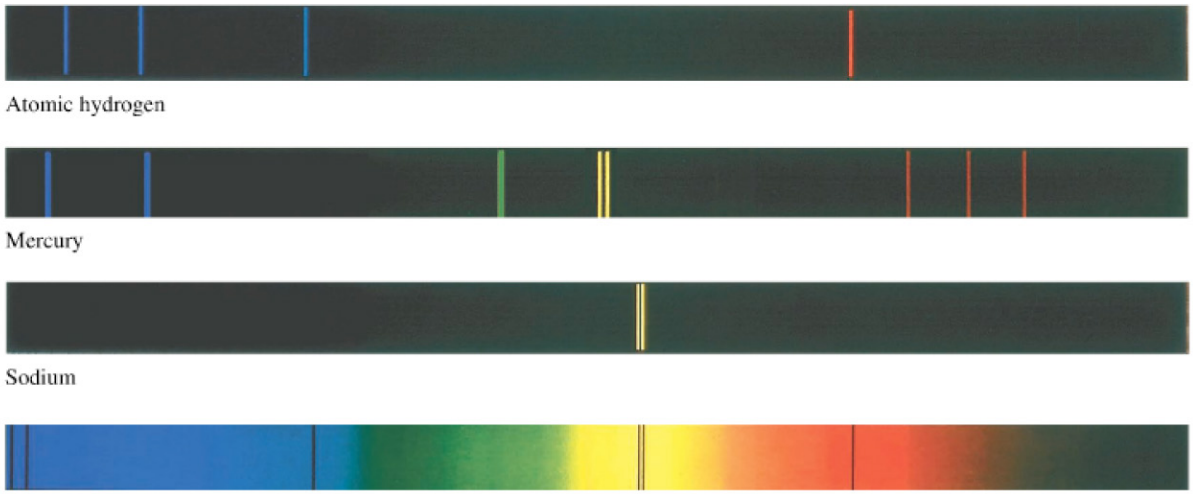


FIGURE 24–28 Line spectra for the gases indicated, and spectrum from the Sun showing absorption lines.

lines reveals that at least two-thirds of all elements are present in the Sun's atmosphere. The presence of elements in the atmosphere of other planets, in interstellar space, and in stars is also determined by spectroscopy.

Spectroscopy is useful for determining the presence of certain types of molecules in laboratory specimens where chemical analysis would be difficult. For example, biological DNA and different types of protein absorb light in particular regions of the spectrum (such as in the UV). The material to be examined, which is often in solution, is placed in a monochromatic light beam whose wavelength is selected by placement angle of a diffraction grating or prism. The amount of absorption, as compared to a standard solution without the specimen, can reveal not only the presence of a particular type of molecule, but also its concentration.

PHYSICS APPLIED

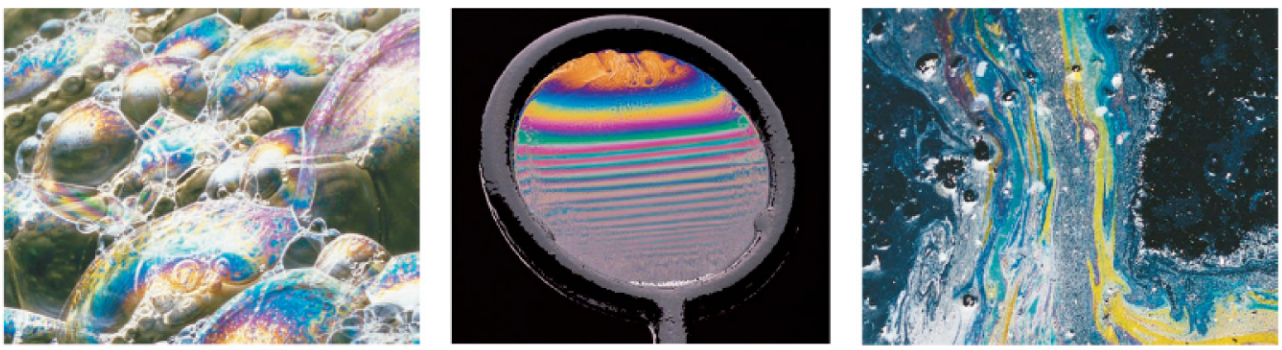
Chemical and biochemical analysis by spectroscopy

Light emission and absorption also occur outside the visible part of the spectrum, such as in the UV and IR regions. Glass absorbs light in these regions, so reflection gratings and mirrors (in place of lenses) are used. Special types of film or detectors are used for detection.

24–8 Interference by Thin Films

Interference of light gives rise to many everyday phenomena such as the bright colors reflected from soap bubbles and from thin oil films on water, Fig. 24–29. In these and other cases, the colors are a result of constructive interference between light reflected from the two surfaces of the thin film. The effect is present only if the thickness of the film is on the order of the wavelength of the light. If the film thickness is greater than a few wavelengths, the effect gets washed out.

FIGURE 24–29 Thin-film interference patterns seen in (a) soap bubbles, (b) a thin film of soapy water, and (c) a thin layer of oil on the water of a street puddle.



(a) (b) (c)