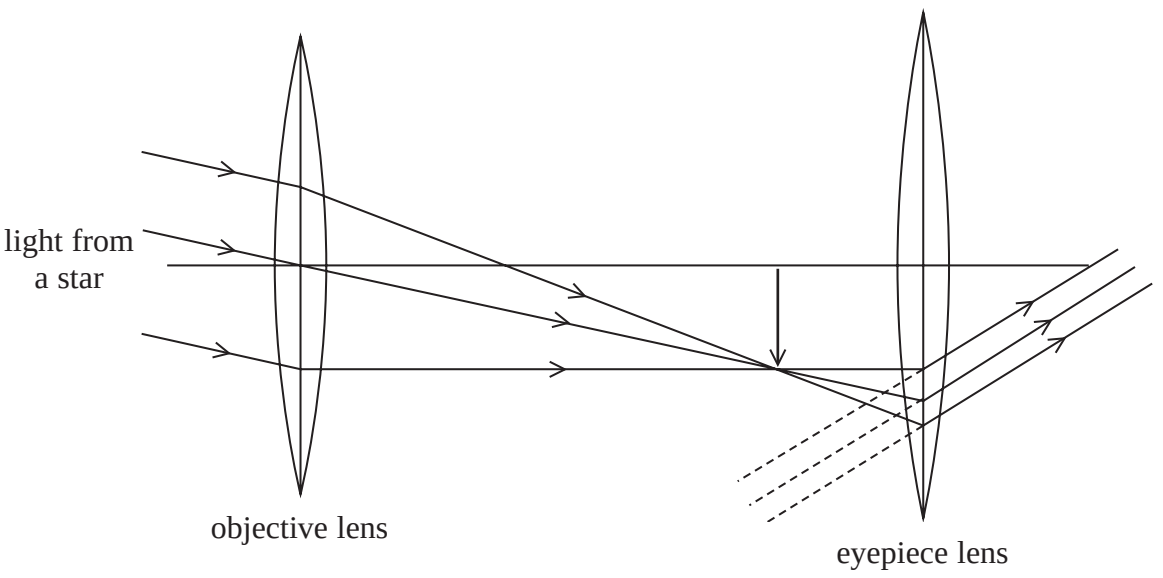
17 A simple astronomical refracting telescope consists of two converging lenses. Light from a star is brought to a focus by the objective lens and then viewed through an eyepiece lens as shown.



(a) (i) In the arrangement shown, the final image is formed at infinity.

Explain why the separation of the objective and eyepiece lenses is equal to the sum of their focal lengths.

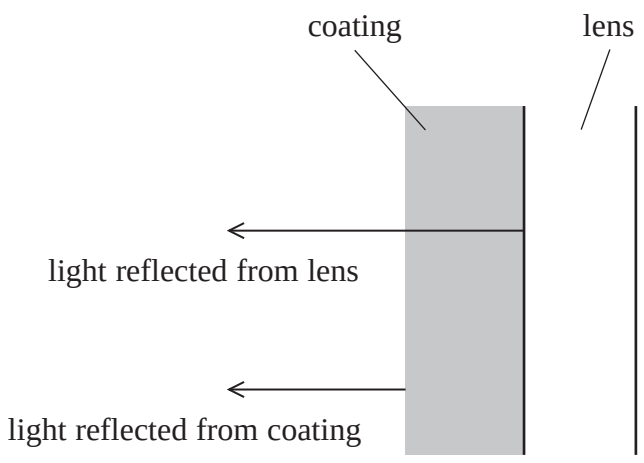
(2)

(ii) State why the final image is inverted.

(1)

(b) Glass lenses used for optical instruments often have an anti-reflective coating. The coating is a thin layer of a transparent substance with refractive index n_c.

Light is reflected from the coating surface and from the lens surface as shown.
The reflected light interferes destructively.



When a single-layer coating is used, the coating thickness is chosen to eliminate reflections for green light, which is in the middle of the visible spectrum.

(i) Calculate the minimum thickness d of the coating required for the reflection of green light to be eliminated.

frequency of green light = 6.00×10^{14} Hz
$n_c = 1.38$

(4)

d = ...

(ii) State why white light reflected from coated lenses is seen as purple.

(1)

(Total for Question 17 = 8 marks)