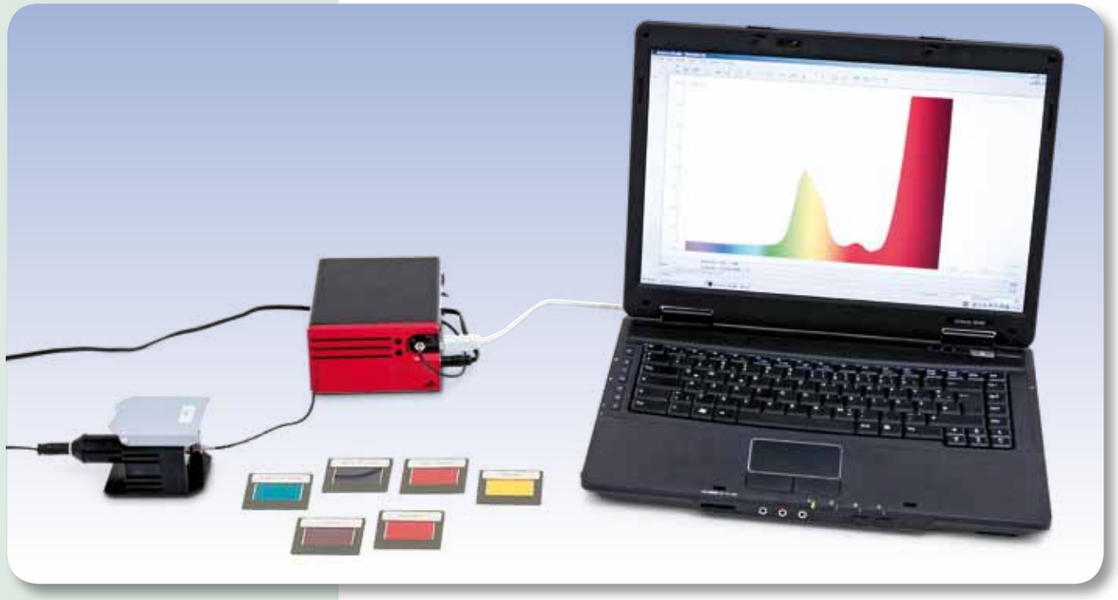
UE4020400 TRANSMISSION SPECTRA

UE4020400



EXPERIMENT PROCEDURE

- **Measure and compare the transmission spectra of solid bodies.**
- **Measure and compare the transmission spectra of liquids.**

OBJECTIVE

Record and interpret transmission spectra of transparent bodies.

SUMMARY

A digital spectrophotometer is used to measure transmission spectra. In this instrument the transmitted light collected by an optical fibre is separated into its spectral components by a reflection grating using the Czerny-Turner principle and is projected as an image onto a CCD detector via two mirrors. The transmission spectrum is generated by automatic normalisation applied to the previously recorded spectrum of the light falling on the detector.

REQUIRED APPARATUS

Quantity	Description	Number
1	Digital-Spectrometer LD	**1018103**
1	Absorption module	**1018105**
1	Set of 7 Colour Filters	**1003084**
1	Macro cuvettes, 4ml	**1018106**
Additionally recommended:		
	Chlorophyll	
	Potassium Permanganate	

BASIC PRINCIPLES

The observed colour of an object illuminated with white light depends on its reflecting properties. The perceived colour of light that has passed through an object depends on its light transmitting properties. For example, the perceived colour may be red if the object is transparent to red light while other colour components of the light are attenuated on passing through the object. In such a case spectral transmission is at a maximum for red light.

The unaided human eye cannot distinguish between a colour sensation caused by spectrally pure light and the same sensation caused by the addition of neighbouring colours of the spectrum. Therefore, it is not possible to reach conclusions about the transmission spectrum solely from the observed colour. To determine it unambiguously is only possible with the help of a spectrometer.

In this experiment, transmission spectra are recorded using a digital spectrophotometer. In this instrument the transmitted light collected by an optical fibre is separated into its spectral components by a reflection grating using the Czerny-Turner principle and is projected as an image onto a CCD detector via two mirrors. The transmission spectrum is generated by automatic normalisation applied to the previously recorded spectrum of the light falling on the detector.

EVALUATION

Spectral absorptivity $A(\lambda)$ can be calculated directly from the spectral transmission coefficient $T(\lambda)$ of a body if the effect of reflection at the surface is neglected. The relationship is:

$$A(\lambda) = 1 - T(\lambda)$$

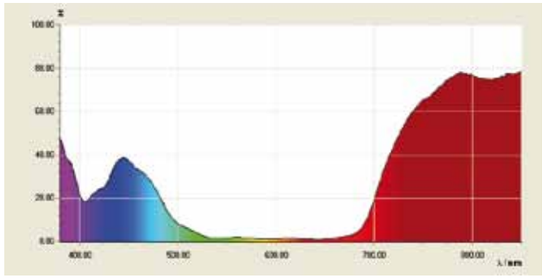


Fig. 1: Transmission spectra of a blue colour film

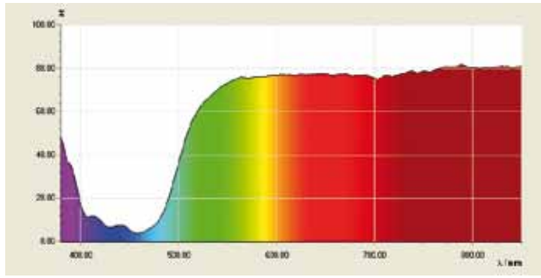


Fig. 2: Transmission spectra of a yellow colour film

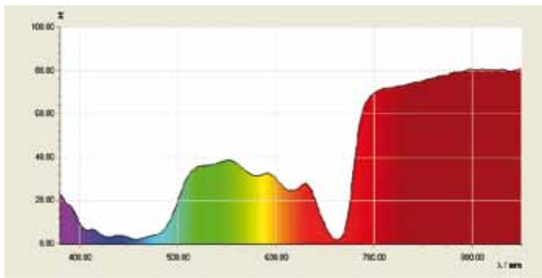


Fig. 3: Transmission spectrum of a chlorophyll solution

Fig. 4: Transmission spectrum of a potassium permanganate solution