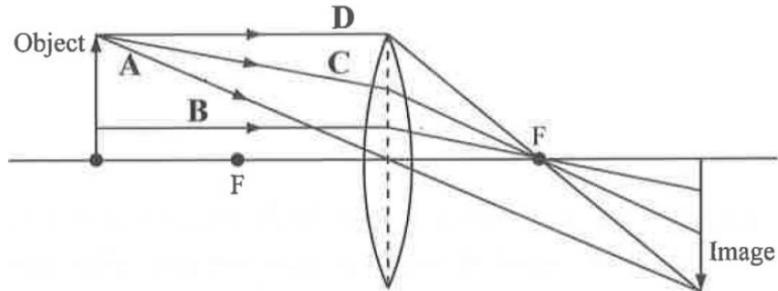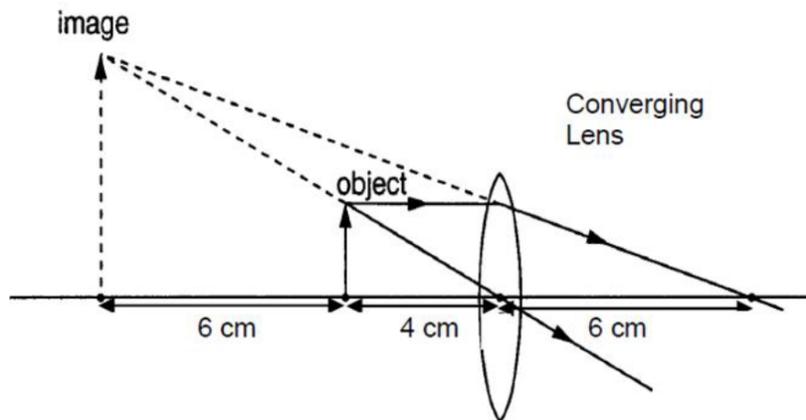# Lenses

1 The diagram shows a thin converging lens used to form an image.
Which ray is drawn incorrectly?

2 The figure below shows a converging lens used as a magnifying glass when the object is at 4 cm from the centre of the lens. The diagram is not drawn to scale.

Which of the following correctly describes the characteristics of the image when the object is now placed 12 cm away from the lens?

A	diminished	**B**	magnified
C	same size	**D**	virtual

3 A thin converging lens of focal length 15 cm forms a real, inverted and magnified image of an object placed at a distance u from the lens.
What are the possible values of u?

I. 15 cm
II. 20 cm
III. 25 cm
IV. 30 cm

A	I and II	**B**	II and III	**C**	I, II and III	**D**	III and IV

4   Michelle was conducting the following experiment in a Physics lab. She shifted the lens from position Q to the illuminated object. As she shifted the lens, she observed the first image formed on the screen.
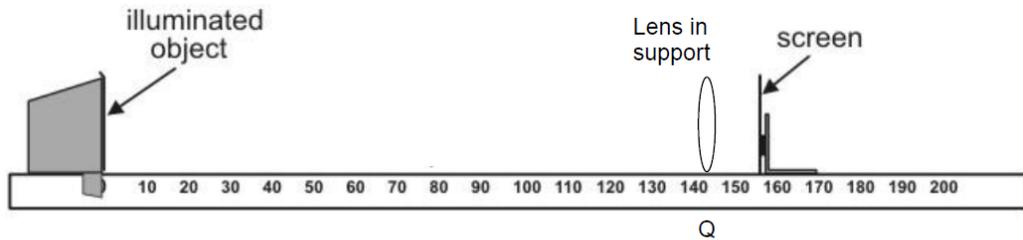
What would be the change in the image formed on the screen as Michelle continued to shift the lens?

A   The second image became bigger.
B   The second image became smaller.
C   The second image became upright.
D   The second image could not be formed on the screen.

5   The diagram shows a parallel, cylindrical light beam of diameter *d* incident on a thin converging lens. A screen is placed a distance equal to two focal lengths 2*f* from the lens.
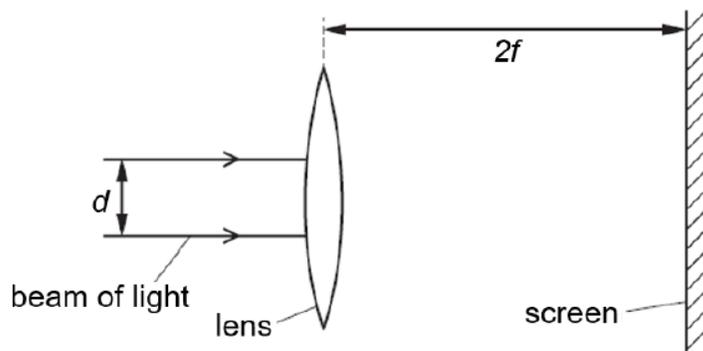
Which diagram shows the size of the spot of light seen on the screen?

6 Fig. 5.1 shows an overhead projector that can project pictures printed on a transparency onto an opaque screen. The transparency is first lit by strong light from underneath. The beam, after reflected by a plane mirror set at 45°, is then refracted by a converging Lens A.
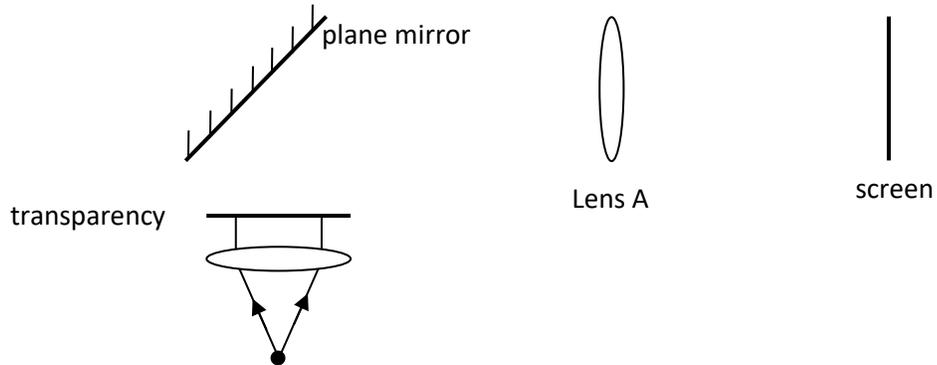

Fig. 5.1

(a) Describe the characteristics of the image formed on the white screen.

……..……………………………………………………………...……….....………………

(b) The object distance is 40 cm. Using the scale given in Fig. 5.2, construct a ray diagram to show how the image is formed by Lens A. The object on the transparency has a height of 20 cm and the image has a magnification of 4. Label clearly the position of the focal point with the point F.
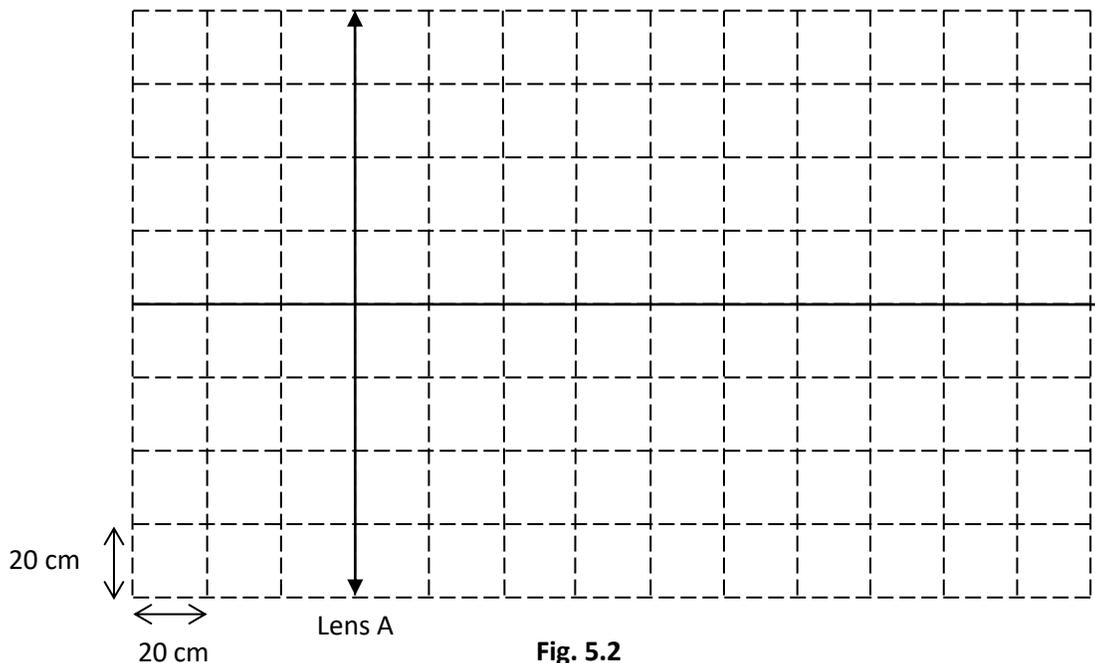

20 cm

Lens A

20 cm

Fig. 5.2

hwq

(c) From the figure above, determine the focal length of the Lens A.

……….………………………………………………….....………..………………

7 An upright image is formed 10 cm from its object using a converging lens. The magnification factor of the lens is 3.0.

2.0 cm

2.0 cm

Fig. 7
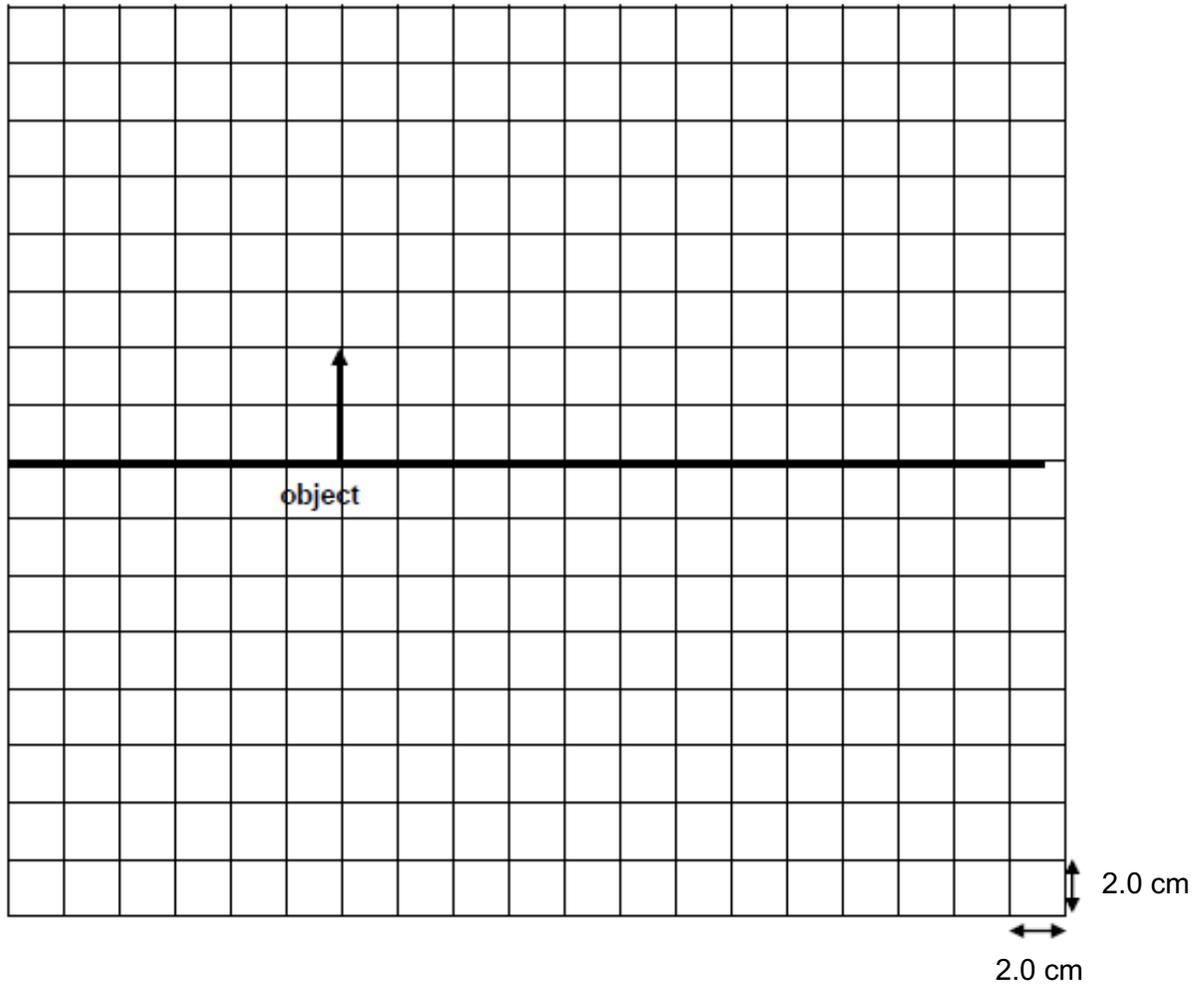
(a) On Fig. 7, draw the position of the image and indicate its size clearly below.

…….………………………………………………………………………………….

(b) On Fig. 7, draw a ray to locate the position of the lens. Label it as **L**.

(c) On Fig. 7, draw a ray to locate the position of the focal point. Label it as F. State the focal length of the lens used.

………………………………………………………………………………….

8 **(a)** Fig. 6.1 shows a graph of the image distance against object distance for a thin converging lens. An image of the same size is produced when an object is placed two focal lengths away from the lens.
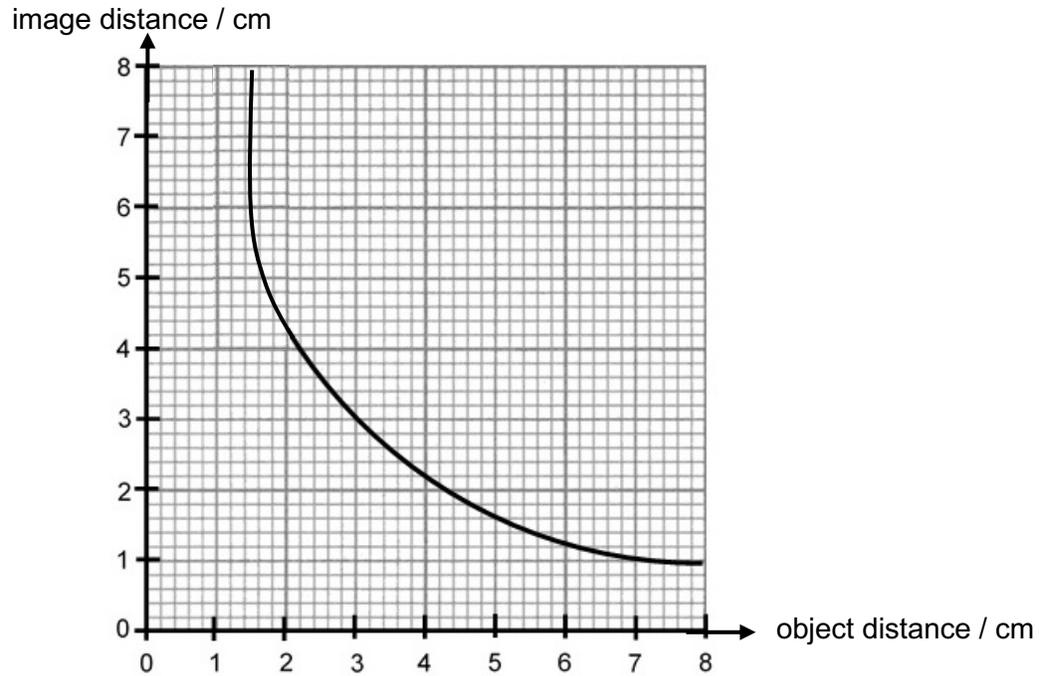
image distance / cm

Fig. 6.1

(i) Determine the focal length of the lens.

(ii) Determine the magnification of the lens when the object is placed at 6.0 cm away from the lens.

(b) Fig. 6.2 shows object **AB**, placed in front of a thin converging lens. **F** is the principal focus (focal point) of the lens.
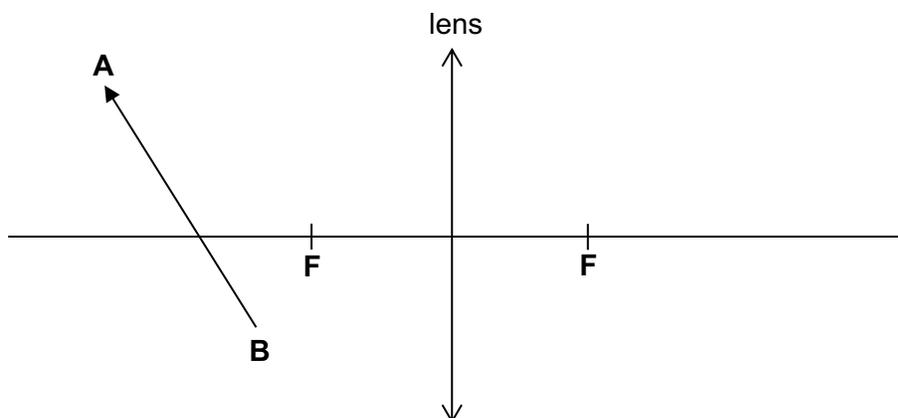

Fig. 6.2

On Fig. 6.2, draw rays to determine the position of the image **AB**. Draw and label the image as **A'B'**.

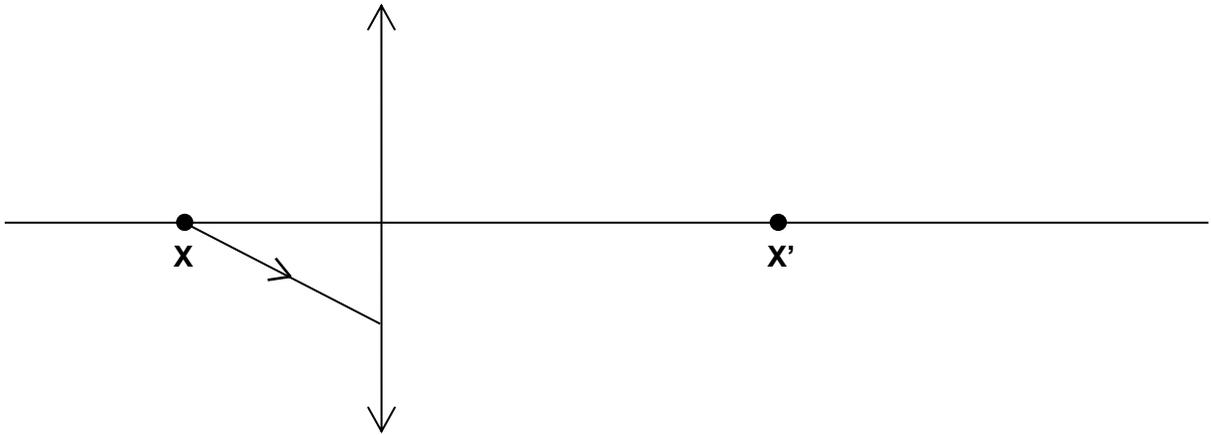**9** Fig. 12.2 shows a thin converging lens being used to produce an image **X'** of an object **X**.


Fig. 12.2

(a) Complete the path of the light ray on Fig. 12.2 after the light ray passes through the converging lens.

(b) Determine the position of the focal point of the lens and indicate its position **F** on Fig. 12.2.

(c) State two properties of the image formed at **X'**.

....

....

(d) The converging lens is moved further away from the object.

Describe a change to the properties of the image formed.

....

....

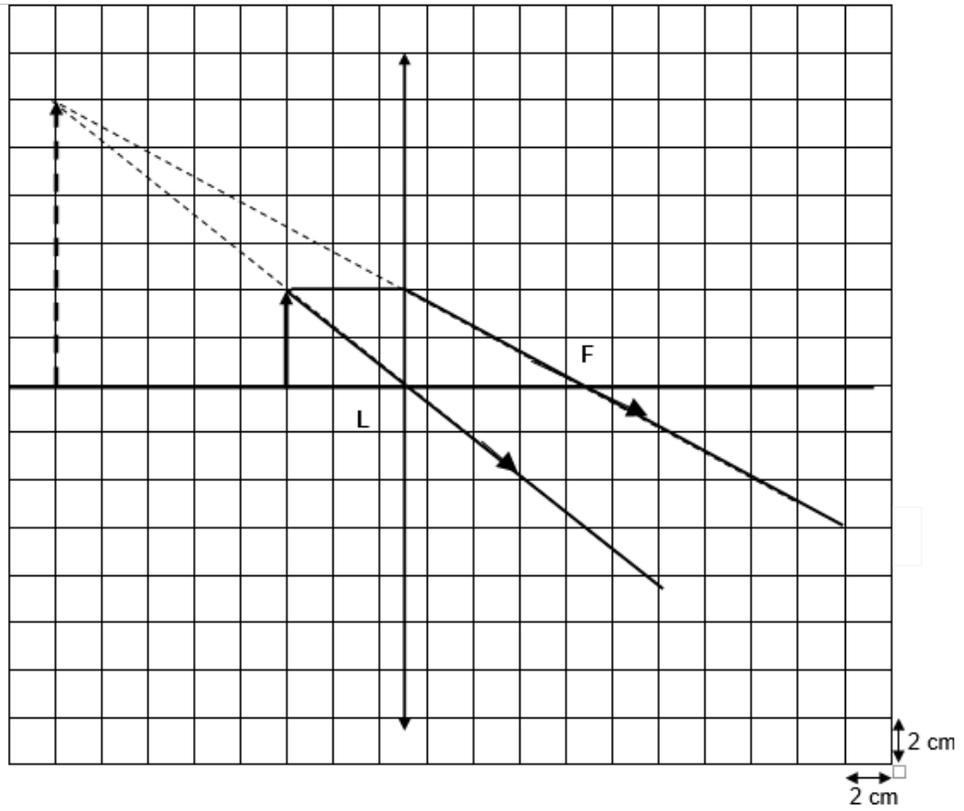**Answers**

CCBAC

6   (a)   The image is real, inverted and magnified.

(b)

20 cm
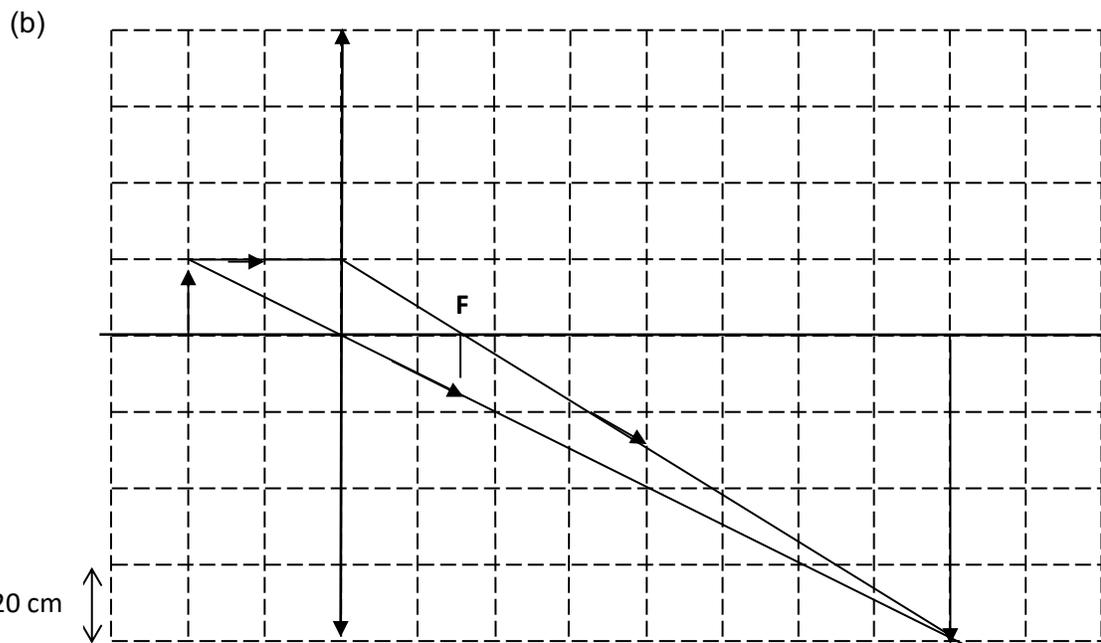
(c)   About 30 cm

7

Size of image = 12 cm
Focal length = 8 cm

8   (a)   (i)   1.5 cm
          (ii)   0.20

     (b)

Fig. 5.3

9   (a) – (b)

converging lens

principal axis

F

X

X'
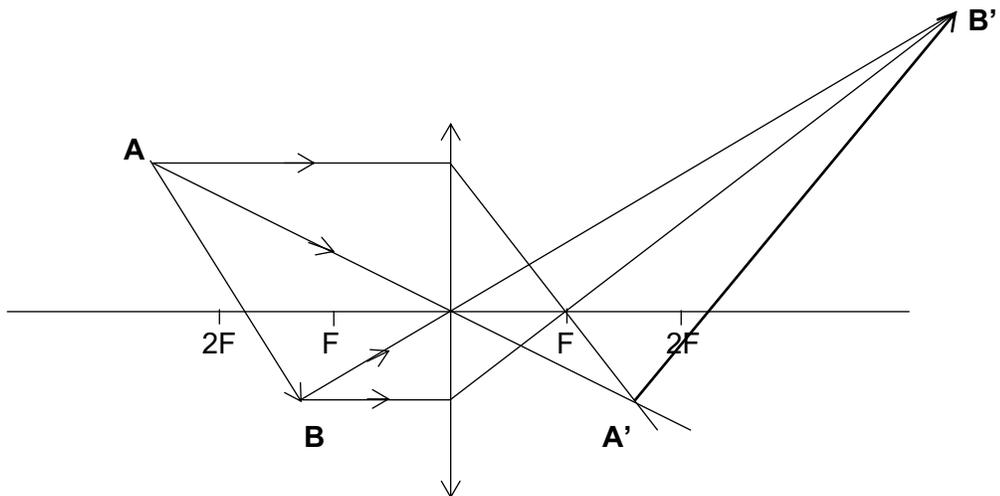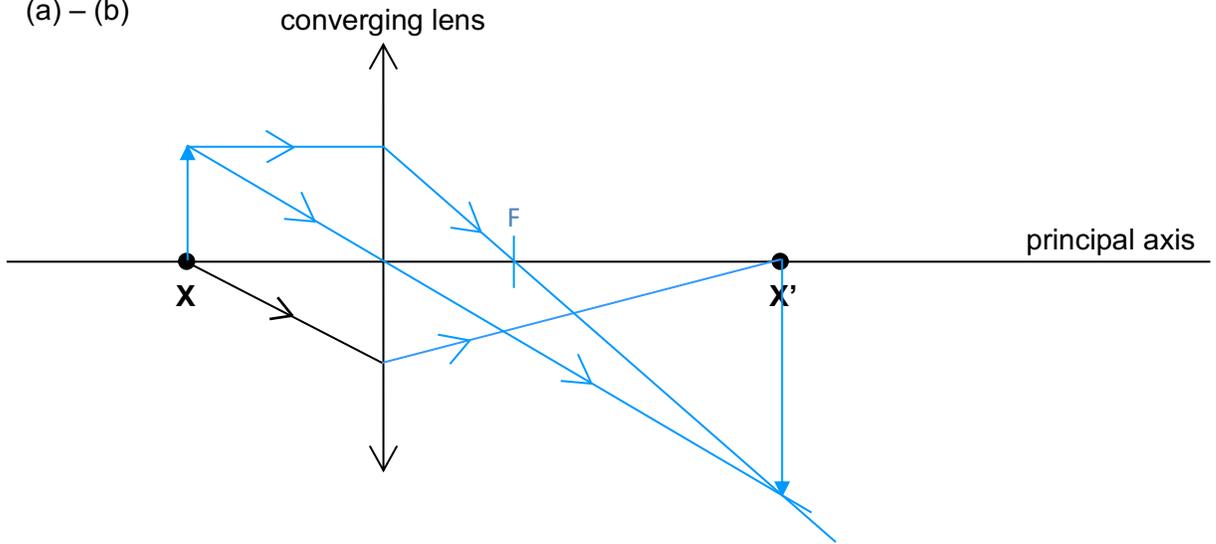
(c)   Inverted/ real/ magnified

(d)   The image becomes smaller
       OR
       Image is formed nearer to the lens.