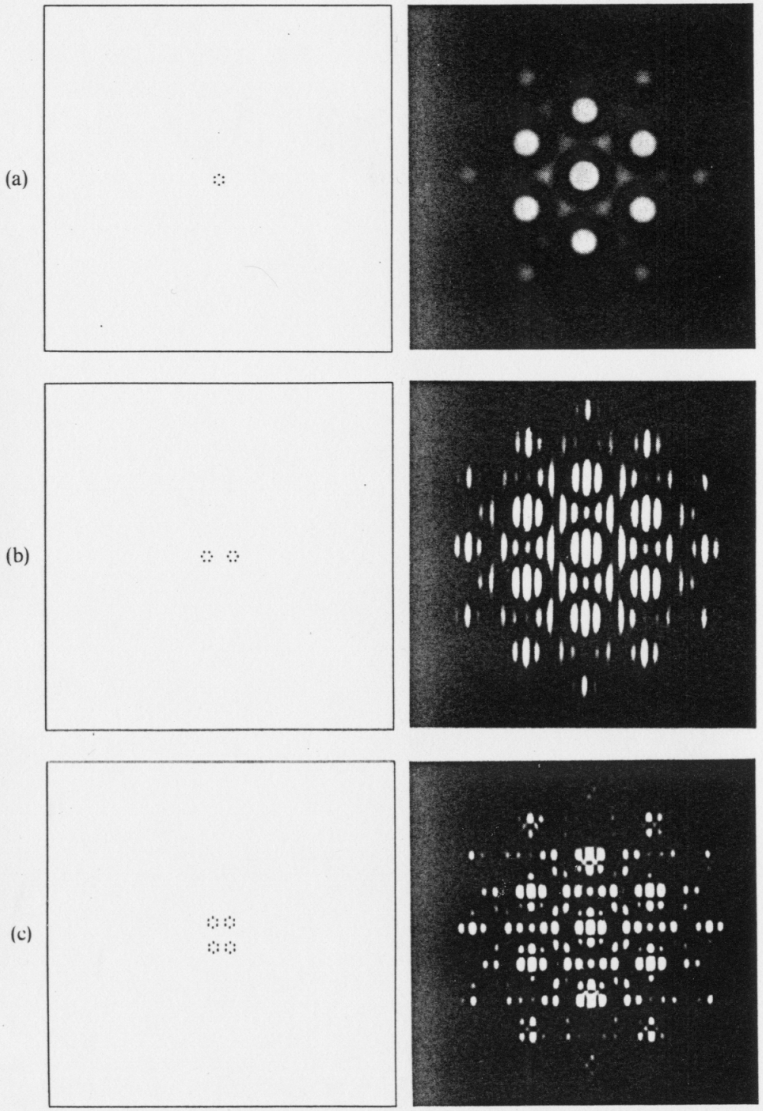
Box 13-4 OPTICAL DIFFRACTION PATTERNS FROM ARRAYS

The same mathematical formalism developed in the text to calculate x-ray diffraction from molecular arrays also applies to optical diffraction from arrays of slits or pinholes. The figures show the optical diffraction pattern from a series of opaque masks containing increasingly more elaborate arrays of pinholes. Such diffraction patterns can be created by the apparatus shown in Figure 10-4a by using the mask as a sample. The figures on the left show the sample masks used; the corresponding figures on the right indicate the diffraction patterns produced by the masks.



(a) A six-atom molecule, modeled by six pinholes. **(b)** Two six-atom molecules in a row. Note how the presence of two atoms introduces additional vertical fringes. **(c)** Four six-atom molecules. The horizontal repeat in structure leads to additional horizontal fringes. **(d)** A vertical row of many pairs of six-atom molecules. Note how the diffraction pattern sharpens in the vertical direction but remains broad in the horizontal direction. **(e)** A two-dimensional crystalline array of six-atom molecules. Note that the diffraction pattern is now a set of sharp spots. **(f)** A different crystalline array of the same molecules. The smaller reciprocal lattice results from the larger crystal lattice. [From G. Harburn, C. A. Taylor, and T. R. Welberry, *Atlas of Optical Transforms* (Ithaca, N.Y.: Cornell Univ. Press, 1975).]