TAP 322- 5: Using a CD as a reflection grating

An experiment for home or laboratory

The combination of the silvering and the regular grooves on a compact disc make them very effective reflection gratings. Polychromatic light is seen to reflect in rainbow colours; monochromatic light cannot be split and so remains as one colour. This experiment gives you a quick and effective method of establishing whether a light source is polychromatic or not.

You will need

- ✓ digital audio CD or CD-ROM
- ✓ light sources, selected from the following or individually chosen: daylight bulb, incandescent bulb, sodium vapour lamp, street lamps, light-emitting diode

The task

Everyone who has used a CD will have seen the rainbow patterns they create. This experiment attempts to use this effect to gather information about light sources used in everyday life. It can be performed in the laboratory, but it is very simple to look at the reflected light from a CD using light sources around your home or outside.

1. Observe the reflection of a 'white' light bulb in the CD.
2. Draw what you see, paying close attention to the intensity and position of the colours. Note the angle at which you held the CD.
3. Keeping the geometry of the set-up as similar as possible, look at other light sources. Are they polychromatic or monochromatic?
4. Try these: sodium street lights, a candle, a 'daylight' light bulb, a coloured light bulb, light shining through a coloured transparent layer such as dyed cellophane. Can you distinguish between, say, monochromatic yellow light and visual yellow – that is, light that looks yellow but is in fact a mixture of red and green?

Two things to look out for

1. CDs can make useful reflection gratings.
2. Some common light sources are monochromatic.

Practical advice

This is a simple experiment that is open ended and could be taken further by interested students. If used as a home experiment a 'reporting back' session is very useful in which the students can be shown the pattern formed in true monochromatic light. The particular pattern observed can be used as a basis for discussion.

Useful areas for consideration include the difference between 'natural' daylight bulbs and everyday white bulbs and distinguishing between true monochromatic sources and visual monochromes.

Alternative approaches

A similar experiment can be performed using 'magic spectacles' which act as an interference grating. The spiral images in the resource 'Diffraction and interference for pleasure' were formed using these.

External reference

This activity is taken from Advancing Physics chapter 6, 250H