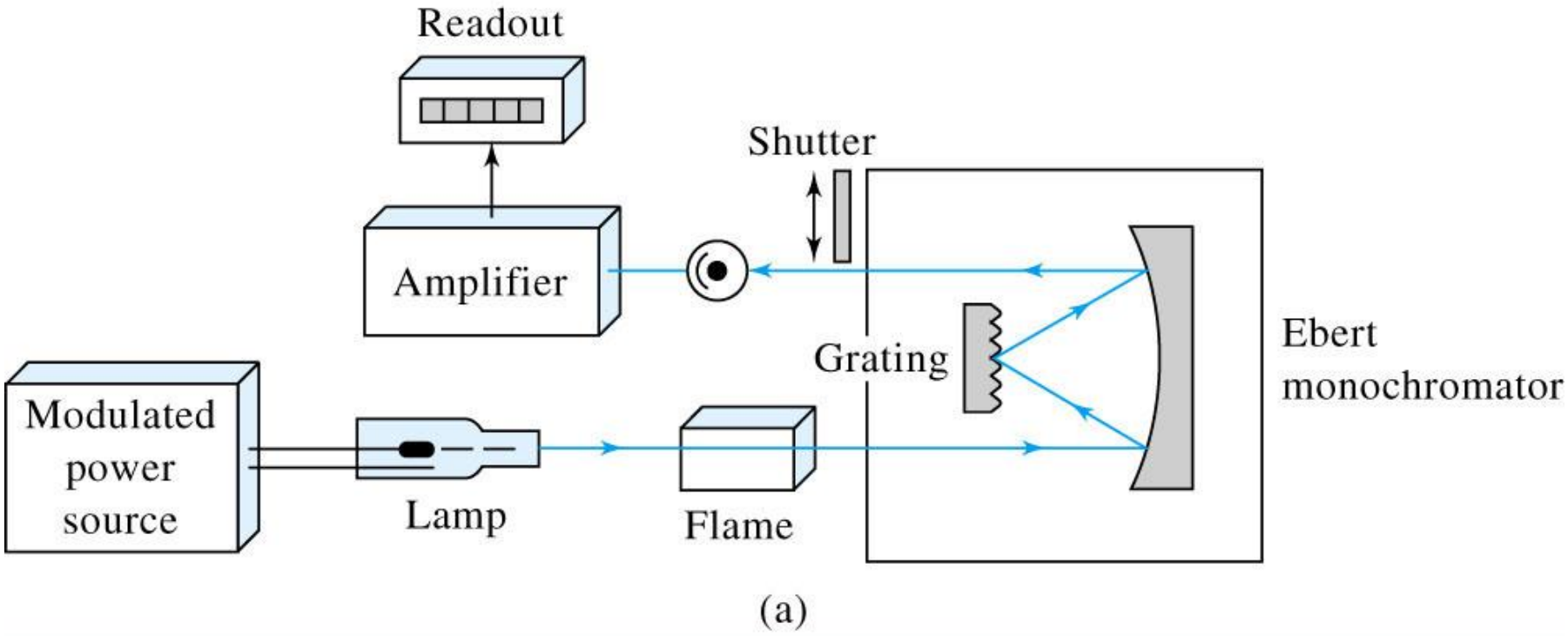
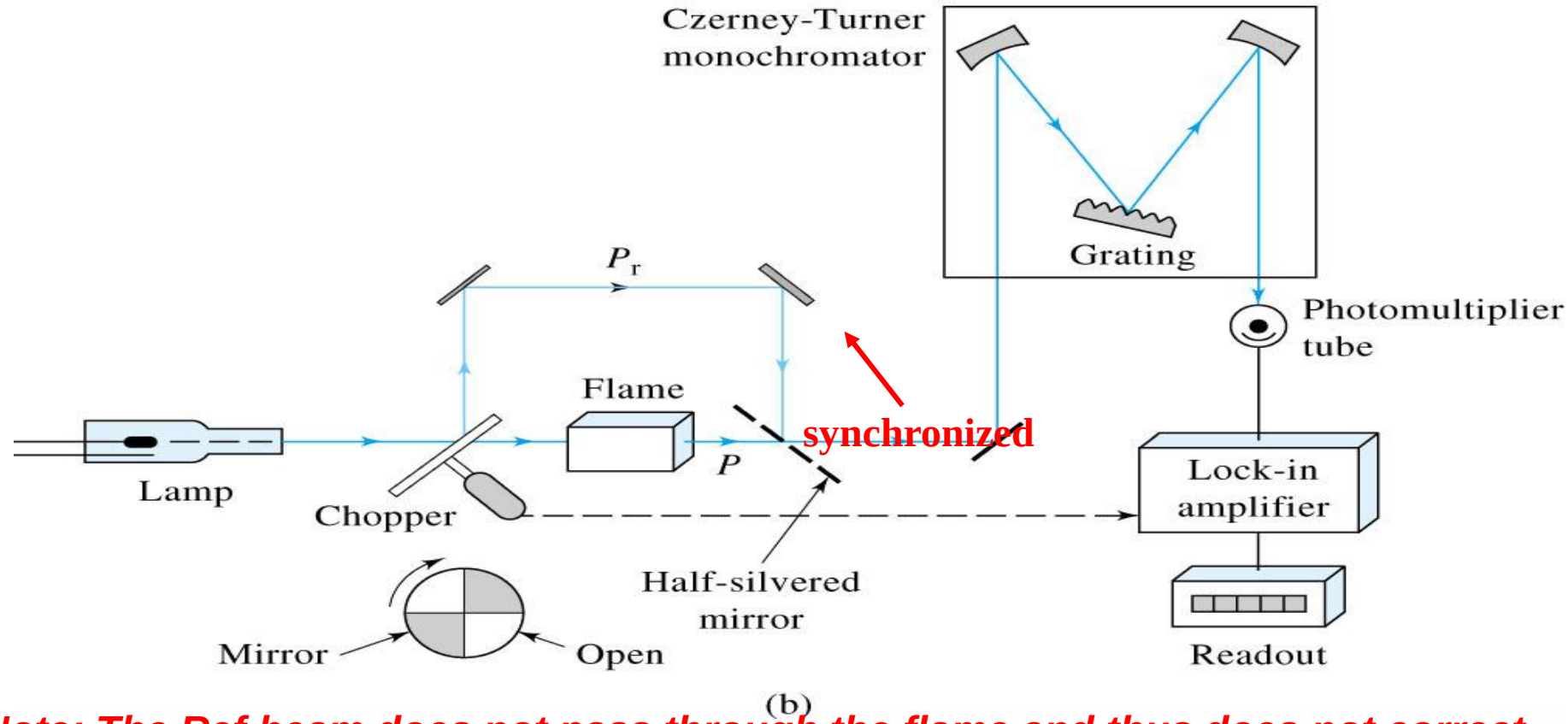
9B-2 Spectrophotometers

Single-Beam Instruments: A typical single-beam instrument, consists of several hollow cathode sources, an atomizer, and simple grating spectrophotometer with a photomultiplier transducer. The 100% T adjustment is then made while a blank is aspirated into the flame. Finally, the transmittance is obtained with the sample replacing the blank.



Double-Beam Instruments: In double-beam instrument the beam from the hollow cathode source is split by a mirrored chopper, one half passing through the flame and the other half around it. The two beams are then recombined by a half-silvered mirror and passed into a grating monochromator; a photomultiplier tube serves as the transducer. The ratio between the reference and sample signal is then amplified and fed to the readout, which may be a digital meter or a signal recorder.



(b)

Note: The Ref beam does not pass through the flame and thus does not correct for *loss of radiant power due to absorption or scattering by the flame itself.*

INTERFERENCES IN ATOMIC ABSORPTION SPECTROSCOPY

1. Spectral Interferences:

2. Chemical Interferences:

1. Spectral Interferences:

(I) Spectral line Interference:

Spectral interference can occur due to overlapping lines. e.g. a vanadium line at 308.211 nm interferes in an analysis based upon the aluminum absorption line at 308.215 nm. This type of interference can be avoid by employing the aluminum line at 309.27 nm instead.

(II) Interference due to Scattering:

Spectral interferences result from the presence of combustion products that exhibit *broadband absorption* or particulate products that *scatter radiation*. Both diminish the power of the transmitted beam. A blank can be aspirated into the flame to make the correction.

(III) Interference from the Sample matrix.

An example of a potential matrix interference due to absorption occurs in the *determination of barium in alkaline earth mixture*. The wavelength of Ba line used for atomic absorption analysis appears in the center of a broad absorption band for CaOH. The effect can be eliminated by substituting *nitrous oxide for air* as the *oxidant* which yields a higher temperature that decomposed the CaOH and eliminates the absorption band.