Unit 8: Superposition:

Subunit 8.4: The diffraction grating:

Topical Question No: 1

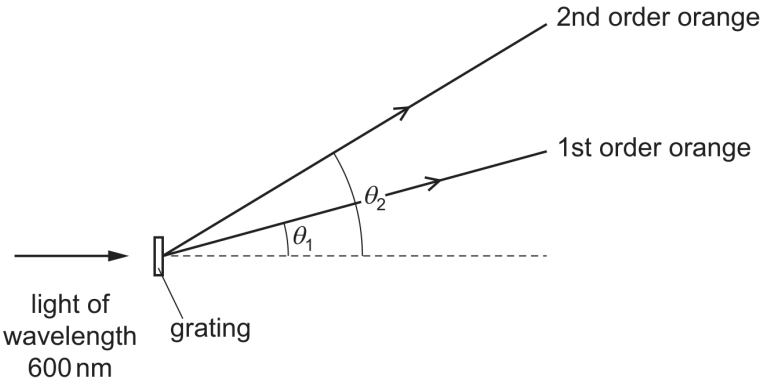
26 Monochromatic light of wavelength 5.30×10^{-7} m is incident normally on a diffraction grating. The first order maximum is observed at an angle of 15.4° to the direction of the incident light.

What is the angle between the first and second order diffraction maxima?

A 7.7° **B** 15.4° **C** 16.7° **D** 32.1°

Topical Question No: 2

29 A diffraction grating experiment is set up using orange light of wavelength 600 nm. The grating has a slit separation of 2.00 μm.

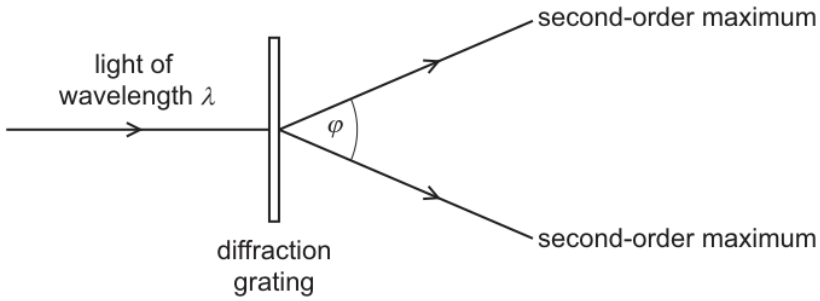


What is the angular separation ($\theta_2 - \theta_1$) between the first and second order maxima of the orange light?

A 17.5° **B** 19.4° **C** 36.9° **D** 54.3°

Topical Question No: 3

29 Light of wavelength λ is incident normally on a diffraction grating, as shown.



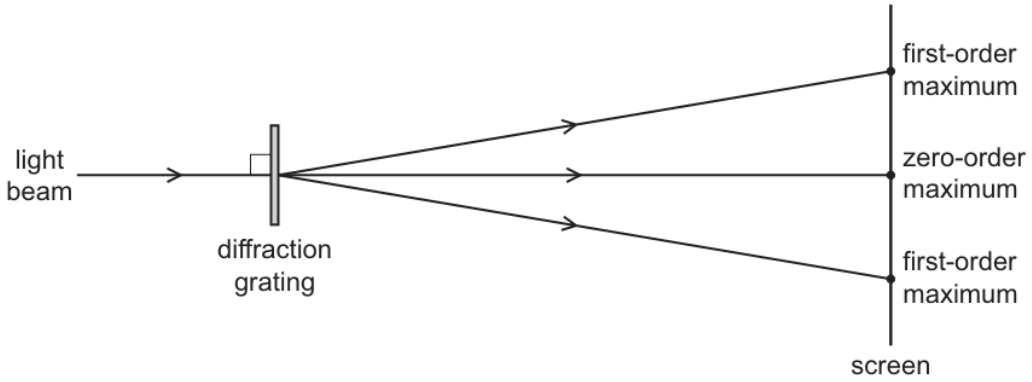
The angle between the two second-order maxima is φ.

Which expression gives the spacing of the lines on the diffraction grating?

A $\frac{\lambda}{\sin\varphi}$ **B** $\frac{\lambda}{\sin(\varphi/2)}$ **C** $\frac{2\lambda}{\sin\varphi}$ **D** $\frac{2\lambda}{\sin(\varphi/2)}$

Topical Question No: 4

29 A beam of red laser light of wavelength 633 nm is incident normally on a diffraction grating with 600 lines per mm.



The beam of red light is now replaced by a beam of blue laser light of wavelength 445 nm. A replacement diffraction grating is used so that the first-order maximum of the blue light appears at the same position on the screen as the first-order maximum of the red light from the original laser.

How many lines per mm are there in the replacement diffraction grating?

A $420\,\text{mm}^{-1}$ **B** $470\,\text{mm}^{-1}$ **C** $600\,\text{mm}^{-1}$ **D** $850\,\text{mm}^{-1}$

Topical Question No: 5

27 A parallel beam of red light of wavelength 700 nm is incident normally on a diffraction grating that has 400 lines per millimetre.

What is the total number of transmitted maxima?

A 3 **B** 4 **C** 6 **D** 7

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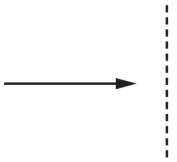
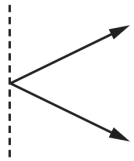
Topical Question No: 6

29 Monochromatic light is directed at a diffraction grating, as shown.

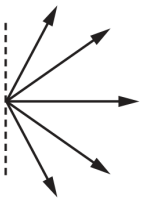


Which diagram could show all the possible directions of the light, after passing through the grating, that give maximum intensity?

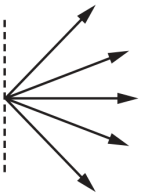
A



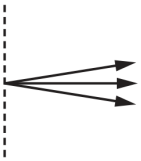
B



C

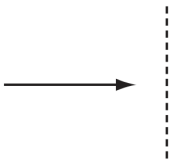


D



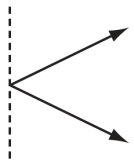
Topical Question No: 7

29 Monochromatic light is directed at a diffraction grating as shown.

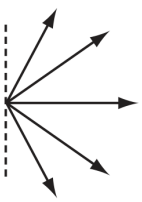


Which diagram shows all the possible directions of the light, after passing through the grating, that give maximum intensity?

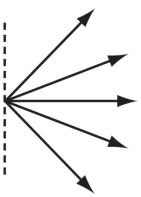
A



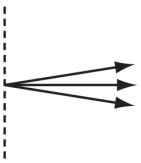
B



C



D



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28 An electromagnetic wave is incident normally on a diffraction grating.

A second-order maximum is produced at an angle of 30° to a normal to the grating.

The grating has 5000 lines per cm.

What is the wavelength of the wave?

A 2.5×10^{-7} m **B** 5.0×10^{-7} m **C** 1.0×10^{-6} m **D** 5.0×10^{-5} m

Answer Key

1. N/A
2. N/A
3. D
4. D
5. N/A
6. N/A
7. N/A
8. N/A