

Diffraction Grating Drills

- 1 Monochromatic red light of wavelength 742 nm is passed through a diffraction grating with 3604 slits per cm and creates a second-order maximum $3.49\text{E-}2$ degrees from the central maximum. How many slits per cm does the grating have?
- 2 Monochromatic green light of wavelength 558 nm is passed through a diffraction grating with 7571 slits per cm and creates a first-order maximum 1.09 m from the central maximum. How far away from the diffraction grating is the screen?
- 3 Monochromatic blue light of wavelength 472 nm is passed through a diffraction grating with 1955 slits per cm onto a screen 1 m away. What angle does the fifth-order nodal line make with the central maximum?
- 4 Monochromatic violet light of wavelength 427 nm is passed through a diffraction grating with 10622 slits per cm onto a screen 5.1 m away. What order maximum is 6.94 m from the central maximum?
- 5 Monochromatic light is passed through a diffraction grating with 1032 slits per cm onto a screen 4.52 m away, creating a third-order minimum $6.96\text{E-}1$ m from the central maximum. What colour is the light?
- 6 Monochromatic orange light of wavelength 601 nm is passed through a diffraction grating with 2390 slits per cm onto a screen 5.56 m away. What order maximum is $3.49\text{E-}2$ degrees from the central maximum?
- 7 Monochromatic blue light of wavelength 452 nm is passed through a diffraction grating onto a screen 0.95 m away, creating a pattern with nodal lines spaced $6.52\text{E-}2$ m apart. How many slits per cm does the grating have?
- 8 Monochromatic violet light of wavelength 421 nm is passed through a diffraction grating with 8916 slits per cm onto a screen 3.91 m away. What order maximum is $6.99\text{E-}2$ degrees from the central maximum?
- 9 Monochromatic violet light of wavelength 402 nm is passed through a diffraction grating with 5884 slits per cm onto a screen 6 m away. What is the spacing between the nodal lines?
- 10 Monochromatic orange light of wavelength 594 nm is passed through a diffraction grating with 1476 slits per cm onto a screen 5.44 m away. What angle does the third-order bright fringe make with the central maximum?

Note: $3.4\text{E}4 = 3.4 \times 10^4$

Answers:

1. The diffraction grating has 3604 slits per cm. 2. The screen is 2.57 m away. 3. The fifth-order nodal line is $8.66\text{E-}2$ degrees away from the central maximum. 4. The third-order maximum is 6.94 m away from the central maximum. 5. The light is orange (597 nm). 6. The second-order maximum is $3.49\text{E-}2$ degrees away from the central maximum. 7. The diffraction grating has 1519 slits per cm. 8. The fourth-order maximum is $6.99\text{E-}2$ degrees away from the central maximum. 9. The nodal lines are 1.42 m apart. 10. The third-order bright fringe is $5.24\text{E-}2$ degrees away from the central maximum.