3 **(a)** Explain the following terms with reference to the light diffracted by a diffraction grating that is used with a monochromatic light source.

      (i) Diffraction

      …………………………………………………………………………………...

      ………………………………………………………………………….. [1]

      (ii) Coherence

      …………………………………………………………………………………...

      ………………………………………………………………………….. [1]

      (iii) Superposition

      …………………………………………………………………………………...

      …………………………………………………………………………………...

      ………………………………………………………………………….. [2]

(b) A parallel beam of white light that consists of wavelengths from 350 nm to 650 nm is incident normally on a diffraction grating that has 500 lines per millimetre.

      (i) Calculate the maximum angle in the second order spectrum.

      maximum angle = …………………° [2]

      (ii) Calculate the minimum angle in the third order spectrum.

      minimum angle = …………………° [1]

(iii) Explain a problem with viewing the second or third order maxima of the white light with this diffraction grating.

………………………………………………………………………………...

………………………………………………………………………………...

……………………………………………………………………….. [1]

(iv) Describe the changes, if any, in the appearance of the fringes for the wavelength used in **(b)(i)**, when a diffraction grating of 250 lines per millimetre is used.

………………………………………………………………………………...

………………………………………………………………………………...

………………………………………………………………………………...

……………………………………………………………………….. [2]