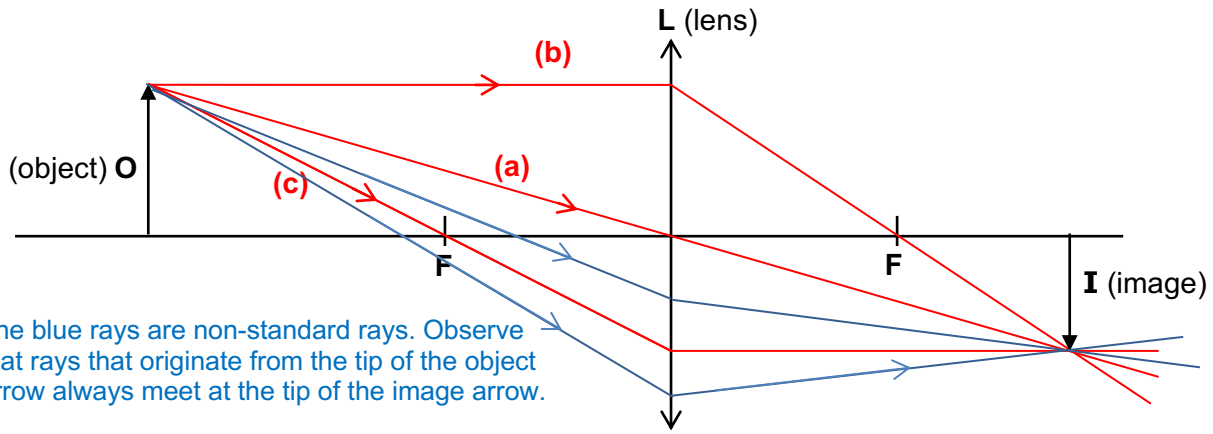
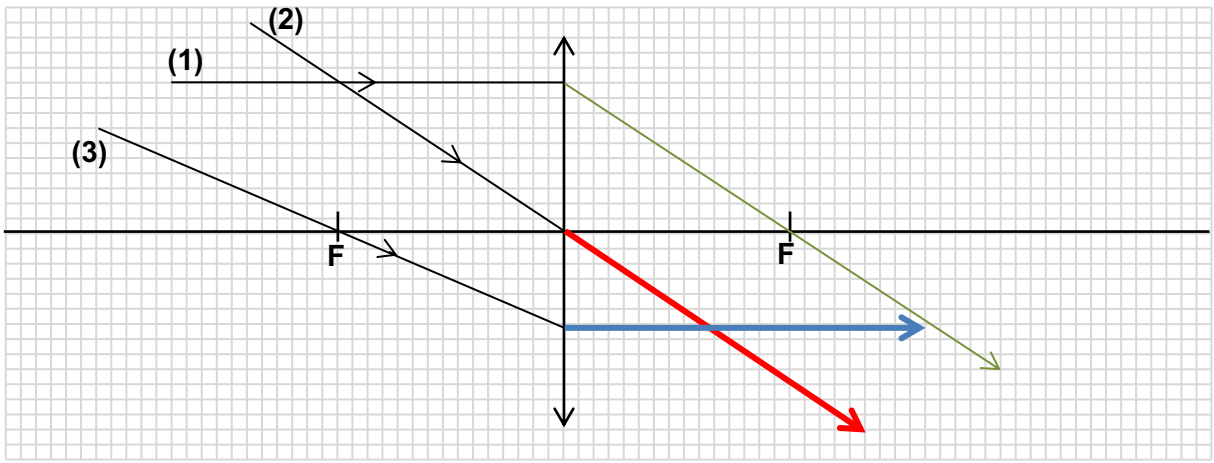
2025 Sec 3 Physics Notes Answers
Chapter 4 Lenses

Example 1

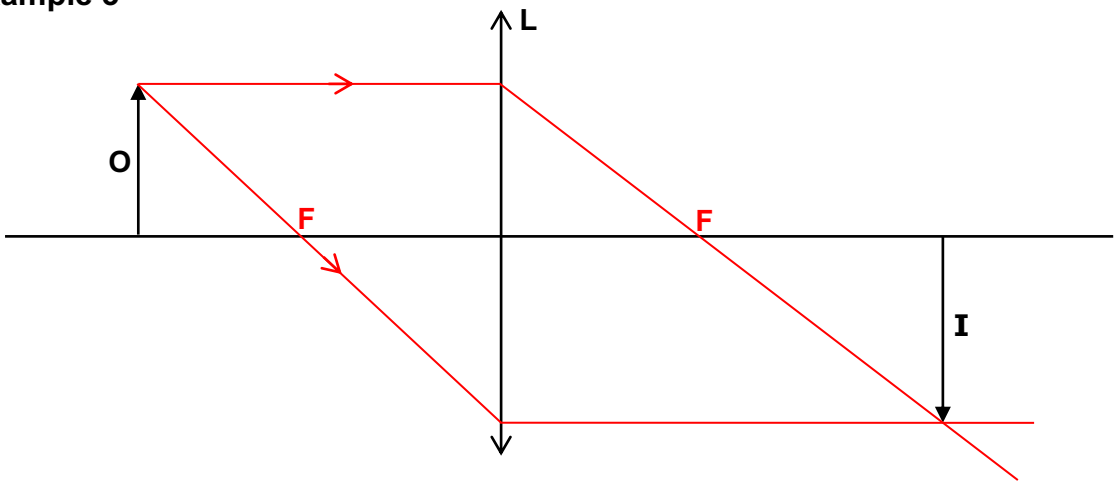


The blue rays are non-standard rays. Observe that rays that originate from the tip of the object arrow always meet at the tip of the image arrow.

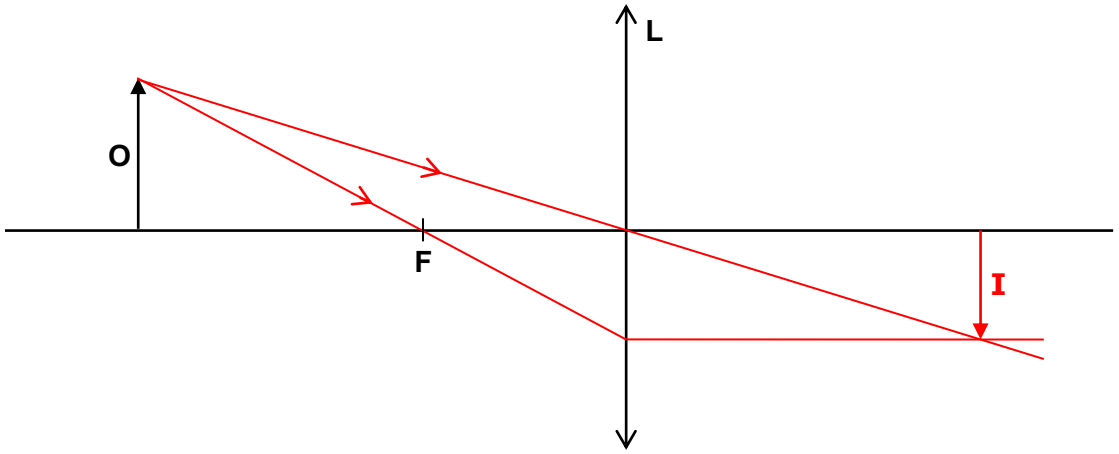
Example 2



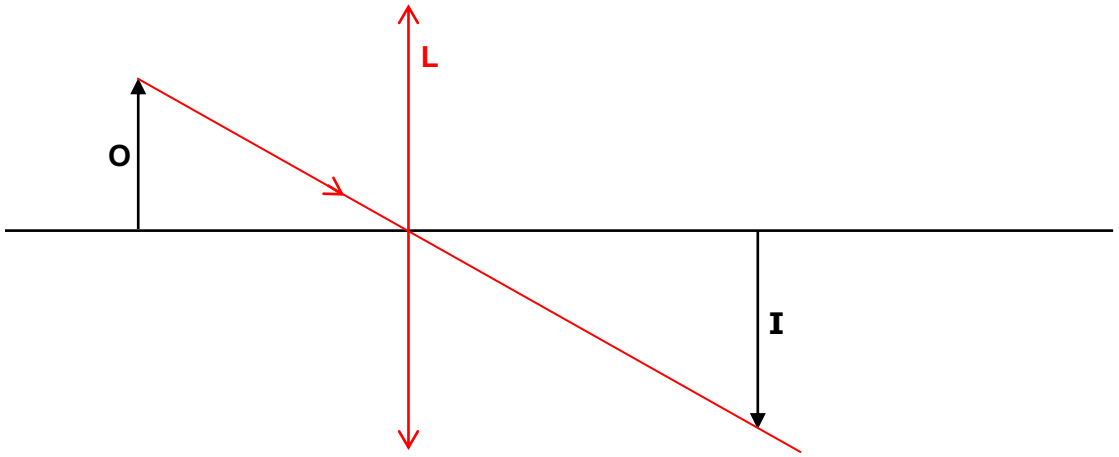
Example 3



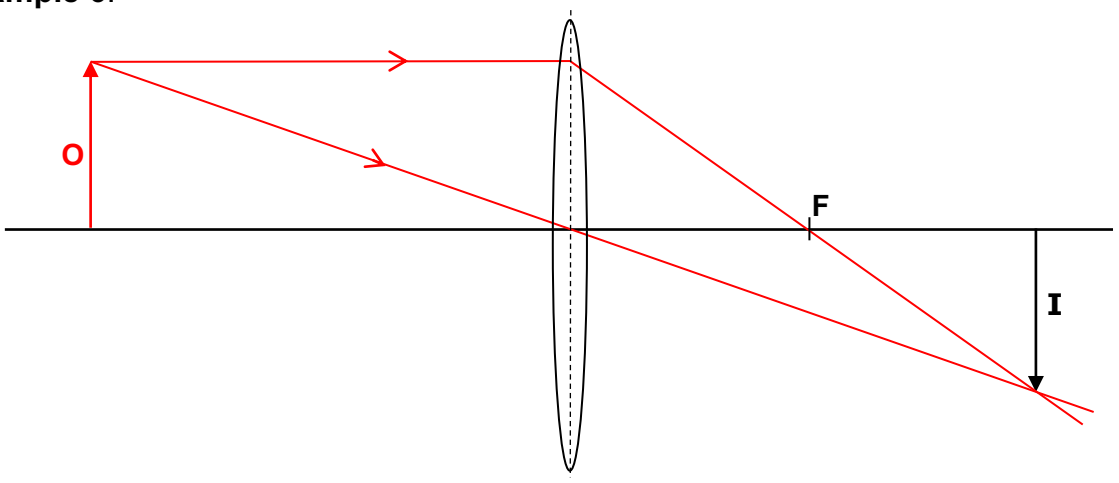
Example 4:



Example 5:



Example 6:



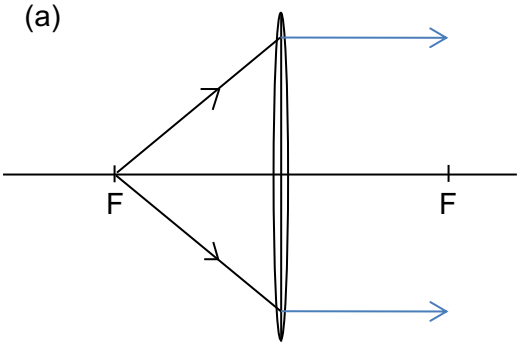
Exercises

1 (a) It bends the light rays towards the principal axis.

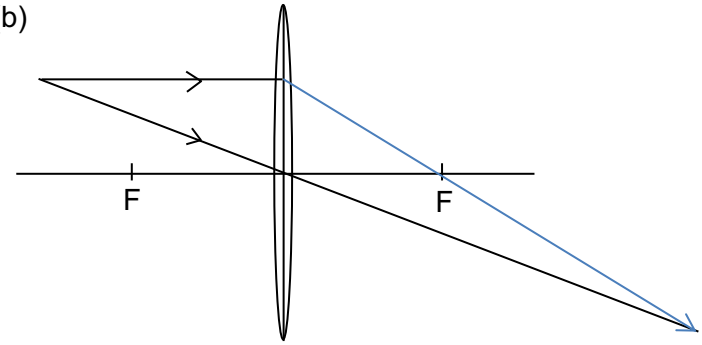
(b) It bends light rays away from the principal axis.

(c) Light rays from the same point O on an object can converge and meet at a common point I (image). I lies on the principal axis provided O lies on the principal axis.

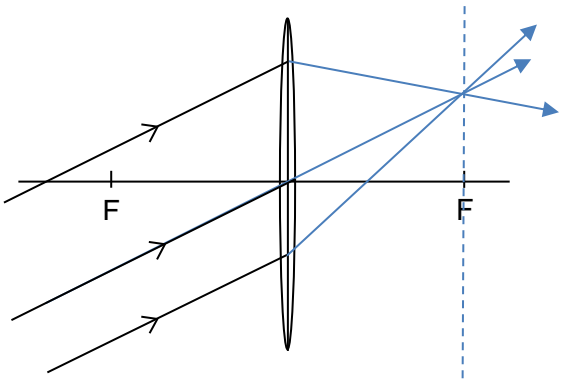
2 (a)



(b)



(c)



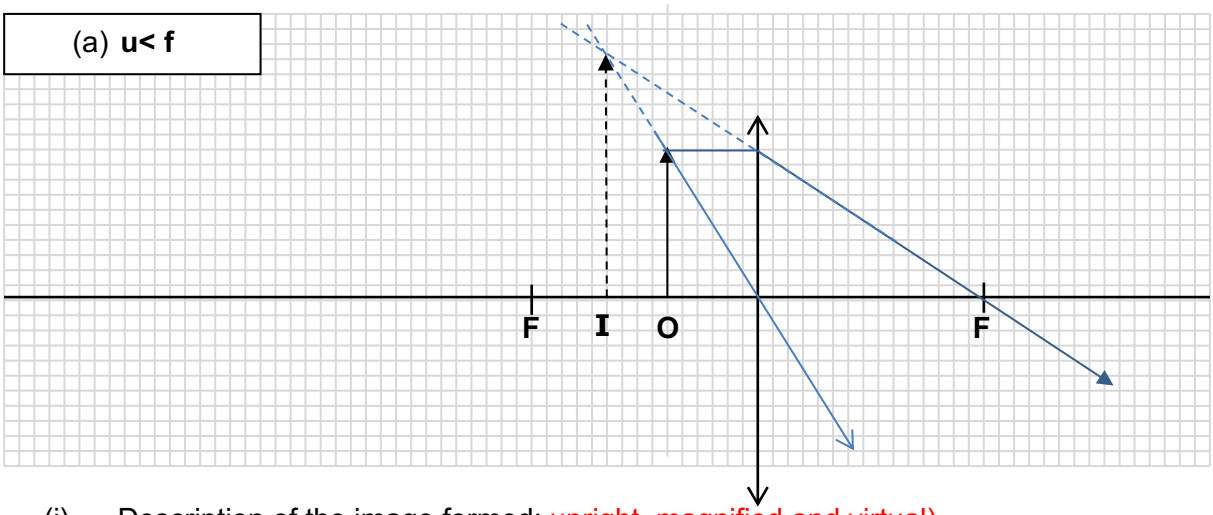
3 The entire image will still be visible but will be less bright.

7 Description of image

when m is greater than 1, the image is magnified
when m is less than 1, the image is diminished
when m is equal to 1, the image is of the same size

Example 7

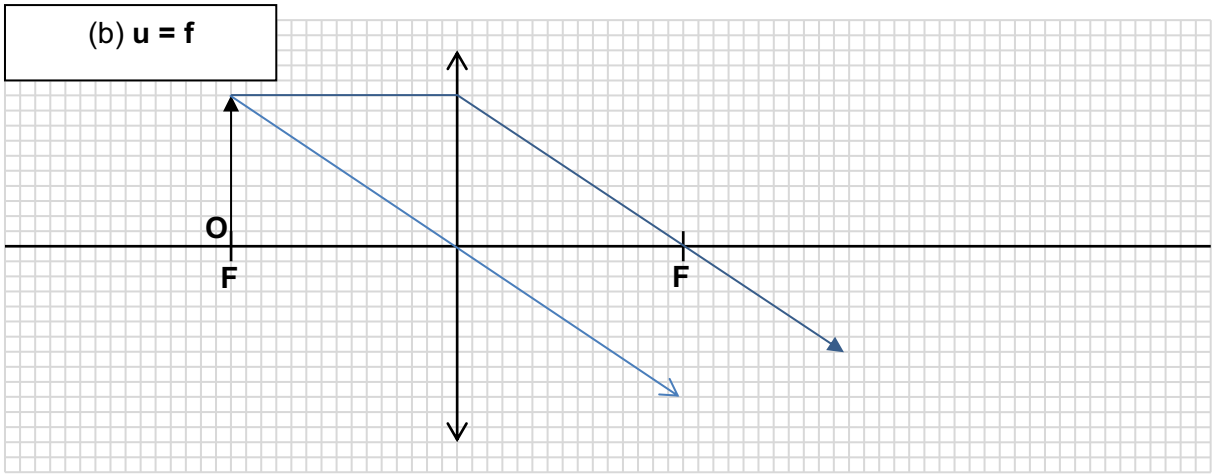
(a) **u< f**



(i) Description of the image formed: upright, magnified and virtual)

(ii) u = 6.0 cm v = 10.0 cm m = 1.67

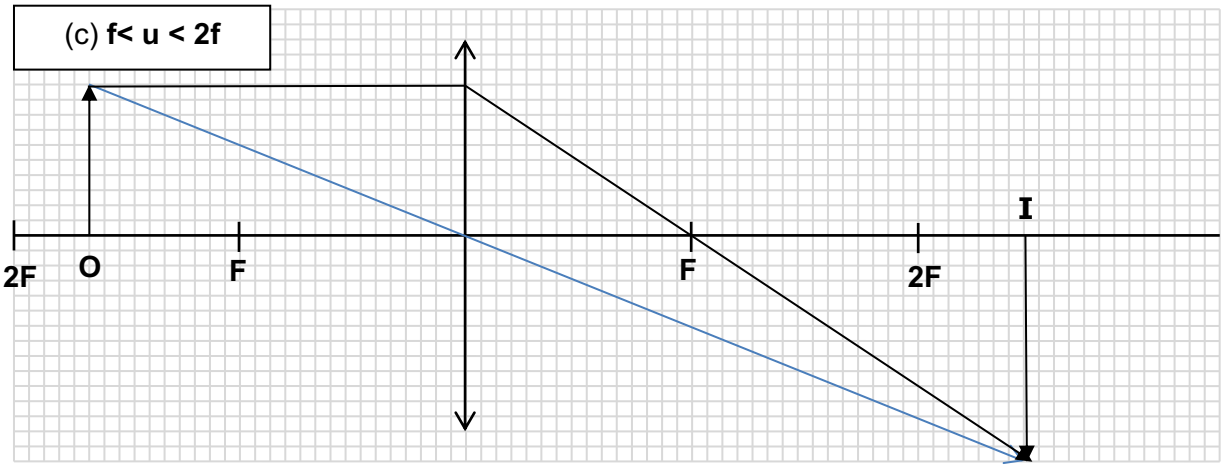
(b) **u = f**



(i) Description of the image formed: magnified, inverted and real

(ii) u = 15.0 cm v = ∞ m = ∞

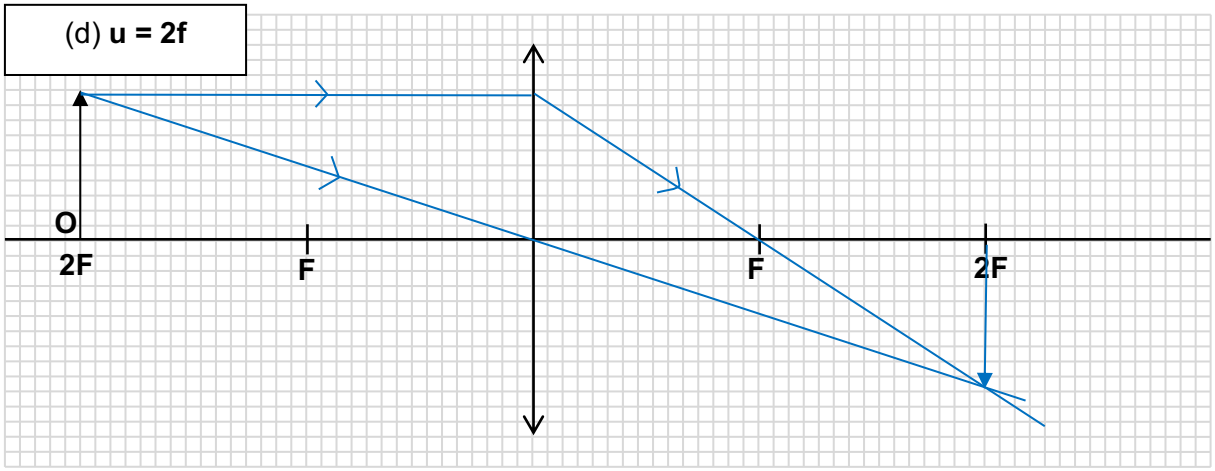
(c) **f< u < 2f**



(i) Description of the image formed: inverted, magnified and real.

(ii) u = 25.0 cm v = 37.5 cm m = .1.50

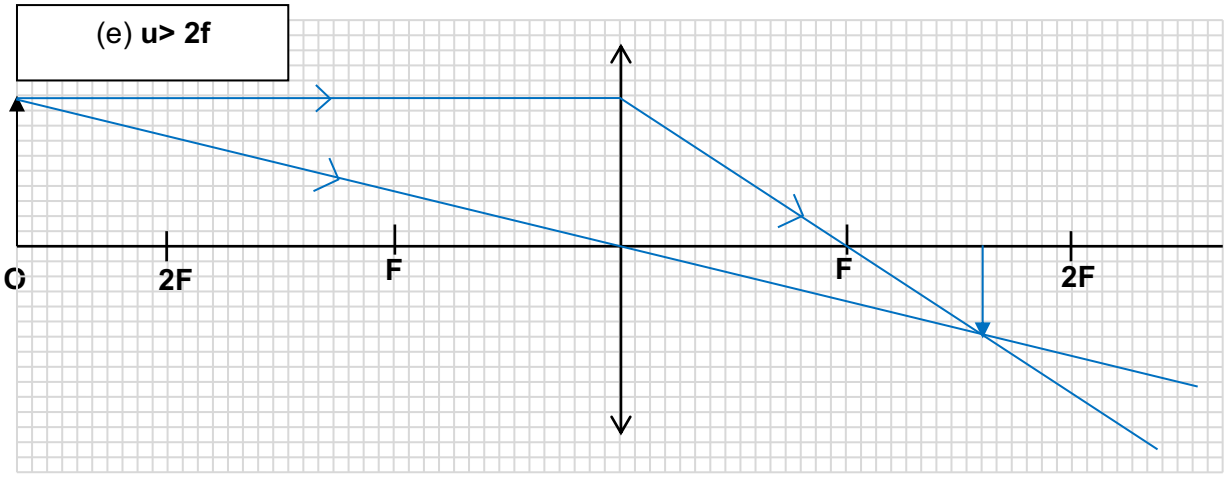
(d) **u = 2f**



(i) Description of the image formed: real, same sized, inverted

(ii) u = 30.0 cm v = 30.0 cm m = 1.00

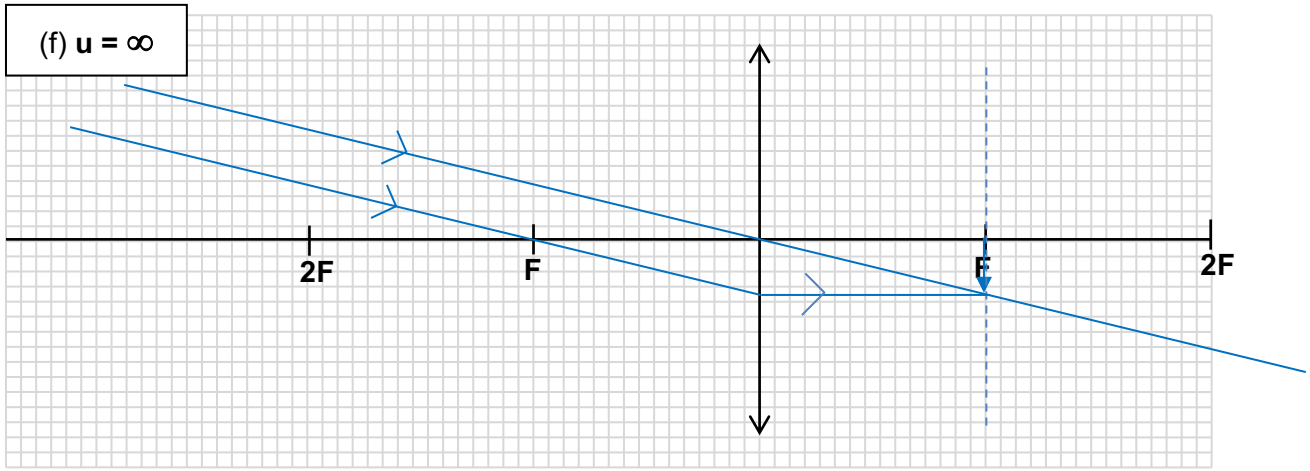
(e) **u> 2f**



(i) Description of the image formed: inverted, diminished, real

(ii) u = 40.0 cm. v = 24.0 cm m = 0.600

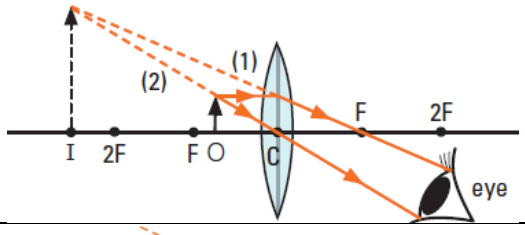
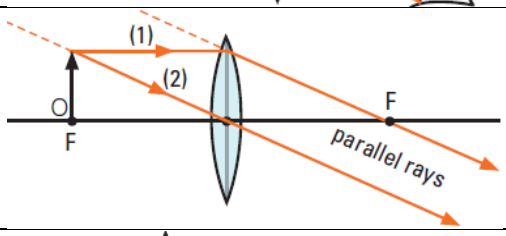
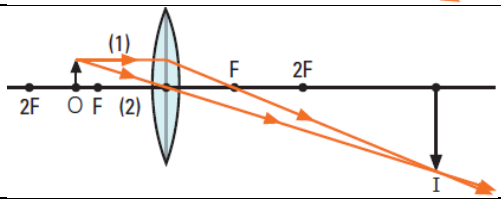
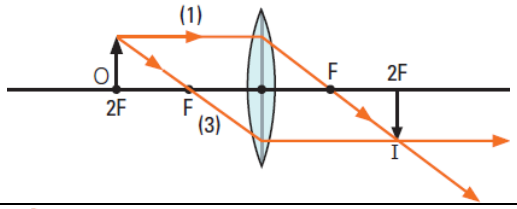
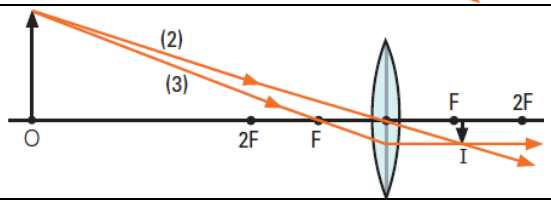
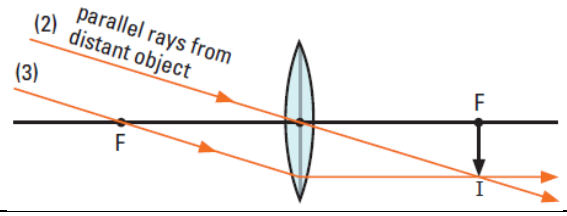
(f) **u = ∞**



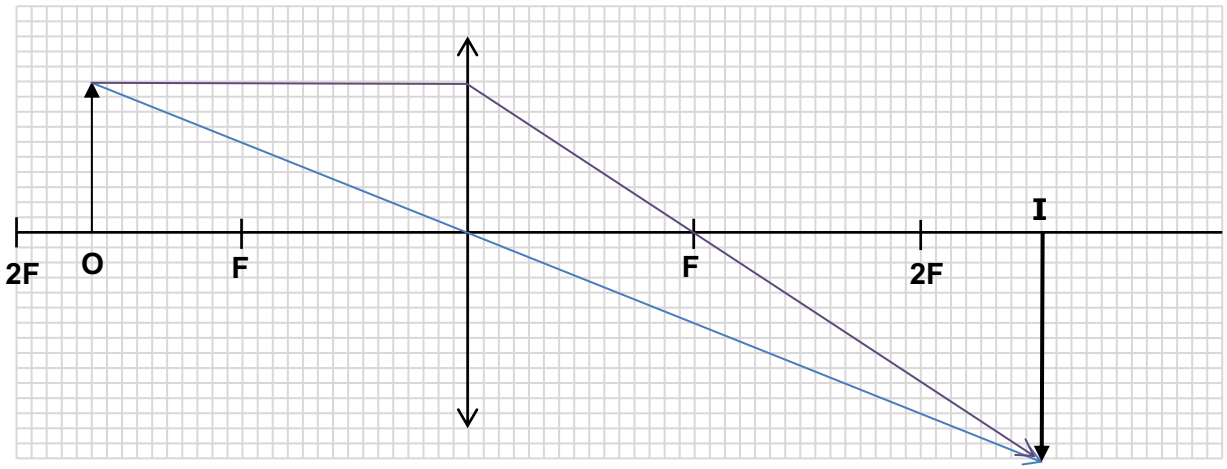
(i) Description of the image formed: real, inverted, diminished

(ii) u = ∞ v = f = 15.0 cm m = N.A.

8 Uses of thin converging lenses (refer textbook on p. 260-261)

Location of object	Ray diagrams	Characteristics of image	Location of image	Uses
u < f		- Virtual - Upright - Magnified	Same side as object	- Magnifying glass
u = f		- Depends on usage	v = ∞	- Spotlight
f < u < 2f		- Real - Inverted - Magnified	2f < v < ∞	- Projector - Photograph enlarger
u = 2f		- Real - Inverted - Same size	v = 2f	- Photocopier making same-sized copy
2f < u < ∞		- Real - Inverted - Diminished	f < v < 2f	- Camera - Eye
u = ∞		- Real - Inverted - Diminished	v = f	- Object lens of a telescope

Example 8

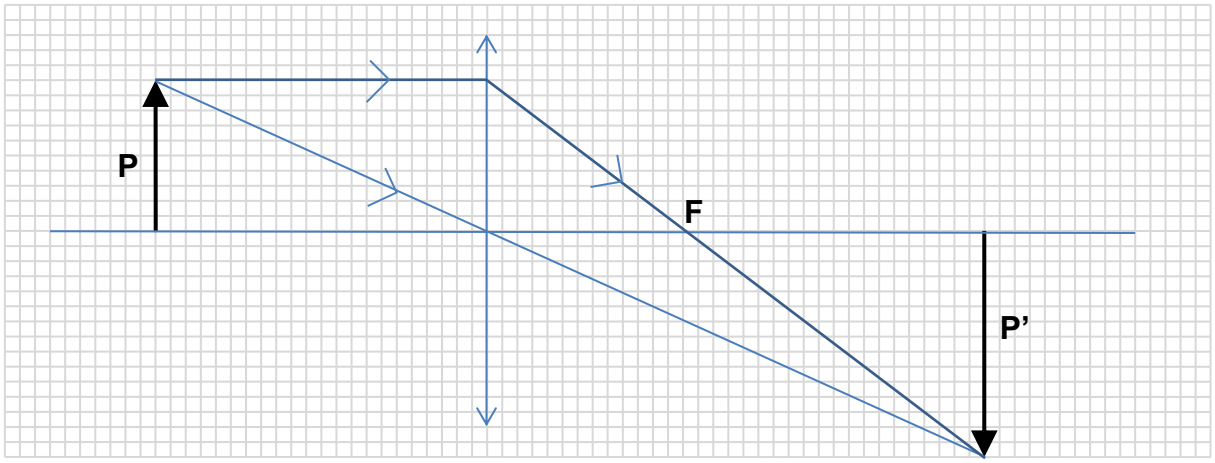


(i) Description of the image formed: real, inverted and magnified.

u = 25.0 cm. v = 37.5 cm m = 1.50

Exercises

1



(a) Draw a ray from **P** to locate the position of the lens, and label the position **L**.

(b) Draw a second ray from **P** to determine the focal length of the lens.

Focal length = 13.0 cm (assuming 1.0 cm:5.0 cm)

(c) The object is then moved slightly further from the lens. State the change to the:

(i) Image position nearer to the optical centre

(ii) the image height shorter

2 A converging lens with a focal length of 20.0 cm is used to create an image of the sun on a paper screen.

How far from the lens must the paper be placed to produce a clear image? Explain with the aid of a sketch of a ray diagram.

The lens must be at a distance of f (20.0 cm). Rays of distant objects (considered to be parallel) will converge along the focal plane. Refer to the ray diagram where u = ∞.