

Instructions to candidates

Duration: 01 hour

Number of questions: 02

Answer **all** questions

Mark allocation: 80 marks

1.

- a. State the laws of reflection and refraction.

(08 marks)

- b. Explain briefly the phenomena "polarization by reflection".

(08 marks)

- c. **Derive** an equation for "Brewster's Angle". Clearly illustrate the steps and clearly name the parameters in the equation.

(10 marks)

- d. As shown in the Figure 01 below, a light ray enters a glass slab at point A at incident angle $\theta_1 = 60^\circ$ and then undergoes total internal reflection at point B. What minimum value for the index of refraction of the glass can be inferred from this information ?

(12 marks)

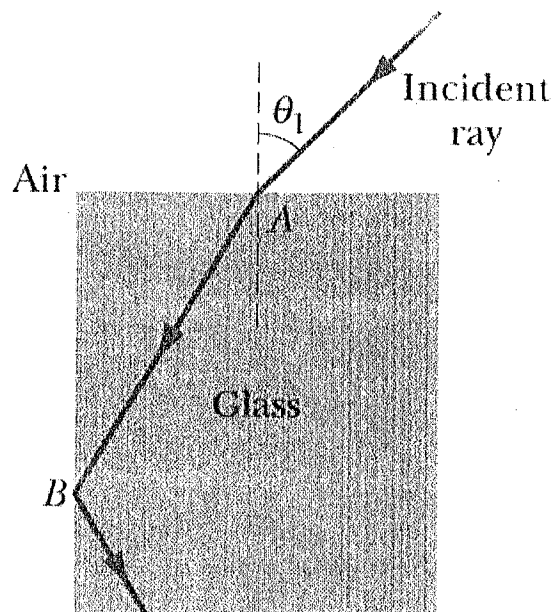


Figure 01



2.

- a. When the phenomena "Interference from thin films" is concerned, what are the three ways in which the phase difference between two waves can change ?

(10 marks)

- b. Suppose you wish to coat flat glass ($n = 1.50$) with a transparent material ($n = 1.30$) so that reflection of light at wavelength 500 nm is eliminated by interference. What is the least coating thickness that eliminates (via interference) the reflections of light with wavelength 500 nm ? Assume that the light is approximately perpendicular to the glass surface.

(16 marks)

- c. In a Young's double-slit arrangement, the slits are separated by a distance equal to 50 times the wavelength of the light passing through the slits.

- I. What is the angular separation in radians between the central maximum and an adjacent maximum ?
- II. What is the distance between these maxima on a screen 25.0 cm from the slits ? Assume that angles, θ in this problem is small enough to permit the use of the approximations $\sin \theta \approx \tan \theta \approx \theta$, in which θ is expressed in radian measure.

(16 marks)