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allow the cells to create an internal environment that is optimized for the biochemical reactions required for normal function. Specialization of cell types and their function is usually achieved by adding a novel organelle or structure, or by altering the mix of membrane proteins that provide pathways for ions and other solutes to move across the barrier. This chapter reviews some common principles of molecular and cellular function that will serve as a foundation for later discussions of how the various organs contribute to maintaining normal body function.

I. CELLULAR ENVIRONMENT

Cells are bathed in an extracellular fluid (ECF) that contains ionized sodium (Na^+), potassium (K^+), magnesium (Mg^{2+}), chloride (Cl^-), phosphate (PO_4^{3-}), bicarbonate (HCO_3^-), glucose, and small amounts of protein (Table 1.1). It also contains around 2 mM free calcium (Ca^{2+}). Ca^{2+} is essential to life, but many of the biochemical reactions required of cells can only occur if free Ca^{2+} concentrations are lowered ten-thousandfold, to around 10^{-7} mM. Thus, cells erect a barrier that is impermeable to ions

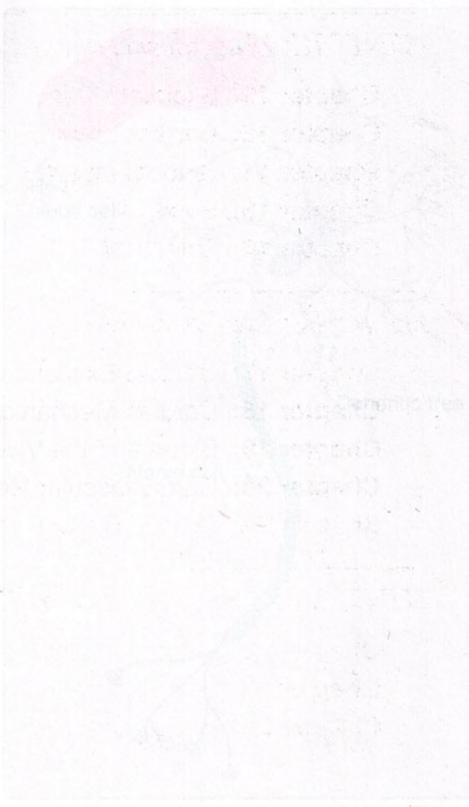


Figure 1.1
Differences in cell morphology