Diffraction Grating QUESTIONS

1.

a) Describe the interference pattern produced by monochromatic light through a diffraction grating, and explain the large regions of negligible intensity between the maxima.

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b) The Antisaurus Defence System uses a $\lambda = 5.1 \times 10^{-7}$ m laser and diffraction grating to deter oncoming formations of pterosaurs*. For the system to work, the second order maxima should be at about 20°.

Show that there are 3400 lines per centimetre in the system's grating.

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2. Derive $d \sin \theta = m\lambda$ for the intensity maxima in the pattern produced by a transmission diffraction grating, where d is the distance between the slits in the grating and θ is the angular position of the mth maximum (m specifies the order of the maximum).

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3.

a) Sketch a graph of the intensity distribution of the maxima produced by a grating, for monochromatic light.

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b) The Antisaurus Defence System uses a $\lambda = 5.1 \times 10^{-7}$ m laser and transmission diffraction grating with 4300 lines per centimetre. Calculate the maximum possible number of pterosaurs that could be deterred at the same time.

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4. Describe how a grating can be used to measure the wavelength of light from a monochromatic source.

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5.

a) Describe and explain the pattern produced by shining white light through a diffraction grating.

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b) Identify the properties of a grating which make it useful in spectroscopy.

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*Pterosaurs are careful creatures, you see, so if a hazard like a laser is shining in their direction they tend to give up formation and go to the beach instead.