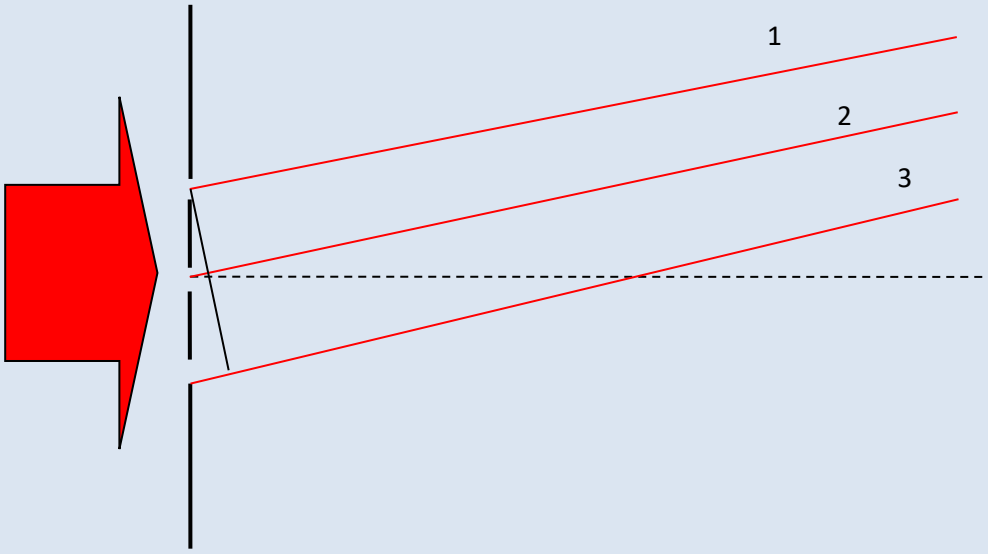
Quiz C14.2

Wave phenomena (HL)

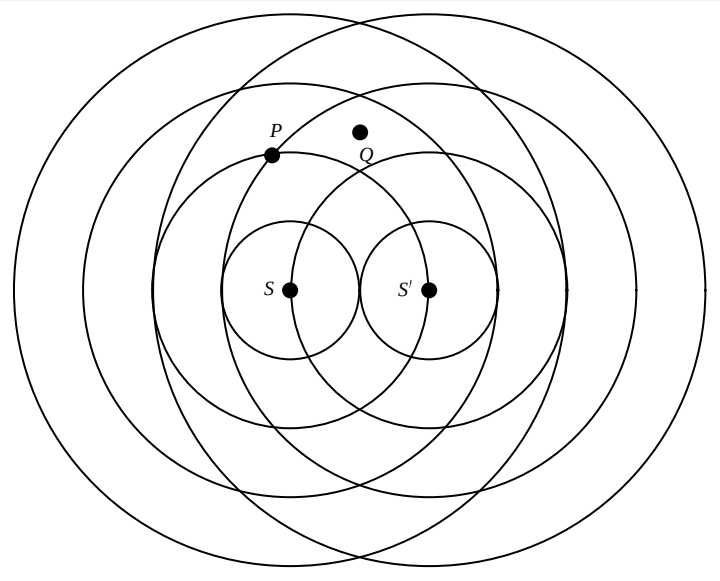
1. Monochromatic coherent light of wavelength λ is incident on three slits. The three rays shown will superpose on a screen far away and will create the first maximum after the central maximum.



What is the path difference between rays 1 and 2 and rays 1 and 3?

	1 and 2	1 and 3
A	λ	2λ
B	λ	4λ
C	2λ	2λ
D	2λ	4λ

2. The diagram shows wavefronts emitted by two sources in phase.



What is observed at P and what is observed at Q?

	P	Q
A	Minimum	Minimum
B	Minimum	Maximum
C	Maximum	Minimum
D	Maximum	Maximum

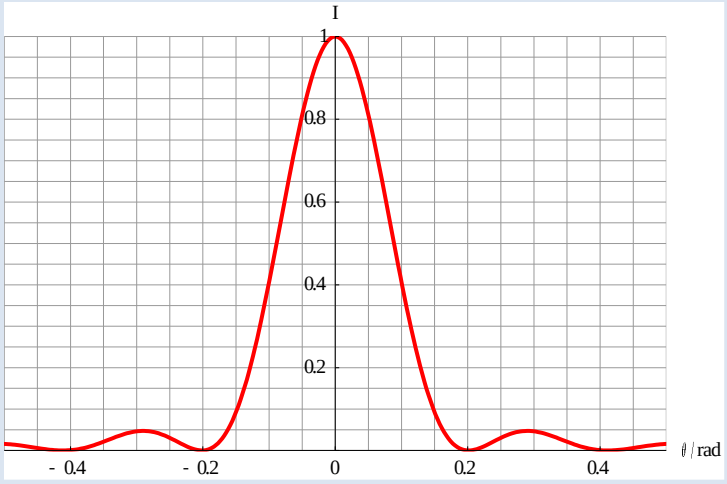
3. A diffraction grating has 400 lines per mm and is illuminated normally with light of wavelength 510 nm. How many maxima are visible on a screen?

A 5 **B** 7 **C** 9 **D** 11

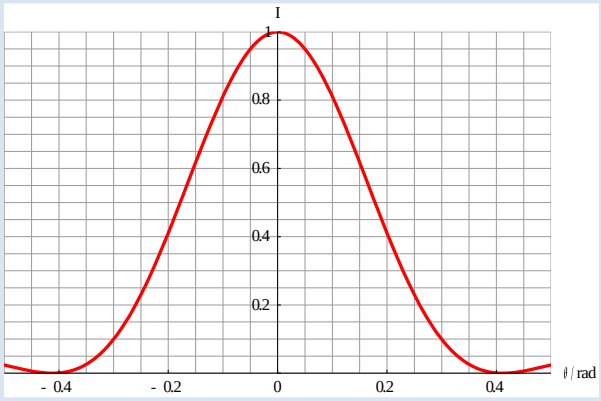
4. Light containing two different wavelengths is incident normally on a diffraction grating. The third order maximum belonging to wavelength 560 nm is observed at the same angle as the fourth order maximum of the other wavelength. What is the other wavelength?

A 420 nm **B** 480 nm **C** 680 nm **D** 780 nm

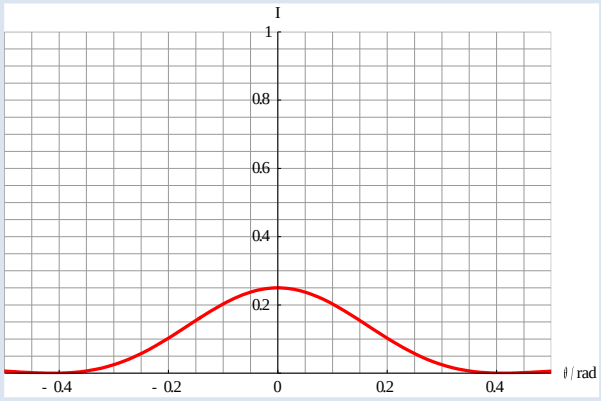
5. The graph shows the single slit diffraction pattern for light of wavelength 600 nm.



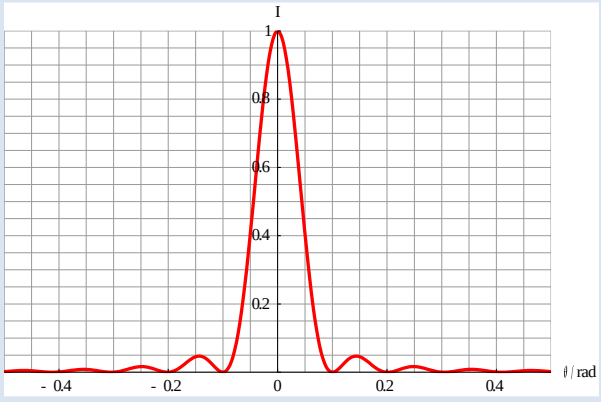
The slit width is halved. What is the new diffraction pattern?



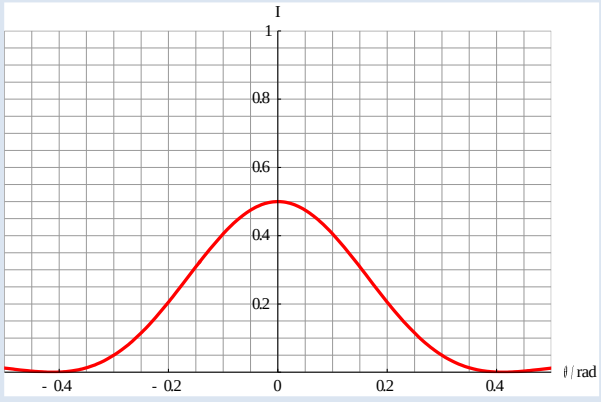
A



B

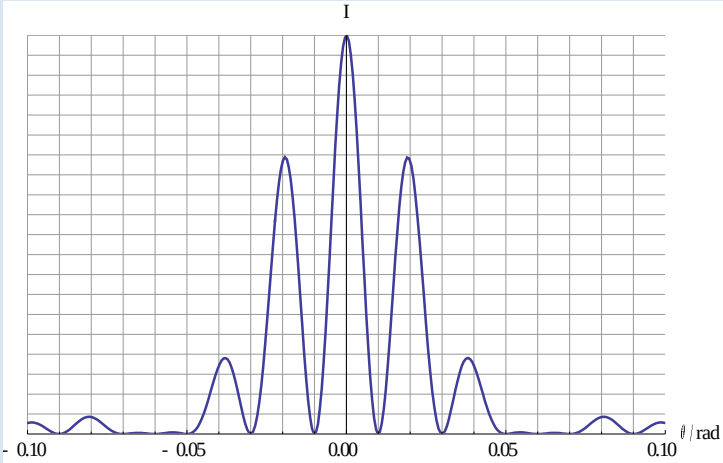


C



D

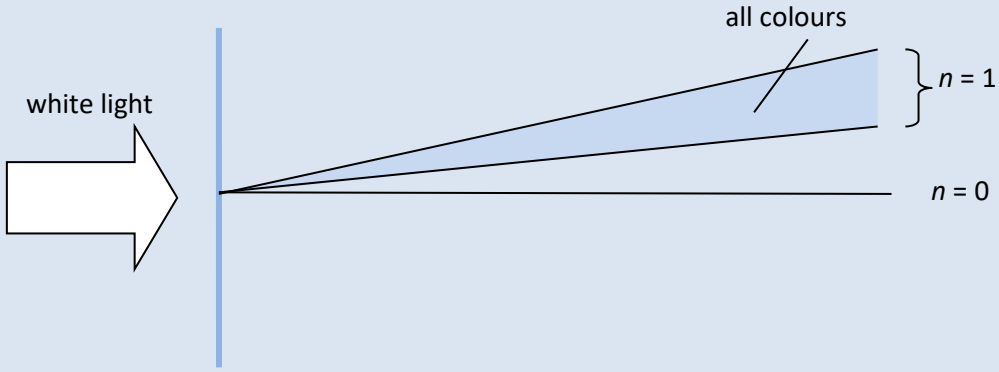
6. The graph shows the variation with diffraction angle of the intensity of light on a screen after passing through two slits.



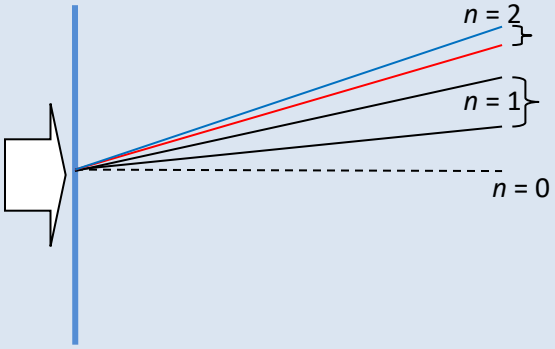
The third maximum is missing. What is a pair of correct relations between the slit width b, the slit separation d and the wavelength λ?

A	$b=\frac{d}{3}$	$d=50\lambda$
B	$b=\frac{d}{3}$	$d=150\lambda$
C	$b=3d$	$d=50\lambda$
D	$b=3d$	$d=150\lambda$

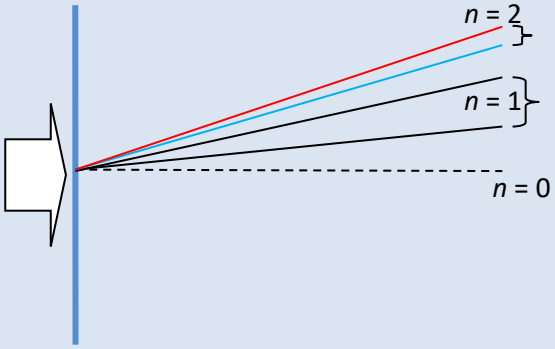
7. White light is incident on a diffraction grating. The diagram shows the formation of the $n = 0$ and the $n = 1$ orders.



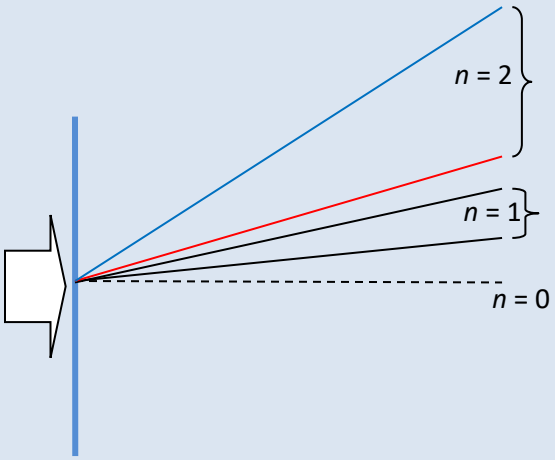
Which diagram shows the correct second order?



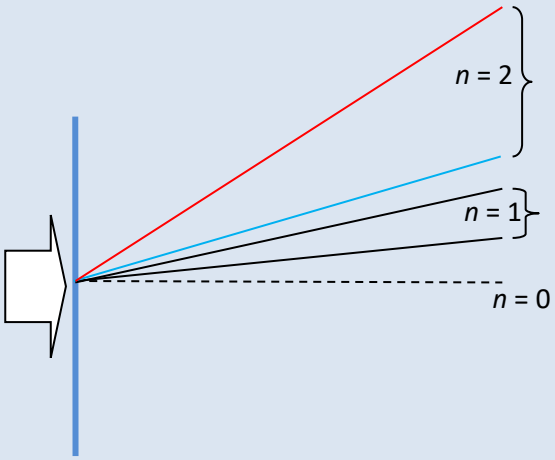
A



B



C

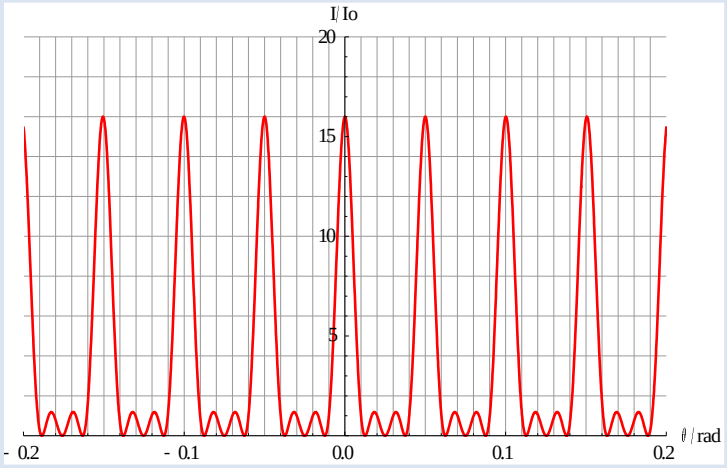


D

8. Light containing wavelengths from 400 nm to 500 nm is incident on a diffraction grating with 300 lines per mm. Which is the largest order that contains all the incident wavelengths?

A 4 **B** 5 **C** 6 **D** 7

9. Coherent monochromatic light is incident on 4 slits. The graph shows the intensity distribution on a screen far from the slits.



The number of slits is doubled to 8 without any changes to the slit width and slit separation. What is correct about the intensity distribution?

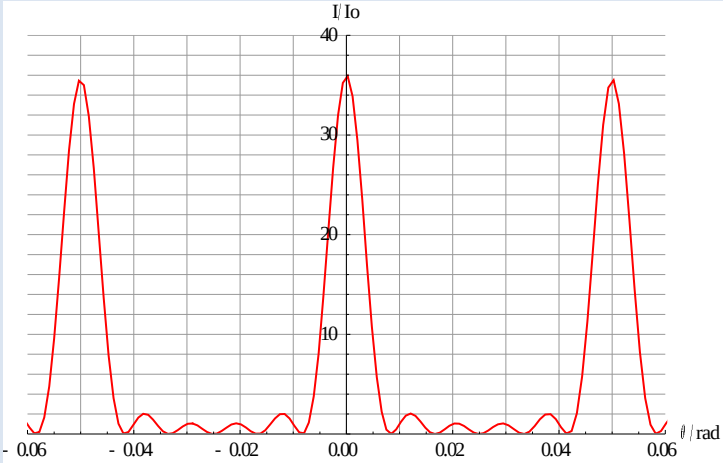
A The first principal maximum will be observed at $\theta = \pm 0.025$ rad.

B The intensity of the principal maxima will decrease.

C The intensity of the secondary maxima will increase.

D The width of the principal maxima will decrease.

10. Coherent monochromatic light of wavelength 700 nm is incident on parallel slits. The graph shows the intensity distribution on a screen far from the slits.



What is the slit separation and what is the number of slits?

	Slit separation	Number of slits
A	1.4×10^{-5} m	4
B	1.4×10^{-5} m	6
C	7.1×10^{-5} m	4
D	7.1×10^{-5} m	6

Quiz C14.2 Answers	
1	A
2	D
3	C
4	A
5	B
6	A
7	D
8	C
9	D
10	B