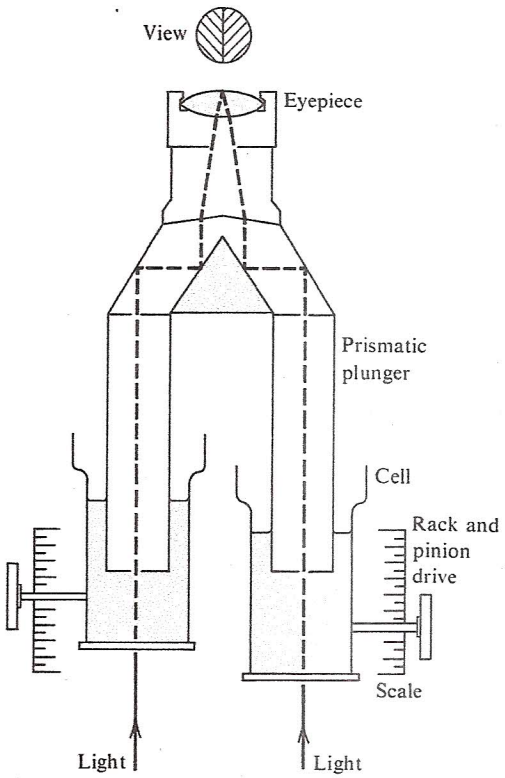
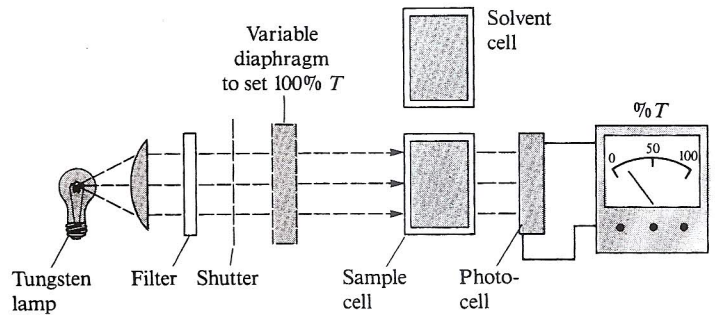


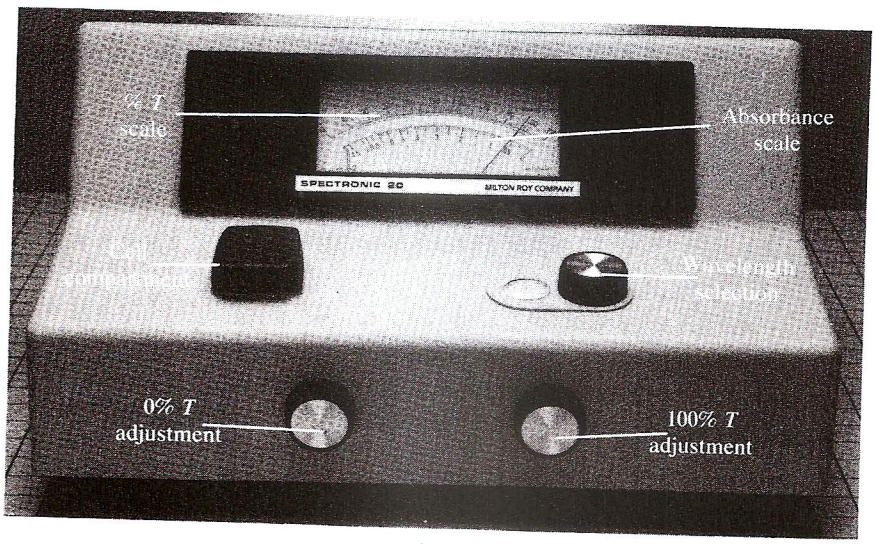
Figure 35-1. Schematic diagram of a Duboscq colorimeter.

exhibit colors of the same shade (that is, hue) and if they are viewed concurrently. If, however, a second color is present in one of the solutions the situation becomes different. This is due to the fact that the eye is unable to "analyze" colors, that is, for example, to differentiate whether a certain green is a single color or whether it is a mixture of yellow and blue. (Note the difference between eye and ear; the latter is able, for example, to isolate the sound of a violin from the total acoustic impression provided by a full orchestra.) The practical consequence of this fact is best understood by the discussion of an example. Manganese is readily determined colorimetrically by oxidation to permanganate and comparing the color developed with that of a standard. This method is quite sensitive because of the high absorptivity of permanganate and is applicable to the analysis of steel. Suppose a steel also contains chromium, which under the conditions of the determination is oxidized to dichromate. The standard solution shows only the purple color of permanganate. In contrast,

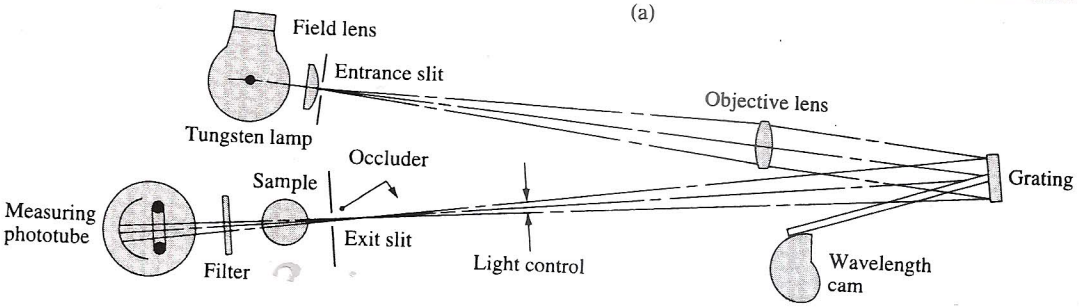


(a)

Figure 22–2
Single-beam photometer for absorption measurements in the visible region.

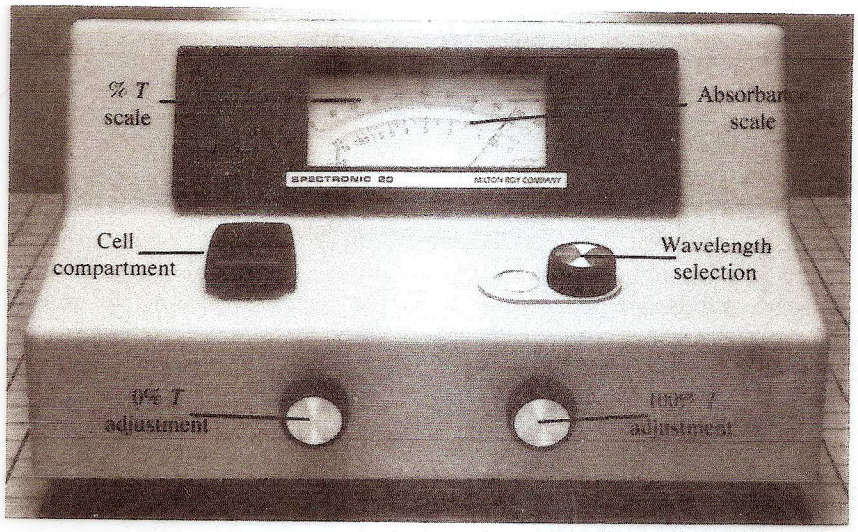


(a)

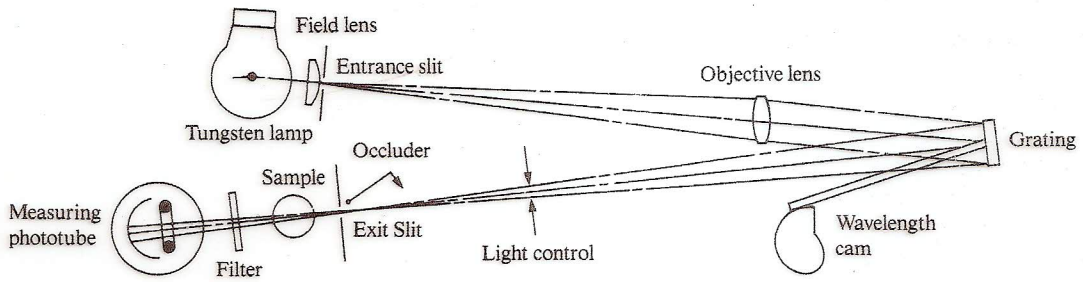


(b)

Figure 22–3
(a) The Spectronic 20 spectrophotometer. (b) Its optical diagram. (Courtesy of Milton Roy Company, Analytical Products Division, Rochester, NY.)

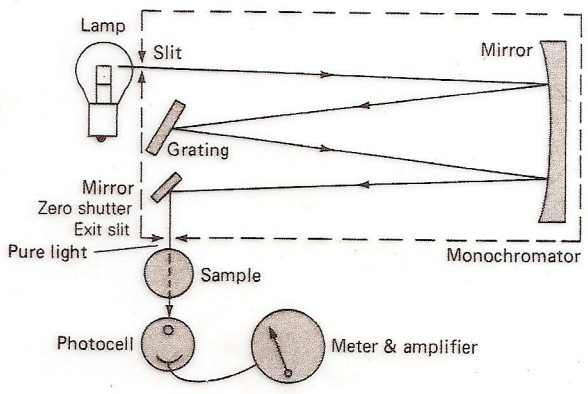


(a)



(b)

FIGURE 7–17 (a) The Spectronic 20 spectrophotometer. (b) Its optical diagram. (Courtesy of Milton Roy Company, Analytical Products Division, Rochester, NY.)



(b)

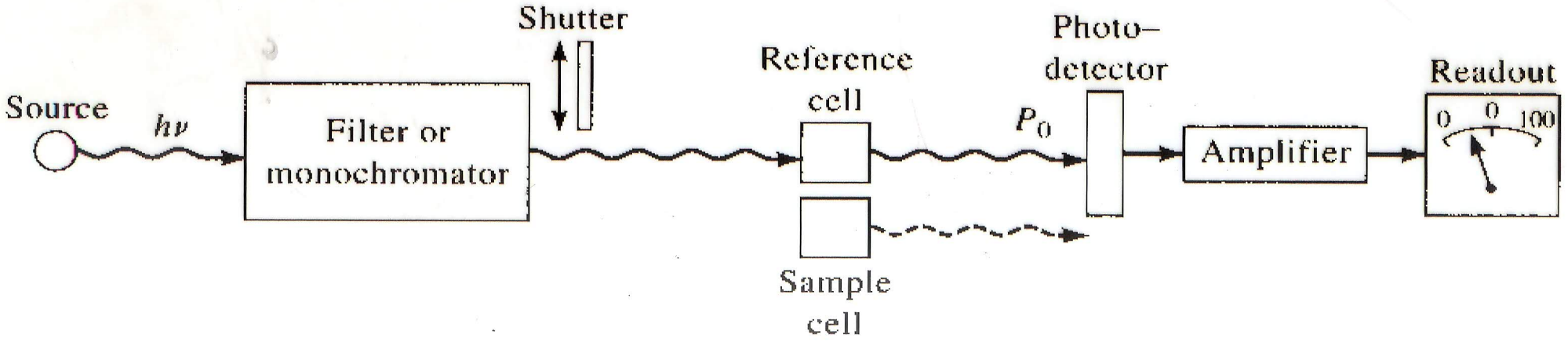
FIGURE 7–18 The Turner Model 350 spectrophotometer. (Courtesy of the Sequoia-Turner Corporation, Mountain View, CA.)

multiplier tubes as detectors and gratings for dispersion. Some are equipped with digital readout devices; others employ large meters. The prices for these instruments range from $2,000 to $8,000.

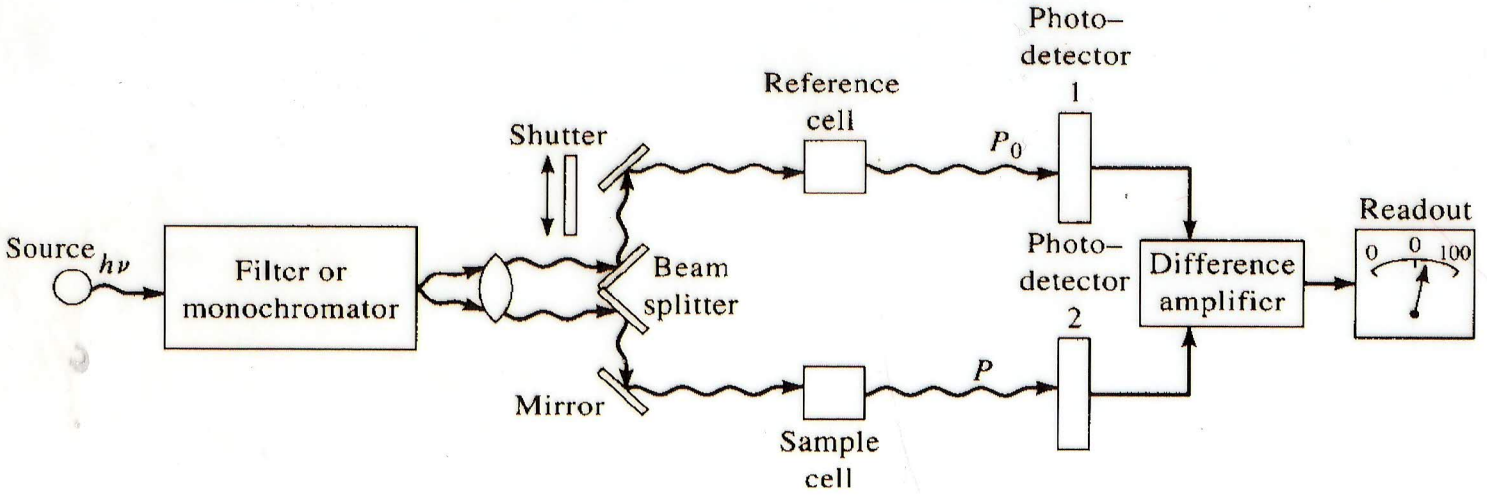
As might be expected, performance specifications vary considerably among instruments and are related, at least to some degree, to instrument price. Typically, bandwidths vary from 2 to 8 nm; wavelength accuracies of ± 0.5 to ± 2 nm are reported.

The optical designs for the various grating instruments do not differ greatly from those of the instruments shown in Figures 7–17 and 7–18. One manufacturer, however, employs a concave rather than a plane grating; a simpler and more compact design results. Instruments equipped with holographic gratings (Section 6C–2) are also beginning to appear on the market.

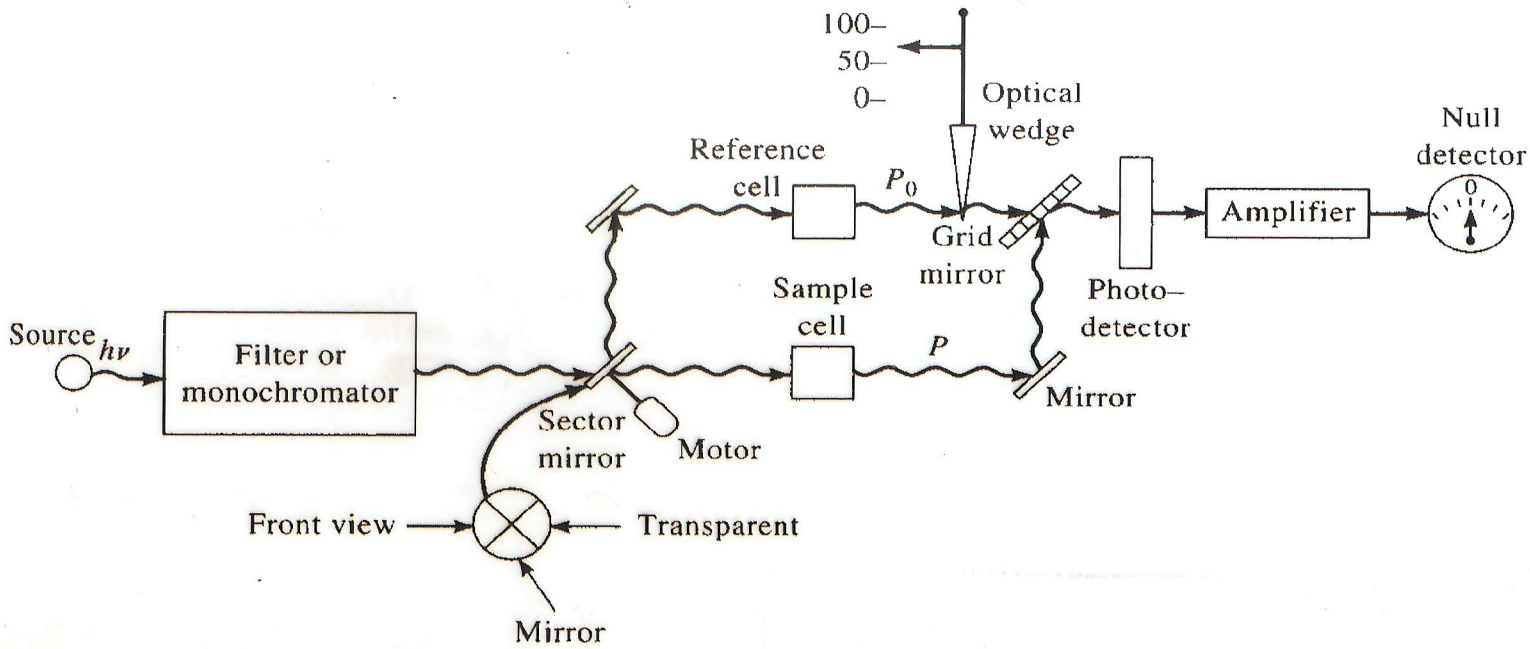
Espectrofotômetro de feixe simples



Espectrofotômetro de feixe duplo



(b)



(c)

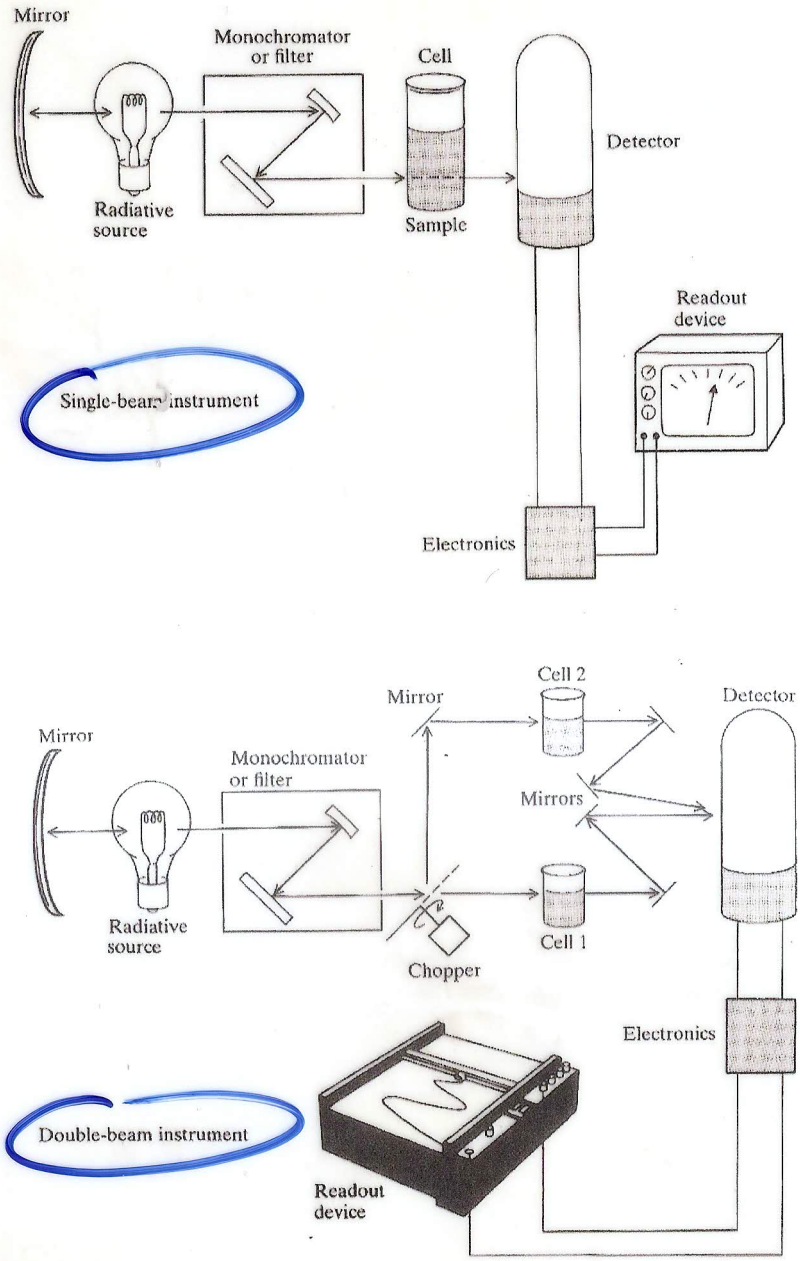


Figure 9-1 Block diagrams of two types of spectrophotometers and photometers.

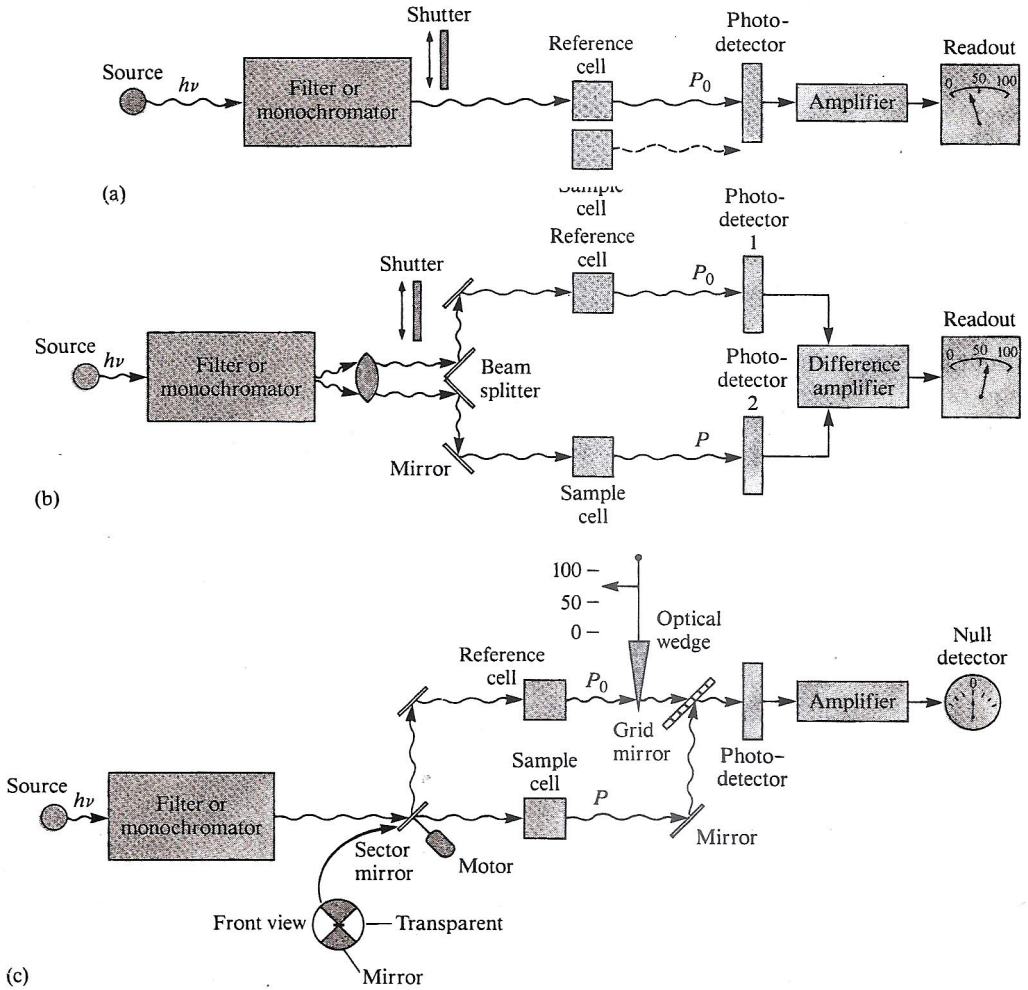


Figure 21–17

Instrument designs for photometers and spectrophotometers: (a) single-beam instrument; (b) double-beam instrument with beams separated in space; (c) double-beam instrument with beams separated in time.

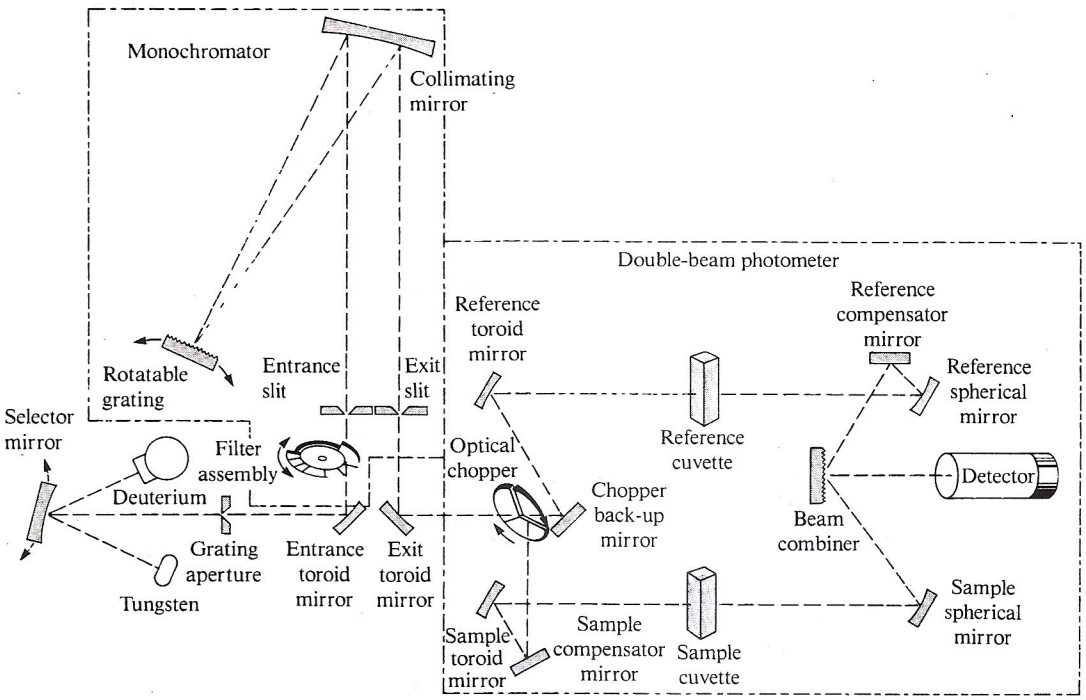


Figure 22–4

A double-beam recording spectrophotometer for the ultraviolet and visible regions; the Perkin-Elmer Series. (Courtesy of Coleman Instruments Division, Oak Brook, IL 50421.)

Table 22–2
SOLVENTS FOR THE ULTRAVIOLET AND VISIBLE REGIONS

Solvent	Lower Wavelength Limit, nm	Solvent	Lower Wavelength Limit, nm
Water	180	Carbon tetrachloride	260
Ethanol	220	Diethyl ether	210
Hexane	200	Acetone	330
Cyclohexane	200	Dioxane	320
		Cellosolve	320

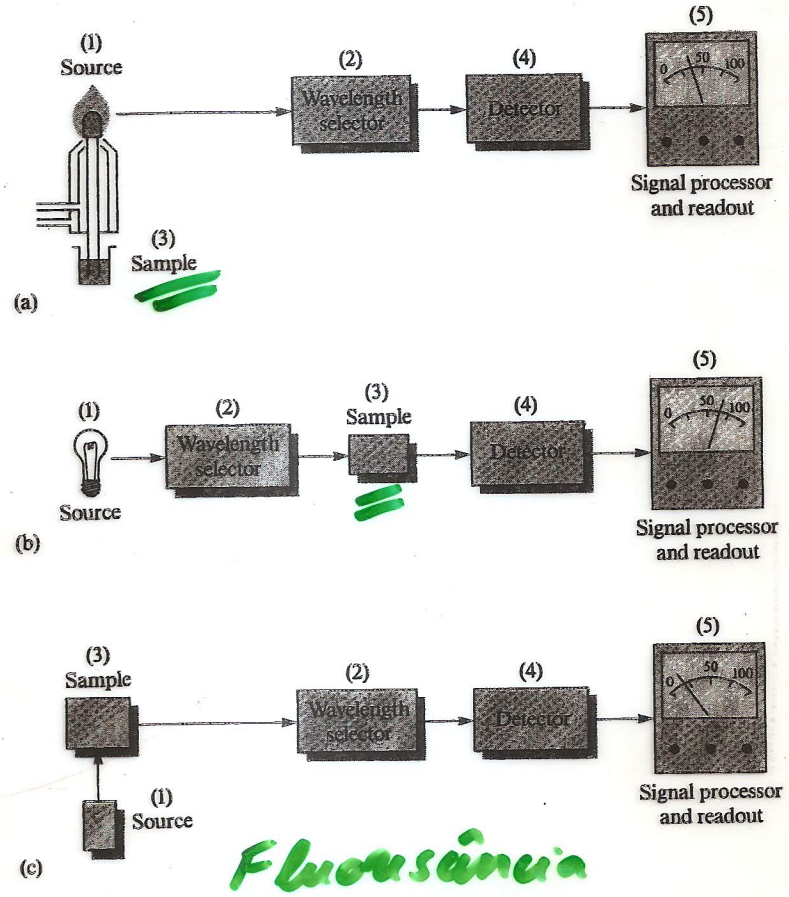


Figure 21–1
Components of various types of instruments for optical spectroscopy: (a) emission spectroscopy; (b) absorption spectroscopy; (c) fluorescence and scattering spectroscopy.

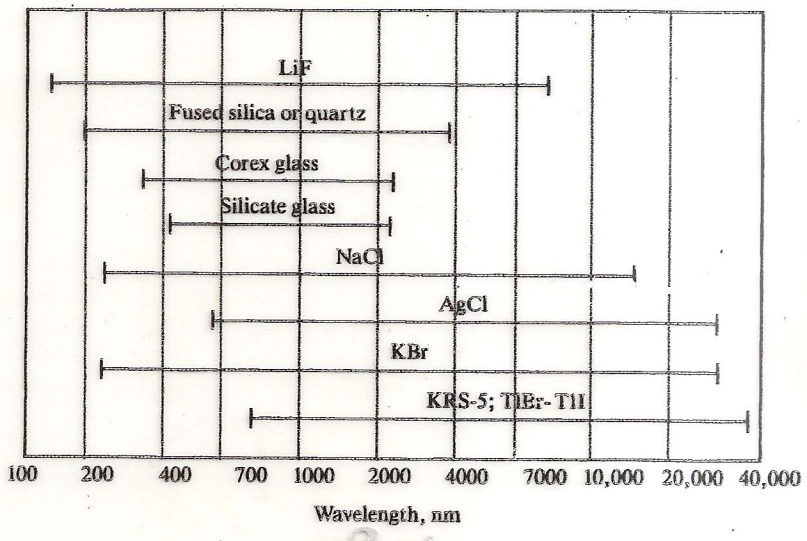


Figure 21–2
Transmittance range for various construction materials.

Espectrofotômetro multicanal