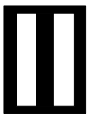
Thapar Institute of Engineering and Technology, Patiala

School of Physics and Materials Science

UPH004: APPLIED PHYSICS
Tutorial Sheet # 6 [DIFFRACTION]

[NB: Consider normal incidence of light on all slits / plane transmission grating]

1. For a single slit diffraction fringe find the percentage intensities of 1^{st} and 2^{nd} order maxima with respect to that of the central maximum.
2. The eleventh order minima of a single slit diffraction pattern are found at a distance of 5 *cm* on either side of the central maximum. Find the wavelength of the monochromatic radiation used, while the distance between the slit and screen is 1*m* and slit width is 0.1*mm*
3. A thin needle is placed at the centre of an aperture (as in figure), having width thrice that of the needle. If a laser beam incidents normally on this arrangement, which order spectrum will be absent from the diffraction pattern?



4. A double-slit, each slit having width 0.05 *cm* and a separation of 0.5 *cm* between them, forms diffraction pattern on a screen placed 1.5 *m* away from the slits. If the diffraction fringe width is 0.15*mm* find the wavelength of the monochromatic light used.
5. 15,000 numbers of long chain Iodine molecules (opaque) are arranged parallel on a transparent thin film of length 1 *inch*. Let, the film is illuminated by a light of wavelength 5600 Å. How many bright spots will be observed on the screen? Label their order.
6. Prove that for white light (wavelength range 4000 Å to 7000 Å) the second and third order spectrum will partially overlap for any grating.
7. A plane transmission grating has 300 rulings per *mm*. Determine the dispersive power of violet (wavelength 4000 Å) and red (wavelength 6328 Å) light for second order diffraction pattern.
8. A plane transmission grating can just resolve two spectral lines of wavelength 5499.5 Å and 5500.5 Å in the first order diffraction pattern. Determine the minimum order the same grating can resolve, while using another pair of wavelength 6500 Å and 6500.5 Å.