Diffraction Gratings

Why a grating gives sharper maxima than two slits.

Physics

Maxima occur where the path difference between adjacent slits is a whole number of wavelengths.

$$d \sin \theta = n\lambda \cdot d = 1/N$$

500 lines per mm — $d = 2\times10^{-6}$ m

1 ÷ 500,000.

Maximum order — $n \leq d/\lambda$

sin θ cannot exceed 1.

White light — Spectra, red deviated most

Opposite to a prism.

THE COMMON MISTAKE

× Assuming a grating disperses like a prism

✓ The order is reversed

A grating deviates longer wavelengths more; a prism deviates shorter wavelengths more. Red and blue swap sides.

Gratings are used in spectroscopy because the maxima are sharp enough to resolve closely spaced wavelengths.