10.3.2.1.4 Optical components of non-dispersive spectral instruments

An *optical filter* attenuates radiation either in its transmission or reflection. *Neutral filters* ideally attenuate all wavelengths of radiation uniformly over the optical spectral range while spectral filters have transmissive or reflective properties which are wavelength-dependent.

In the case of spectral filters, *high-pass filters* attenuate radiation below certain *cut-off wavelengths*. The reverse holds for *low-pass filters*. *Band-pass filters* enable a limited spectral band to be selected. *Band-blocking filters* attenuate radiation within a specific band.

If the spectral characteristics of a spectral filter are independent of the direction or position of the beam of radiation, it is called a *homogeneous filter*, but if these characteristics are directionally or positionally dependent, it is called a *variable filter* (i.e., the central transmission wavelength changes with position or angle).

An *absorption filter* which reduces the intensities of certain portions of the spectrum may be e.g., a solution, glass, plastic or gelatin.

An interference filter which reflects or transmits radiation in certain spectral bands as a result of optical interference may consist of partly transmissive and partly reflective *dielectric layers* with fixed separations between them.

A *Christiansen filter* reduces the intensities, by scattering, at those wavelengths at which the refractive index of a transmission medium differs from the refractive index of immersed particles.

An example of a *double-beam interferometer* is the *Michelson interferometer*. It makes use of the interference of two beams of radiation, split by means of a semi-transparent dividing plate or *beam splitter*. The beams are recombined after reflection from two separate mirrors. A *correction plate* is used to compensate for the optical path difference between the two beams introduced by the beam splitter.

The *Twyman interferometer* is a modification of the Michelson interferometer making use of an entrance collimator.

Its characteristics are:

- The maximum shift $a_{\max}$ of the moveable mirror;
- the transmission factor τ and the reflection factor ρ of the beam splitter;
- the effective beam diameter D_{eff}.

From these the theoretical resolving power R_{o} follows

$$R_0 = \frac{2a_{\max}}{\lambda}$$