

Diffraction Questions from 12.2A

Young's Double Slit:

- Two slits are separated by a small distance and are illuminated by 575 nm light. The interference pattern has bright fringes that are 1.13 cm apart on a screen that is 2.46 m away. a. What distance separates the two slits? (0.125 mm) b. What is the angle between the second order and the fifth order fringes on one side? (0.790°)
- Two slits are separated by a distance of 0.245 mm and are illuminated by monochromatic light. The interference pattern has bright fringes separated by 1.41 cm and falls on a screen that is 5.59 m away. a. What is the wavelength of light? (618 nm) b. What is the distance on the screen between the central maximum and the fourth order maximum? (5.64 cm)
- Two slits are separated by a distance of 0.251 mm and are illuminated by 647 nm light. The interference pattern has fringes separated by a distance of 1.52 cm on a screen some distance away. a. What is the distance to the screen? (5.90 m) b. What is the angle between the central maximum and the fourth order maximum? (0.591°)
- Two slits are separated by a small distance and are illuminated by 478 nm light. The interference pattern has fringes separated by 1.65 cm on a screen that is 3.25 m away. a. What distance separates the slits? (9.42×10^{-5} m) b. What is the distance on the screen between the first order and the third order maximum on one side? (3.30 cm)
- Two slits are separated by a distance of 0.280 mm and are illuminated by 652 nm light. The interference pattern falls on a screen that is 2.06 m away. a. What distance separates the fringes on the screen? (0.480 cm) b. What is the angle between the central maximum and the second order maximum? (0.267°)

Single Slit:

- A single slit is illuminated by 460. nm light. The angular width of the central maximum is 1.20° . What is the width of the slit? (0.0439 mm)
- A single slit has a width of 0.0680 mm and is illuminated by 715 nm light. What is the angle between the center of the central maximum, and the second minimum on one side? (1.20°)
- A single slit has width of 0.0287 mm. There is an angle of 2.15° separating the center of the first maximum on one side with the center of the first maximum on the other side. What is the wavelength of light? (359 nm)
- A single slit is illuminated by 656 nm light, and there is a 3.10° angle between the second maximum on one side, and the center of the central maximum. What is the width of the slit? (0.0303 mm)
- A single slit has a width of 0.0243 mm, and there is an angle of 2.61° between the first maximum on one side, and the third minimum on the same side. What is the wavelength of the light? (738 nm)
- A single slit has a width of 0.130 mm and is illuminated by monochromatic light. A screen 1.51 m away has a pattern where the center of the central maximum is separated from the center of the next maximum by a distance of 0.857 cm. What is the wavelength of light? (492 nm)
- A single slit has a width of 0.113 mm and is illuminated by 635 nm light. The interference pattern is projected on a screen that is 4.51 m away. What is the distance on the screen from the center of the first maximum on the left side to the center of the first maximum on right side? (7.60 cm)
- A single slit has a width of 0.0748 mm and is illuminated by 524 nm light. A screen some distance away has a central maximum pattern that is 3.24 cm wide. What is the distance to the screen? (2.31 m)
- A single slit is illuminated by 524 nm light. A screen 4.20 m away has a central maximum pattern where the first minimum on one side is separated from the second by a distance of 1.26 cm. What is the width of the slit? (1.75×10^{-4} m)
- A single slit has a width of 0.152 mm and is illuminated by 740 nm light. The interference pattern is projected on a screen that is 2.57 m away. What is the distance on the screen from the center of the central maximum to the center of the second maximum on one side? (3.13 cm)

Diffraction Gratings:

- A diffraction grating has 6126 lines per cm. It is illuminated by a monochromatic light, and the central maximum and third order fringe are separated by 31.0° . What is the wavelength of the light? (280 nm)
- A diffraction grating has 3852 lines per cm. It is illuminated by 398 nm light. What angle separates the second order and the fourth order fringes? (20.0°)
- A diffraction grating is illuminated by 428 nm light. There is an angle of 3.58° between the central maximum and the second order fringe on one side. How many lines per cm does the grating have? (729 lines/cm)
- A diffraction grating has 2083 lines/cm. It is illuminated by a monochromatic light beam. There is an angular separation of 8.13° between the central maximum and the first order fringe. What is the wavelength of light? (679 nm)
- A diffraction grating is illuminated by a 596 nm light. There is an angle of 38.2° between the central maximum and the third order fringe on one side. How many lines per cm does the grating have? (3459 lines/cm)