Important Numerical from Diffraction

1) A Plane grating has 15000 lines per inch. Find the angle of separation of the 5048 A^0 and 5016 A^0 lines of helium in the second order spectrum. [Ans : 0.26^0]

2) What is the highest order spectrum which may be seen with monochromatic light of wavelength 6000 A^0 by means of a diffraction grating with 5000 lines per centimeter? [Ans : 3]

3) A wire grating is made of 200 wires per cm placed at equal distances apart. The diameter of each wire is 0.025 mm. Calculate the angle of diffraction for the third order spectrum. The wavelength of light used is 6×10^{-5} cm. Also find the width of the transparency. [Ans: $2.06^0, 2.3 x 10^{-3}\ cm$]

4) Light of wavelength 550 nm is incident normally on a grating that has 400 lines per mm. At what angle does the second order principal maxima occur? [Ans : 26.1^0]   [TU 2074]

5) A diffraction grating used at normal incidence gives a line (540 nm) in a certain order superimposed on the violet line (450 nm) of the next higher order. How many lines per cm are there in the grating if the angle of diffraction is 10^0? [Ans : 3086/cm]   [TU 2074]

6) A grating with 250 grooves/mm is used with an incandensent light source. Assume visible spectrum to range in wavelength from 400 to 600 nm. In how many orders can one see the entire visible spectrum?   [TU 2073]

7) In a Fraunhofer single slit diffraction, a convex lens of focal length 20 cm is placed just after a slit of width 0.6 mm. If a plane wavefront of wavelength 6000 A^0 falls on slit normally, calculate the separation between the second minima on either side of central maxima.   [TU 2072]

8) Calculate the minimum no. of lines per cm in a 2.5 cm wide grating which will just resolve the sodium lines 5890 A^0 and 5896 A^0 in second order spectrum. [Ans : 196]   [TU 2072]

9) How many rulings must a 4.00-cm-wide diffraction grating have to resolve the wavelengths 415.496 and 415.487 nm in the second order?

10) A grating has 600 rulings/mm and is 5.0 mm wide. (a)What is the smallest wavelength interval it can resolve in the third order at λ=500 nm? (b) How many higher orders of maxima can be seen? [Ans : (a) 56 pm (b) 3]

11) An x-ray beam of a certain wavelength is incident on a NaCl crystal, at 30.0° to a certain family of reflecting planes of spacing 39.8 pm. If the reflection from those planes is of the first order, what is the wavelength of the x rays? [Ans : 39.8 pm]

12) X rays of wavelength 0.12 nm are found to undergo second order reflection at a Bragg angle of 28° from a lithium fluoride crystal. What is the inter-planar spacing of the reflecting planes in the crystal? [Ans : 0.26 nm]