

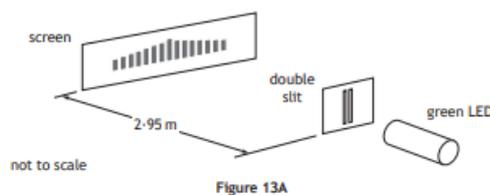


A. Key Concepts

1. Describe what is meant by the term 'coherent'. You should include the word 'Phase'.
2. Describe the conditions for constructive and destructive interference.
3. Describe how optical path difference compares to geometric path difference.
4. Explain what is meant by 'division of amplitude'.
5. How does a wave change when reflected by a more optically dense medium?
6. State the equation for the *minimum* thickness of a non-reflective coating.
7. State the equation to calculate the separation between wedge fringes.
8. Explain the term 'division by wavefront'.
9. State the equation to using when considering problems on division of wavefront.

B. Past Paper Practice

1. A student uses a double slit to produce an interference pattern with green light from an LED. This is shown in Figure 13A.



The LED emits light of wavelength 550 nm. The student makes the following measurements

14 fringe separations	43.4 mm
Distance from slits to screen	2.95 m

- a)
 - i. Determine the distance between the slits. 4
 - ii. Explain why the student measured 14 fringe separations rather than measuring the separation of two adjacent fringes. 1
- b) The student replaces the green LED with an LED that emits red light. 2
 Apart from colour, state how the fringe pattern now observed by the student differs from the pattern produced by the green LED.
 You must justify your answer.
- c) A second student uses a different arrangement to produce an interference pattern. Monochromatic light of wavelength 550 nm is shone onto a soap film at nearly normal incidence. The light is reflected from the soap film and an interference pattern is visible on the film. This arrangement is shown in Figure 13B.

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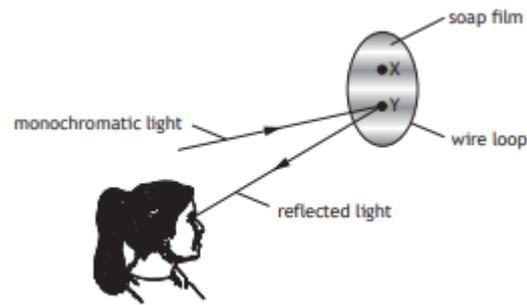
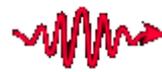


Figure 13B

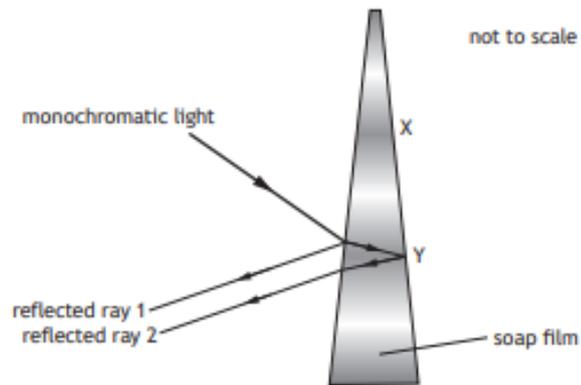


Figure 13C

- i. At Y the thickness of the film is 3.39×10^{-6} m. **3**
 The refractive index of the film is 1.46.
 Determine the optical path difference between reflected ray 1 and reflected ray 2.
- ii. There is an area of destructive interference at Y. **1**
 The next area of destructive interference occurs at X, where the film is slightly thinner.
 Determine the optical path difference between the reflected rays at X.