

## Diffraction Problems

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1. In Young's double slit experiment, a monochromatic (only one wavelength) source of wavelength 550 nm illuminates slits that are  $4.0 \times 10^{-6}$  m apart. What angle does the first order maximum occur? Second order? Third order? Is there a mathematical pattern?
2. Given that the second-order maximum occurs at  $22^\circ$  and the light of wavelength 600 nm is used, what is the double slit separation? [3.2  $\mu$ m]
3. Two slits are 0.015 mm apart and the second-order maximum is 7.8 mm away from the centre line. If that maximum is 1.1 m from the slits, what is the wavelength of light used? [ $5.3 \times 10^{-6}$  m]
4. In an interference experiment, yellow light of wavelength 580 nm illuminates a double slit. If the screen is 1.3 m away and the distance between the centre line and the 9<sup>th</sup> maximum is 38.5 cm, find the slit separation. [1.83 mm]
5. A diffraction grating with 2000 slits per centimeter is used with red light of wavelength 650 nm. Find the order number of the maximum occurring at  $15.1^\circ$ . [n=2]
6. What is the distance to the n=2 maximum for a diffraction grating with 20000 slits per meter if the screen is 0.90 m away and orange light with wavelength 600 nm is used? (assume  $\theta \leq 15^\circ$ ) [0.022 m]
7. The distance between the central line and the 5<sup>th</sup> maximum is 65 cm when the grating is 92 cm from the screen. What is the wavelength of the light if the diffraction grating has 250 lines per millimeter? [447 nm]
8. Two identical diffraction gratings are set up the same distance from a screen. A red laser of wavelength 675 nm is aimed at one grating and a green laser of wavelength 515 nm at the other. The distance to the first maximum for the red laser is 3.7 cm, what is the distance for the first maximum for the green laser? (assume  $\theta \leq 15^\circ$  for both gratings) [2.8 cm]
9. What is the value of  $\theta$  for the n = 2 maximum if an orange laser beam of wavelength 615 nm is fired through a diffraction grating with  $2 \times 10^4$  lines per millimeter?