EXPERIMENTAL PROBLEM 2

A Grating and Optical Filters

The following equipment is at your disposal:

- a small torch
- a non-standard reflection diffraction grating, fixed to a plastic block.
  The lines on this grating are in the form of circular arcs. Thus the behaviour of the grating is somewhat different from that of an ordinary diffraction grating.
- a few plastic toy blocks, to be used as supports
- several optical 'slides': 1 (red);
  2 (red);
  3 (blue);
  4 (pink);
  5 (purple);
  6 (grey);
  7 (white)
- three sheets of graph paper
- a cardboard box that may be used for supporting the apparatus

1) Determine the line separation of the reflection diffraction grating, as accurately as possible. Estimate the error in your result. Explain the theory and describe the experimental method used; draw diagrams where needed. Tabulate your raw experimental data, give your final numerical results complete with errors and an explanation of how you obtained them.

2) Slides 1–5 are coloured filters. Find which wavelengths are transmitted or absorbed by them. Report numerical values and error estimates where possible, or otherwise report your results graphically. Identify the optical item in slide 6.

3) Slide 7 consists of a wire mesh. Determine the distance between the wires in this mesh for both perpendicular directions. Fully describe your method in the form of a diagram.

Visible light has wavelength between 0.4 and 0.7×10^{-6} m.

Warning

The torch batteries will not last forever. Switch the torch off when you are not using it as otherwise, after 40 minutes, the light will become noticeably dimmer and redder in colour.