

Solutions

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

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

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.

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 = $14/2.8 = \mathbf{5.0}$ mm (C1, A1).

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.

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.