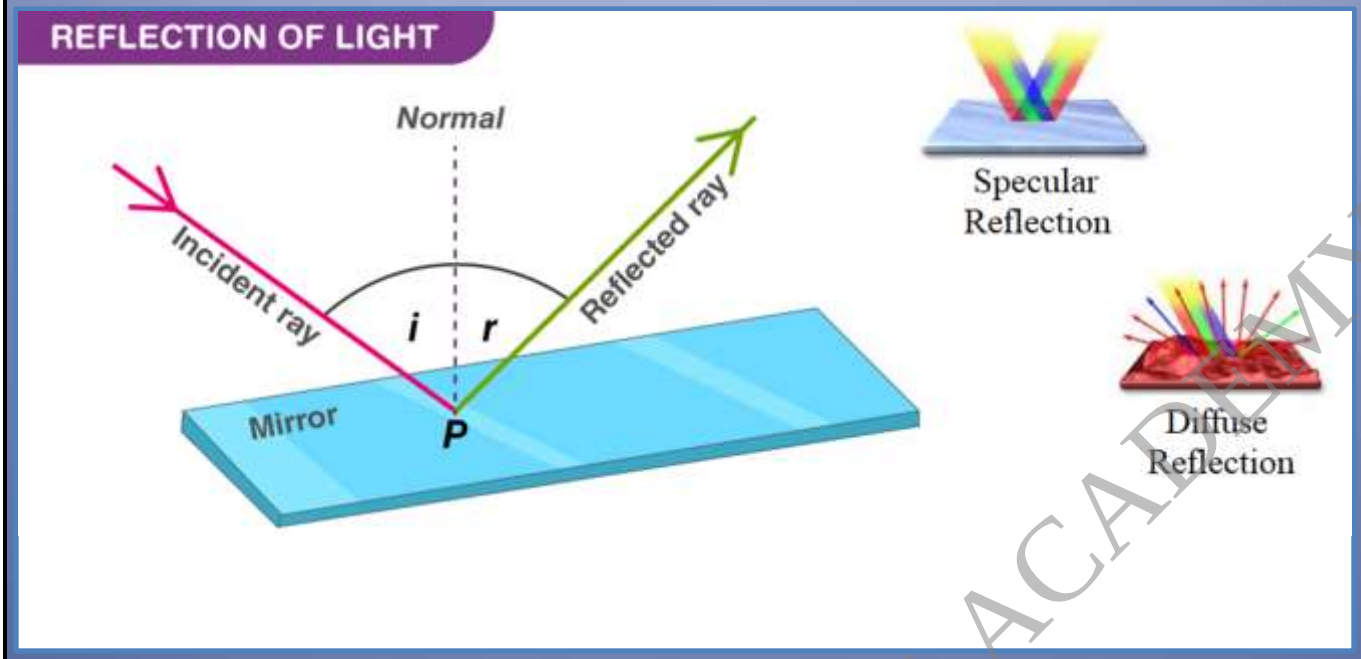

PHYSICS CHAPTER 4 REFLECTION OF LIGHT

For Form 4 Students According to New Somalian Curriculum

Rising Star Online Academy

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Chapter Exercise	Physics Chapter 4 REFLECTION OF LIGHT

CHAPTER EXERCISE

Question # 1

Define reflection of light. State its kinds.

Answer:

Reflection is when light bounces off an object.

1. Specular Reflection
2. Diffuse Reflection

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Question # 2

What is meant by:

a) Principal focus of a spherical mirror?

Answer:

It is a point on the principal axis of the spherical mirror at which, the light rays which are parallel to the principal axis actually meet.

b) Focal length of a spherical mirror?

Answer:

It is the distance between the pole of mirror and the focus point called as the focal length of mirror.

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Question # 3

Distinguish between the inverted image and laterally inverted image.

Answer:

Laterally inverted means the left and right sides of the image are interchanged.

Inverted means the image is upside down.

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Question # 4

State four characteristics of image formed in a plane mirror.

Answer:

Characteristics of images are

1. Image formed by a plane mirror is always virtual and erect.
2. The size of the image is equal to that of the object.
3. The image formed is as far behind the mirror as the object is in front of it.
4. The image is laterally inverted.

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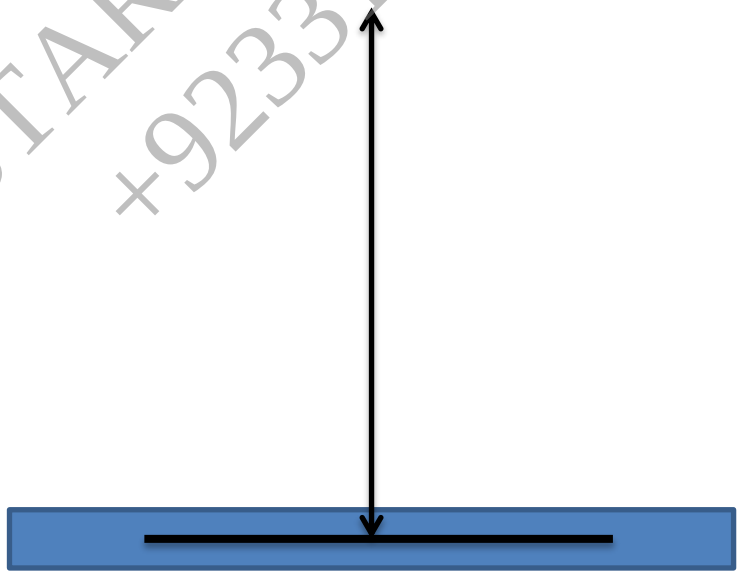
Question # 5

What happens when a ray of light falls normally for perpendicularly on the surface of a plane mirror?

Answer:

When a ray of light falls normally (or perpendicularly) on the surface of a plane mirror, it gets reflected along the same path because the angles of incidence and reflection are both equal to zero.



Perpendicular Or Normal Ray of Light

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Question # 6

For what position of an object a real and diminished image is formed by a concave mirror?

Answer:

Position would be beyond the centre of curvature.

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Question # 7

What is lateral inversion? Explain by giving a suitable example.

Answer:

When an object is placed in front of a plane mirror, then the right side of the object appears to become the left side of the image, and the left side of the object appears to become the right side of the image. This called lateral inversion.

Example:

REFRIGERATOR

REFRIGERATOR

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Question # 8

State the spherical mirror which can produce a real and diminished image of an object?

Answer:

Concave mirror

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Question # 9

State the spherical mirror which can produce a virtual and diminished image of an object

Answer:

Convex mirror

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Question # 10

Give two uses of concave mirrors. Explain why you would choose for these uses.

Answer:

1. Concave mirror are used as shaving mirrors.
   Explanation:
   This is because when the face is placed close to a concave mirror ,the concave mirror produces a magnified and erect image of the face.
2. Concave mirrors are used by dentists to see the large image of the teeth of patients.
   Explanation:
   This is because when a tooth is within the focus of a concave mirror, then an enlarged image of the tooth is seen in the mirror. Due to this, it becomes easier to locate the defect in the tooth.

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Question # 11

Give two uses of plane mirrors Explain why you would choose for these uses.

Answer:

1. Plane mirrors are used to see ourselves. Example mirror on our dressing table is plane mirror.
2. Inside the walls of certain shops to make them look bigger.
3. Plane mirrors are used to make periscopes.

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Question # 12

Give two uses of convex mirrors. Explain why you would choose for these uses.

Answer:

Two uses of convex mirrors:

1. A convex mirror is used as a rear view mirror in vehicles because it form erect and diminished images of the objects and has a wider field of view.

2. Big convex mirror are used as security mirror in shops so that a large number of goods displayed in the shop can be seen in the convex mirror.

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Question # 13

What kind of mirrors are used in big shopping centres to watch the activities of the customers?

Answer:

Convex mirrors because convex mirror have large field of view.

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Question # 14

Distinguish between a plane mirrors and spherical mirrors.

Answer:

Plane mirror always forms virtual image , of the same size and at the same distance from the mirror as that of the object but spherical mirrors form both real and virtual images and the size and distance of the image varies.

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Question # 15

Explain if a driver has one convex and one plane rear-view mirror, how would the images in each mirror appear different?

Answer:

The image formed in the convex rear view mirror will be smaller than those formed in the plane rear view mirror.

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Question # 16

Write the relation between object distance image distance and focal length of a spherical mirror (concave mirror or convex mirror)

Answer:

For a spherical mirror, the principal focus (F) lies exactly mid-way between the pole (P) and centre of curvature (C). So the focal length (f) of a spherical mirror is equal to half of its radius of curvature (R).

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Question # 17

Explain why a driver prefers to use a convex mirror as a rear - view mirror in vehicle?

Answer:

Drivers use convex mirror as a rear view because convex mirror enables a driver to view large area of the traffic behind him. Convex mirror forms very small image than the object.

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Question # 18

What is the advantage and disadvantage of using a convex mirror?

Answer:

Advantages :-

1) The rear view in mirror is diminished means small in size.
2) Due to formation of diminished image the view become wider.
3) The nature of image is virtual and erect.

Disadvantages :-

1) Objects in the mirror are closer than they appear.
2) This is due formation of diminished image in the mirror.

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Question # 19

State the signs (positive or negative) which can be given to the following and giving reasons:

a) Object distance (u) for a concave mirror or convex mirror.

b) Image distances (v) for a concave mirror or a convex mirror

Answer:

(a) Negtive

(b) In case of a concave mirror, if the image is formed on the left side of the mirror, then the image distance (v) will be **Negative** and if the image is formed on the right side of the mirror, then the image distance (v) will be **Positive.**

(c) Positive

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Question # 20

Which kind of mirror is used in the headlights of a car? Why is it used for this purpose?

Answer:

Concave mirror because when a lighted bulb is placed at the focus of a concave mirror reflector, then the diverging light rays of the bulb are collected by the reflector to produce a strong, parallel-sided beam of light .

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Question # 21

Explain why, a ray of light passing through the centre of curvature of a concave mirror gets reflected back along the same path

Answer:

When a ray of light passes through the centre of curvature of a concave mirror gets reflected back along the same path as it falls normally on the mirror surface;

so $\angle i = \angle r = 0^o$

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Question # 22

If an object is placed at a distance of 16 cm in from of a plane mirror, how far would it be from its image?

Answer:

16 cm

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Question # 23

A body 10 cm from a spherical mirror gives rise to virtual image 7.5 cm behind the mirror Determine the magnification of the image and the type of mirror used.

Answer:

$$u = -10cm$$

$$v = 7.5\ cm\ (Virtual\ Image)$$

$$Magnification = -\frac{v}{u} = -\frac{7.5}{-10} = \frac{3}{4}$$

The mirror used is of convex type.

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Question # 24

A body is placed 16 cm from

(a) a converging mirror, and

(b) a diverging mirror of radius of curvature 20 cm Calculate the image position and magnification in each case.

Answer:

(a) Object distance = u = -16 cm

Radius of curvature = R = - 20 m ; $f = \frac{R}{2} = -\frac{20}{2} = -10$ cm

Using mirror formula for converging mirror,

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{v} + \frac{1}{-16} = \frac{1}{-10}$$

$$\frac{1}{v} = -\frac{1}{10} + \frac{1}{16} = -\frac{3}{80}$$

$$v = -\frac{80}{3}\ cm$$

The image is formed 30 cm in front of converging mirror;

Magnification, $m = -\frac{v}{u} = -\frac{-\frac{80}{3}}{-16} = -\frac{5}{3}$

So image is real, inverted and large in size.

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Part (b)

For diverging mirror,

Object distance = u = -16 cm

Focal length = f = 10 cm

Using mirror formula for diverging mirror,

$$\frac{1}{v}+\frac{1}{u}=\frac{1}{f}$$

$$\frac{1}{v}+\frac{1}{-16}=\frac{1}{10}$$

$$\frac{1}{v}=\frac{1}{10}+\frac{1}{16}=\frac{8+5}{80}=\frac{13}{80}$$

$$v=\frac{80}{13}\ cm$$

Magnification, $m=-\frac{v}{u}=-\frac{\frac{80}{3}}{-16}=+\frac{5}{13}$

So image is virtual, erect and small in size.

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Question # 25

If a body of 12 cm height is placed at a distance of 25cm from a concave mirror of focal length 10 cm, find the position, nature and height of the image.*

Answer:

Object distance = u = -25 cm

Focal length of concave mirror = f = -10 cm

$$\frac{1}{v}+\frac{1}{u}=\frac{1}{f}$$

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

$$\frac{1}{v}=-\frac{1}{10}+\frac{1}{25}=\frac{-5+2}{50}=-\frac{3}{50}$$

$$v=-\frac{50}{3}=-16.6$$

$$Magnification => -\frac{h_i}{h_o}=-\frac{v}{u}$$

$$\frac{h_i}{h_o}=-\frac{v}{u}$$

$$\frac{h_i}{12}=-\frac{-\frac{50}{3}}{-12}$$

$$h_i=-\frac{50}{3}$$

Image formed is real and inverted.

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Question # 26

A girl stands 8 m in front of a large plane mirror. How far must she walk before she is 4 m away from her image?

Answer:

Initially, the distance between the man and the mirror is 10m. So, the distance between man and image is 8+8 = 16 m.
Distance between the man and his image is 4m when the man is 2 m away from the mirror.
Therefore, he has to walk 8m – 2m = 6m towards the mirror.

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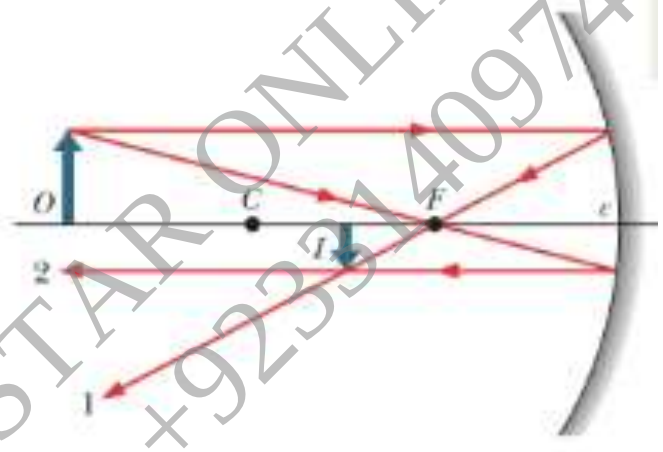
Question # 27

Draw a ray diagram showing how a concave mirror can be used to produce a real, inverted and diminished image of an object.

Answer:



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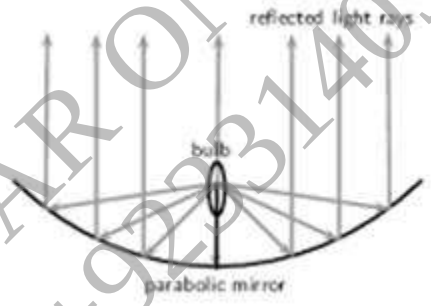
Question # 28

Which mirror is used as a torch reflector? Draw a labeled diagram to show how torch reflector can be used to produce a parallel beam of light. Where is the bulb placed in relation to the torch reflector?

Answer:

For a torch reflector concave mirror is used.



Bulb is placed at the focus of the torch reflector.

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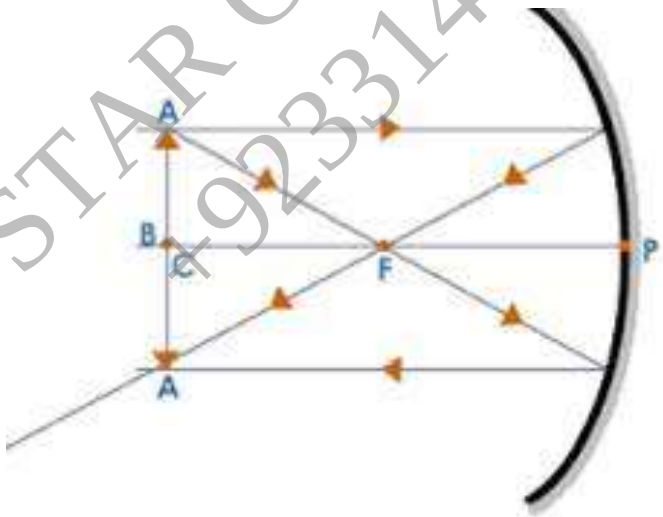
Question # 29

With the help of a ray diagram determine the position, nature and size of the image formed of an object placed at the centre of curvature of a concave mirror.

Answer: When an object is placed at the centre of curvature of a concave mirror, the image formed is at the centre of curvature, is real and inverted and is of same size as the object.



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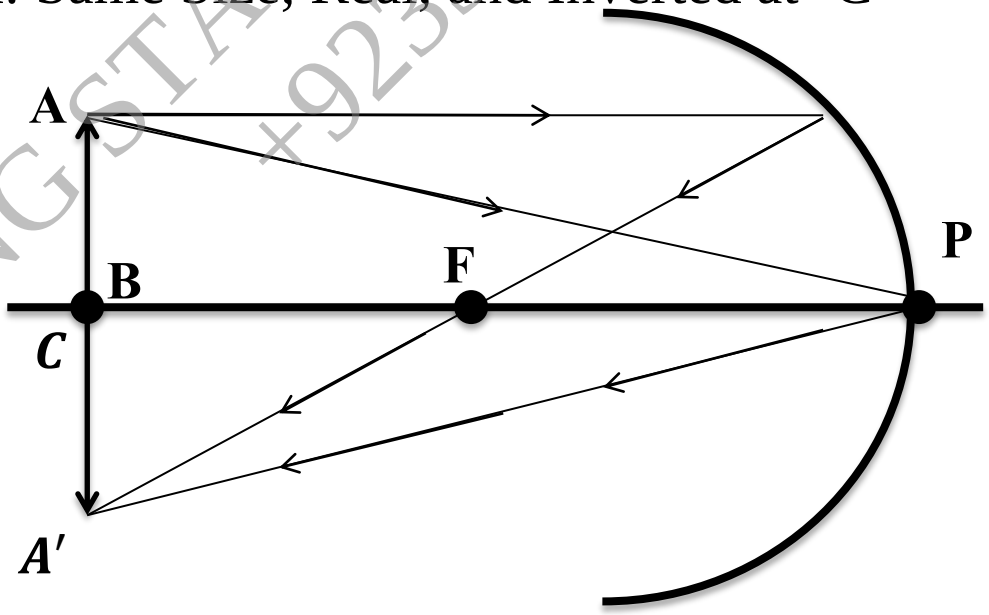
Question # 30

Explain with a suitable diagram, how a concave mirror converges a parallel beam of light rays. Mark clearly the pole, focus and centre of curvature.

a) Draw the following diagram in your answer book and show the formation of image of the object AB with the help of suitable rays.



Solution: Same Size, Real, and Inverted at 'C'



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b) Draw the following diagram in your answer book and show the formation of Image with the help of suitable rays. Object?

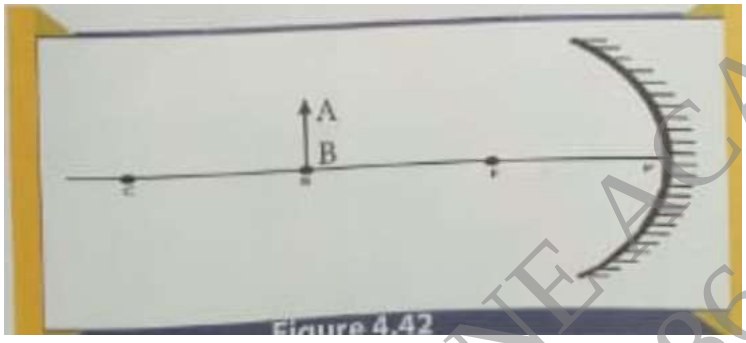
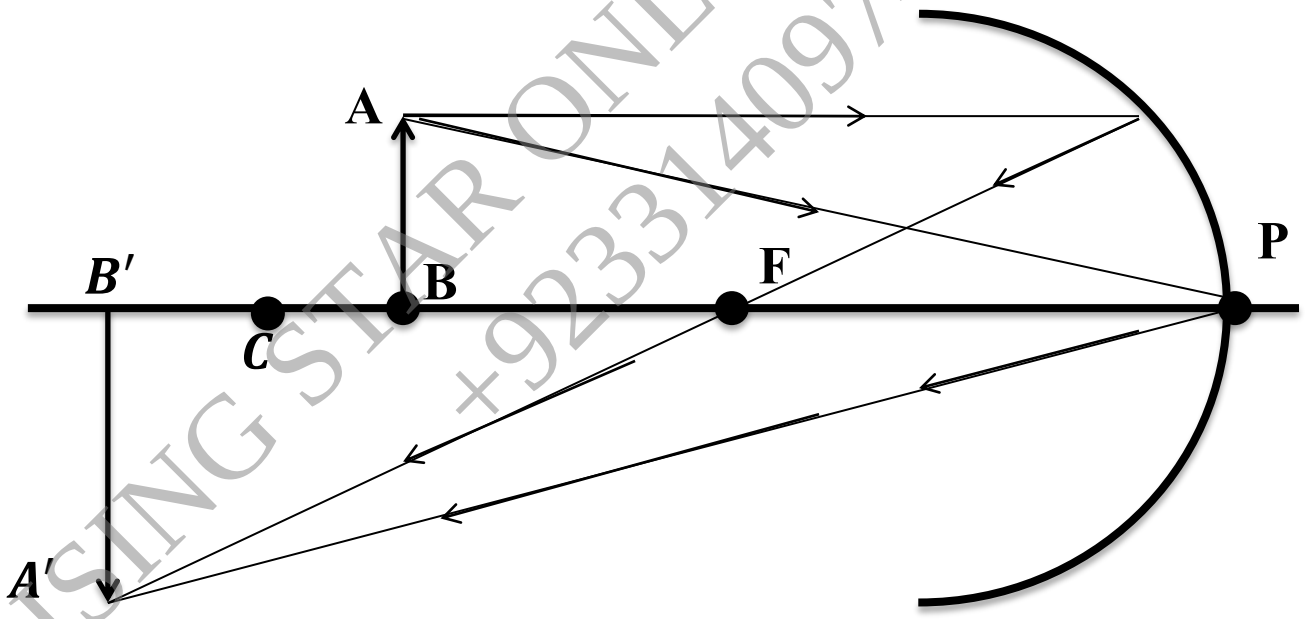


Figure 4.42

Solution:Large Size, Real, Inverted and Beyond 'C'.



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