

**Mark scheme for Option A**

- 1 a i** Rod cells are used for vision in low intensity light; cones cells are mostly used in bright daylight.
- Rod cells cannot distinguish coloured objects; cone cells can.
- Rod cells cannot distinguish detail; cone cells can.
- Many rod cells are connected to the same nerve fibre; fewer cone cells are connected to the same nerve fibre. [4]
- ii** The concentration of cones increases as we approach the point on the retina that is crossed by the principal axis of the eye.
- Rod cells are found on the retina far away from the principal axis of the eye. [2]
- b** In low intensity light it is the cones that are primarily responsible for vision.
- And from the graph we see that cone cells are insensitive to red wavelengths. [2]

Exam tip: you **must** mention the first marking point.

- c** The colour of the rose is determined by the light that it reflects.
- Of the incident light, all wavelengths are essentially absorbed except red.
- Hence the rose appears red. [3]
- 2 a i** Accommodation is the ability of the eye to focus at objects at different distances.
- By changing the focal length of the eye lens. [2]
- ii** Accommodation is achieved by contractions of the ciliary muscles attached to the eye lens that change the focal length of the lens.
- When the lens is thicker the eye can focus on nearby objects. [2]
- b i** The ratio of intensities is  $\frac{1200}{2.5 \times 10^{-7}} = 4.8 \times 10^9$ ;
- so the pupil diameter must change by a factor of  $\sqrt{4.8 \times 10^9} \approx 7 \times 10^4$ ; [2]
- ii** The factor just calculated is enormous.
- It is impossible for the eye to affect such a change/another mechanism must be in operation. [2]