4 **(a)** **(i)** Explain what is meant by the *diffraction* of a wave.

……

…… [1]

(ii) State an important condition for significant diffraction to occur.

…… [1]

(b) A diffraction grating with 300 lines per millimeter is being used in a typical light experiment. Different types of light are allowed to fall normally on a diffraction grating and the resultant pattern formed is to be studied. The first light source to be studied is a white light consisting of wavelengths between 400 nm and 700 nm

(i) Determine the maximum order of the complete spectrum that can be observed.

maximum order = …….. [2]

(ii) Determine the order of the complete spectrum before the first overlapping between two higher order spectra.

order = ……. [3]

(c) The next experiment is of light from a low pressure sodium lamp. Light from the lamp consists mostly of two wavelengths, 588.99 nm and 589.59 nm.

(i) Explain quantitatively the problem that would likely arise in observing the spectral lines.

……

…… [2]

(ii) Suggest a refinement to the set up to help overcome this problem.

……

…… [1]

[Total: 10]