

Exercise walk-through

6.4

Lenses and visible light – physics only (4.6.2.5–4.6.2.6)

AQA · GCSE · Physics

Exercises 2.1·2.3

2.1 An object 2.0 cm high forms an image 6.0 cm high. Calculate the magnification. [2]

2.2 State the difference between the images a convex and a concave lens can form. [2]

2.3 Why does a red object look red in white light, and what does it become in blue light? [2]

3 Exam-style questions

Exercises 2.1·2.3

2.1 An object 2.0 cm high forms an image 6.0 cm high. Calculate the magnification. [2]

2.1 $m = 6.0/2.0 = \mathbf{3.0}$ (C1; no unit stated A1).

2.2 State the difference between the images a convex and a concave lens can form. [2]

2.2 Convex: image can be real or virtual; concave: always virtual.

2.3 Why does a red object look red in white light, and what does it become in blue light? [2]

3 Exam-style questions

2.3 It reflects red wavelengths most strongly and absorbs the rest; in blue light no red is present to reflect, so it absorbs the blue and appears black.

Exercise 3.1

3.1 A student investigates a convex lens.

- (a) Draw a ray diagram for an object beyond the principal focus. Label the image real and inverted. [3]
- (b) The object moves inside the focal length. Describe the new image. [2]
- (c) The image height is 14 mm and magnification is 2.8. Calculate the object height. [2]

Exercise 3.1

3.1 A student investigates a convex lens.

- (a) Draw a ray diagram for an object beyond the principal focus. Label the image real and inverted. [3]
- (b) The object moves inside the focal length. Describe the new image. [2]
- (c) The image height is 14 mm and magnification is 2.8. Calculate the object height. [2]

3.1 (a) Two correct rays (parallel through focus; straight through centre); image located where rays cross, on the far side, upside down; labelled real and inverted. (b) Virtual, upright and magnified on the same side as the object. (c) object height = $14/2.8 = 5.0$ mm (C1, A1).

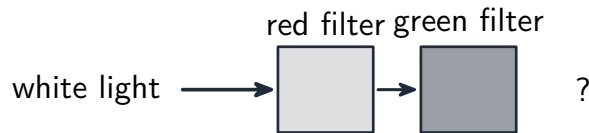
Exercise 3.2

3.2 A gardener views a red flower through green and red filters.

(a) Explain what the flower looks like through each filter. [3]

(b) The leaves look black through the red filter. Explain why. [2]

(c) A shiny leaf differs from a matt leaf in reflection type. Name both types and state which spreads light. [2]



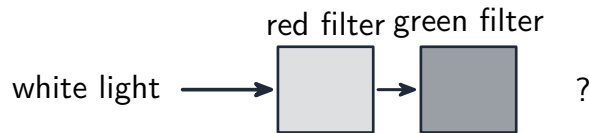
Exercise 3.2

3.2 A gardener views a red flower through green and red filters.

(a) Explain what the flower looks like through each filter. [3]

(b) The leaves look black through the red filter. Explain why. [2]

(c) A shiny leaf differs from a matt leaf in reflection type. Name both types and state which spreads light. [2]



3.2 (a) Through the red filter: red – the filter transmits red and the flower reflects it. Through the green filter: black – the green filter absorbs red, so no light from the flower passes the filter to the eye. (b) Leaves reflect green and absorb red; the red filter transmits only red, which the leaf absorbs – nothing reflects back, so it looks black. (c) Specular and diffuse; diffuse reflection spreads the light.

Exercise 3.3

3.3 A lens system gives magnification 40; the first lens alone gives 5.0.

- (a) Calculate the second lens's magnification. [2]
- (b) An object 0.20 mm wide is viewed. Calculate the final image width in mm. [2]
- (c) State why magnification has no unit, and one advantage of the unitless ratio. [2]

Exercise 3.3

3.3 A lens system gives magnification 40; the first lens alone gives 5.0.

- (a) Calculate the second lens's magnification. [2]
- (b) An object 0.20 mm wide is viewed. Calculate the final image width in mm. [2]
- (c) State why magnification has no unit, and one advantage of the unitless ratio. [2]

3.3 (a) Total $m = 40 = 5.0 \times m_2$ so $m_2 = \mathbf{8.0}$ (C1, A1). (b) $0.20 \times 40 = \mathbf{8.0}$ mm (C1, A1). (c) It is a ratio of two lengths in the same unit, which cancels; advantage: the value is the same in mm or cm, so no unit conversion errors.