THIN LENSES

1. D

2. A
3. D
4. B
5.D
6.

(a) (i) principal focus unambiguously marked B1
focal length approximately indicated C1
focal length precisely indicated, from pole to principal focus A1
(ii) any ray from X to Y, correctly refracted at lens B1
(b) [mark in pairs, using _ + _ = 0]
real B1
diminished B1
inverted B1
image distance less B1
(c) gets smaller B1
gets closer to lens B1

[Total: 10]

7.

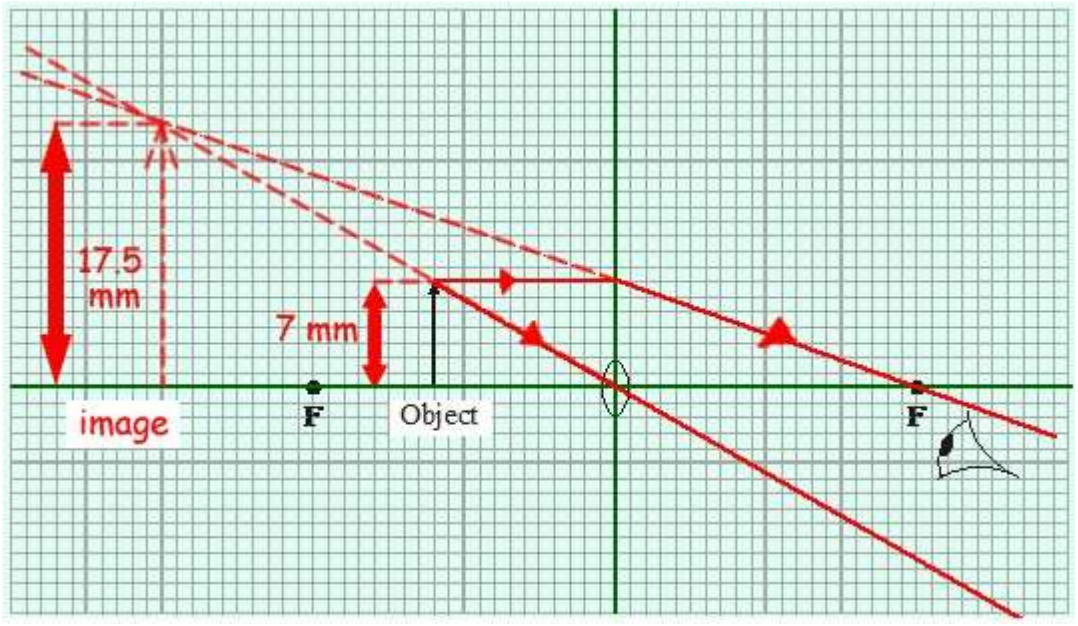
rays completed to retina but would meet behind retina B1

8.

(a) straight line through optical centre by eye M1
one other line from same point on object correctly to image on film A1
(b) move lens towards object/to left/away from film B1

9.

ANS



(a) On the diagram, use a ruler to construct accurately the position and size of the image. You should show how you construct your ray diagram and how light appears to come from the image to the eye.

Ray from object point through pole of the lens (centre of it!) ✓

Ray parallel to the principal axis going through the focal point ✓

Extension lines (dashed lines) for both rays meeting at a point ✓

Image (dashed lines) ✓

(4 marks)

(b) The image is virtual. What is a virtual image?

A virtual image is an image formed by the eye/brain of the observer when the brain assumes that diverging rays entering the eye must have travelled in straight lines from a source.

A virtual image is not real, so it cannot be picked up on a screen - the rays do not cross at the point in is formed at. Instead rays have to be traced back in a straight line to that point. ✓

(1 mark)

(c) Calculate the magnification produced by the lens. Show clearly how you work out your answer.

Magnification = size of image/size of object (see diagram) ✓

= 17.5/7 = 2.5 ✓

(OR Magnification = image distance/object distance = u/v = 30/12 = 2.5)

(2 marks)

(Total 7 marks)