InkPhysics

QUESTION WORKBOOK

Diffraction gratings

Waves · Year 12

AQA 3.3.2.2 · CIE 8.4 · OCR A 4.4.3

10 questions · 30 marks

NAVY SCREEN EDITION

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SECTION A · Warm-up

A1 State the diffraction grating equation and define each term in it. [2]

A2 A diffraction grating has 300 lines per millimetre. Calculate the grating spacing d in metres. [2]

A3 Explain why a diffraction grating produces sharper, brighter maxima than a double slit. [2]

SECTION B · Standard

B1 Light of wavelength 600 nm is shone normally at a grating with 500 lines per millimetre. Calculate the angle of the first-order maximum. [4]

B2 For the same grating and wavelength, calculate the angle of the second-order maximum. [3]

B3 A grating with 600 lines per millimetre gives a first-order maximum at 21°. Calculate the wavelength of the light. [3]

B4 Light of wavelength 500 nm gives a first-order maximum at 15° with a certain grating. Calculate the grating spacing and hence the number of lines per millimetre. [3]

SECTION C · Stretch

C1 A grating has a spacing of 2.0×10^{-6} m and is used with 600 nm light. Calculate the highest order of maximum that can be seen, and the angle at which it appears. [4]

C2 White light (400 nm to 700 nm) passes normally through a grating of spacing 2.0×10^{-6} m. Calculate the angular width of the first-order spectrum (the angle between the 400 nm and 700 nm maxima). [4]

C3 Give two practical uses of diffraction gratings. [3]