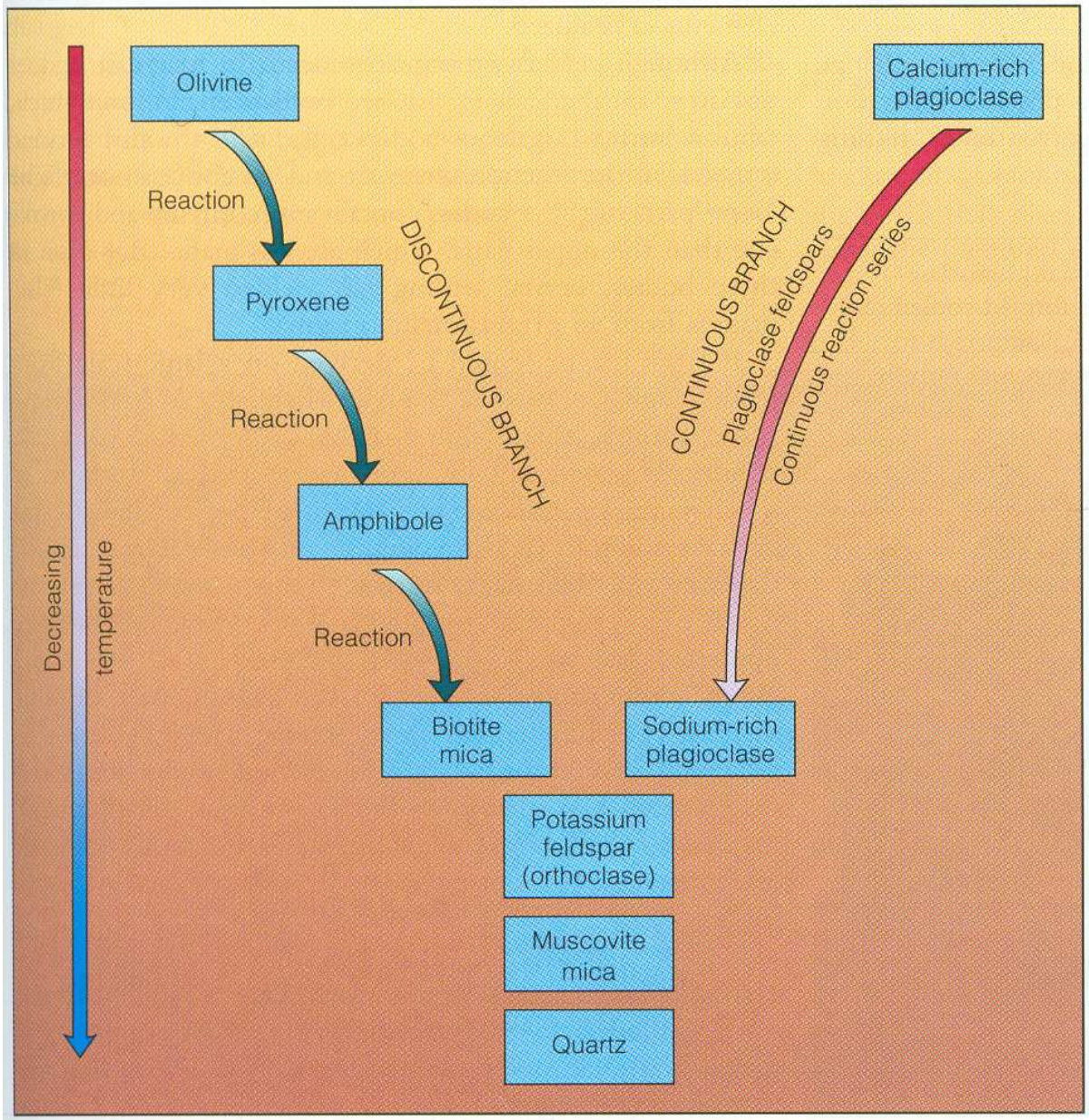
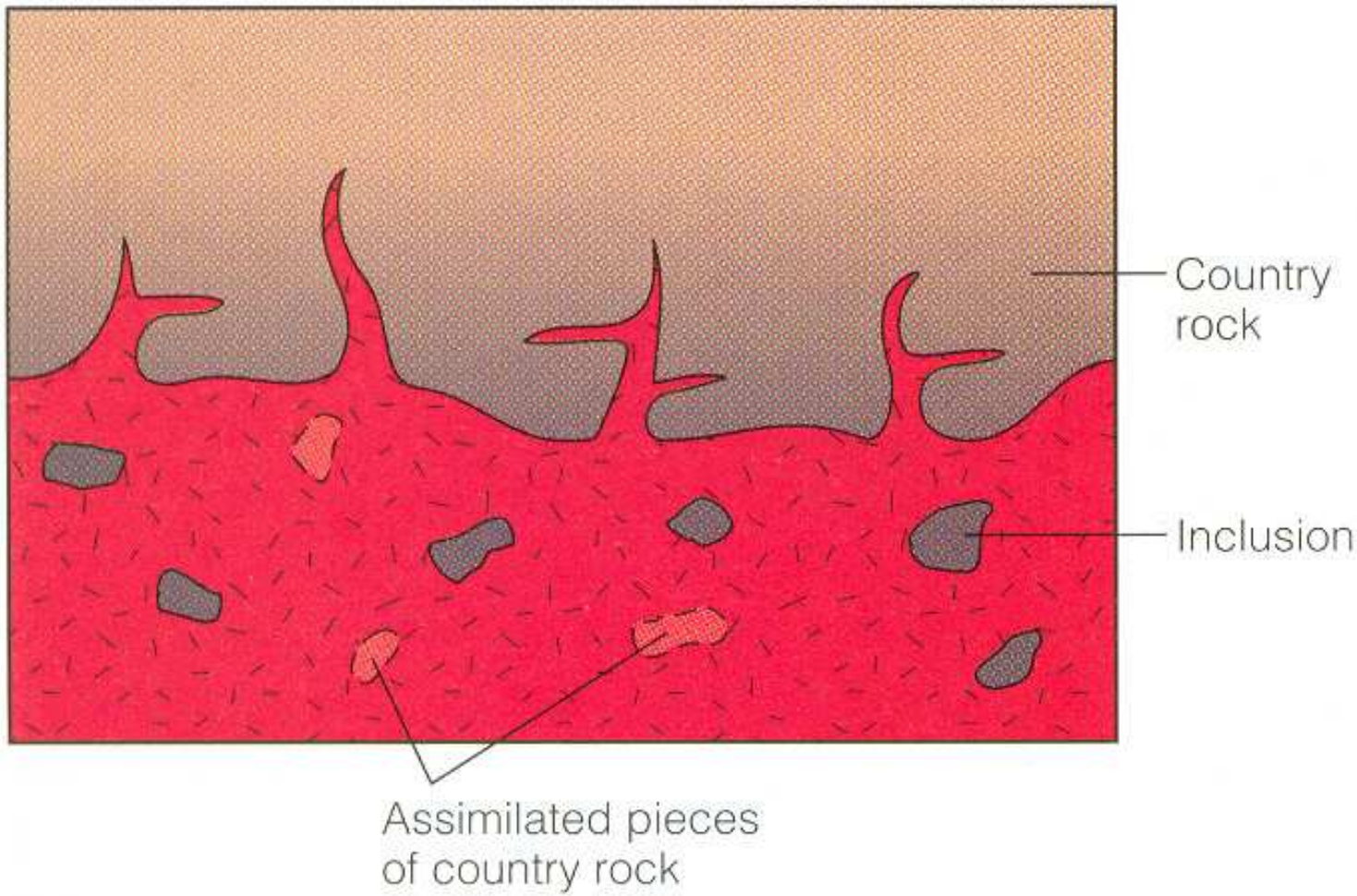
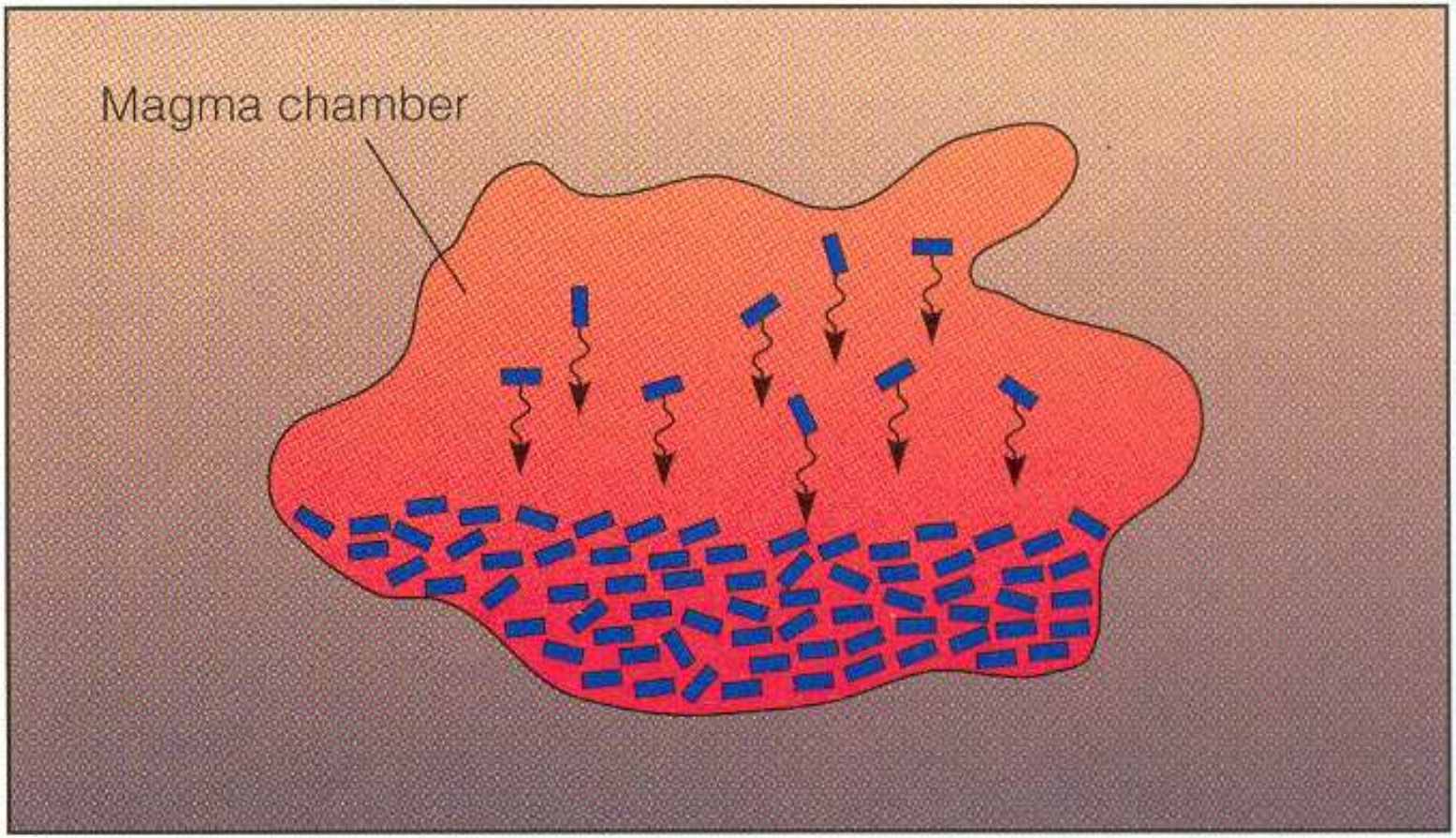


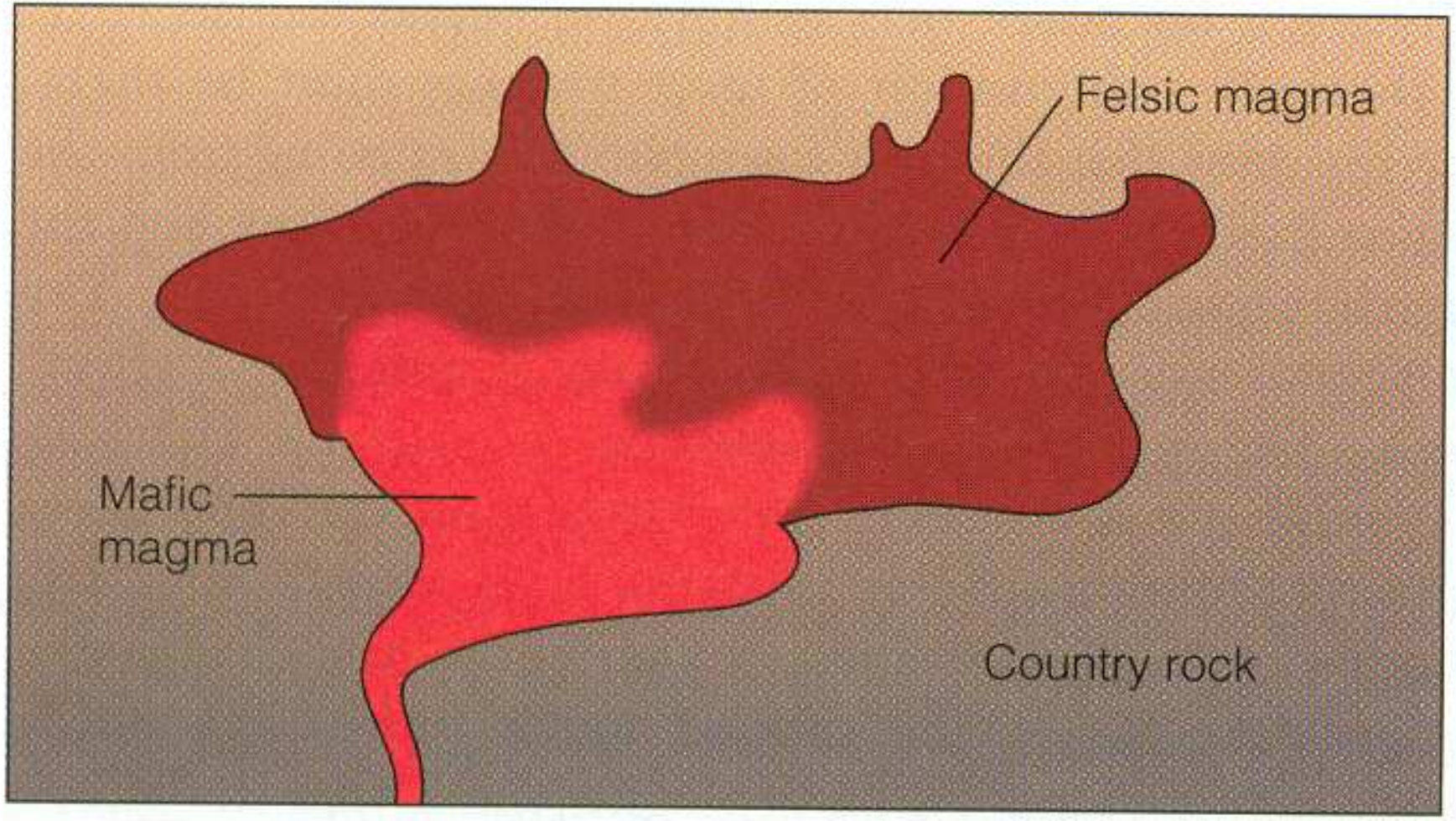
FIGURE 3-6 Bowen's reaction series. Note that it consists of a discontinuous branch and a continuous branch.



➢ FIGURE 3-9 As magma moves upward, fragments of country rock are dislodged and settle into the magma. If they have a lower melting temperature than the magma, they may b incorporated into the magma by assimilation. Incompletely assimilated pieces of country rock are inclusions.



➢ **FIGURE 3-8** Differentiation by crystal settling. Early-formed ferromagnesian minerals have a specific gravity greater than that of the magma so they settle and accumulate in the lower part of the magma chamber.



➢ FIGURE 3-11 Magma mixing. Two rising magmas mix and produce a magma with a composition different from either of the parent magmas.

➢ **FIGURE 3-20** Block diagram showing the various types of plutons. Notice that some of these plutons cut across the layering in the country rock and are thus discordant, whereas others parallel the layering and are concordant.

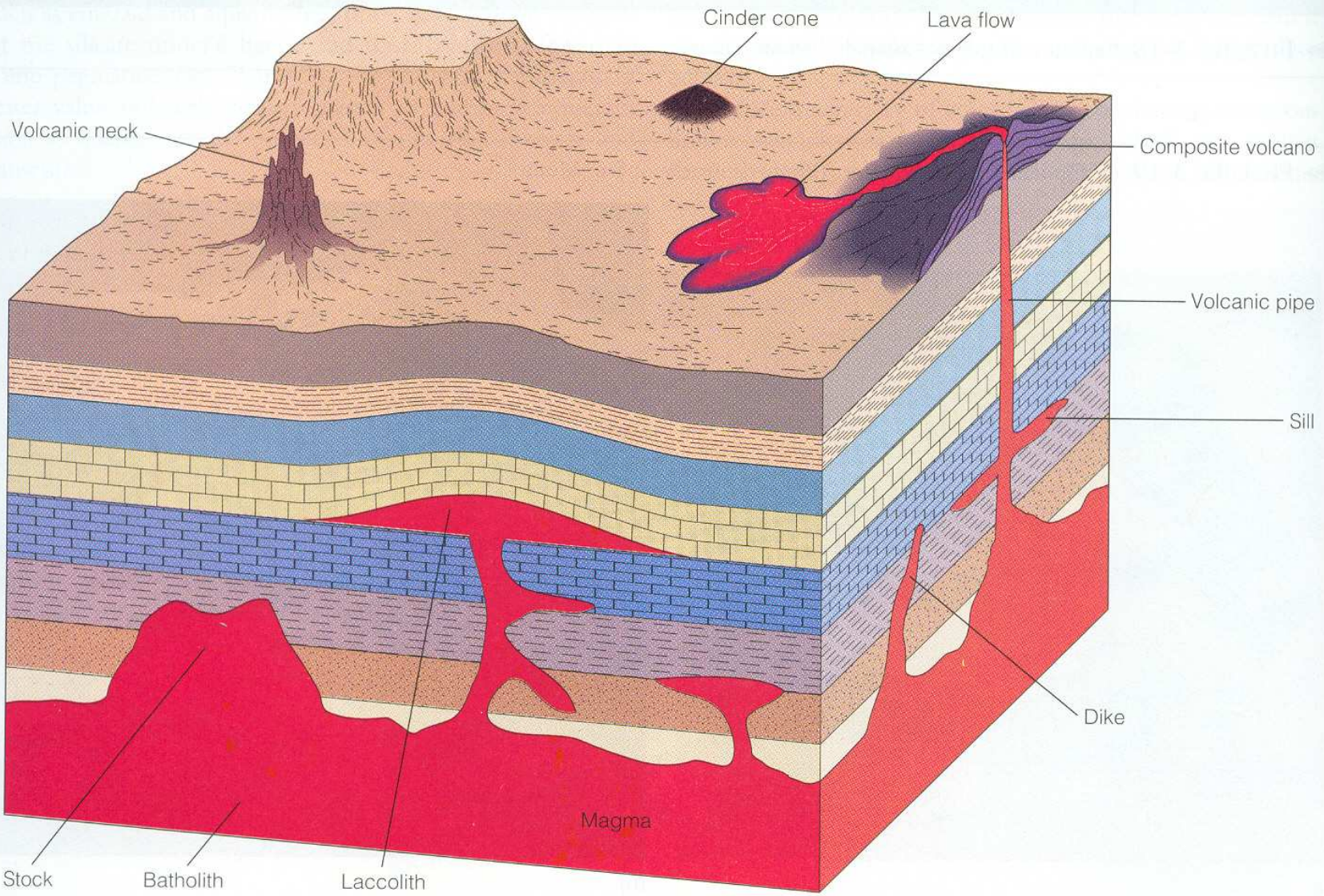
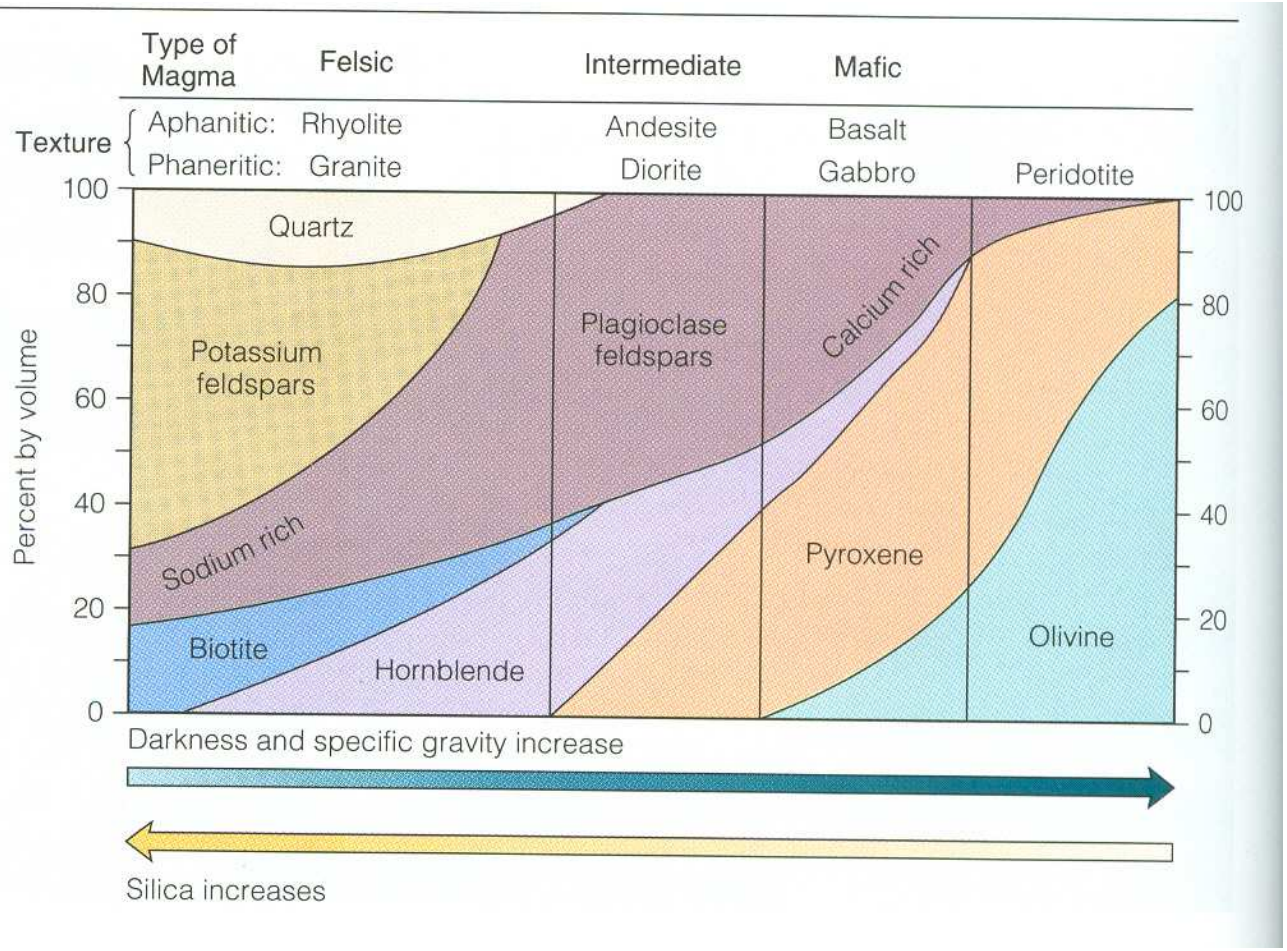


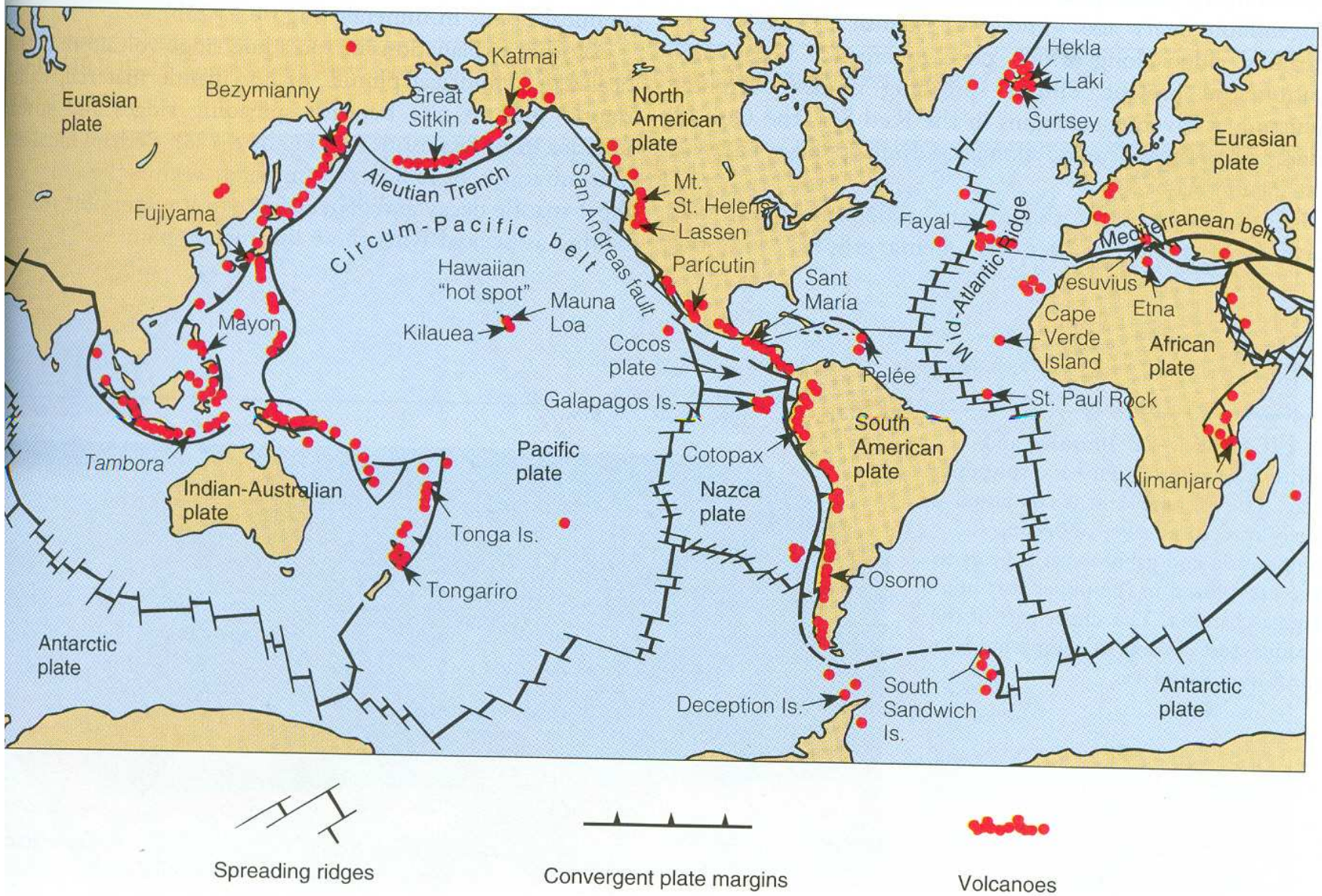
TABLE 3-1 The Most Common Types of Magmas

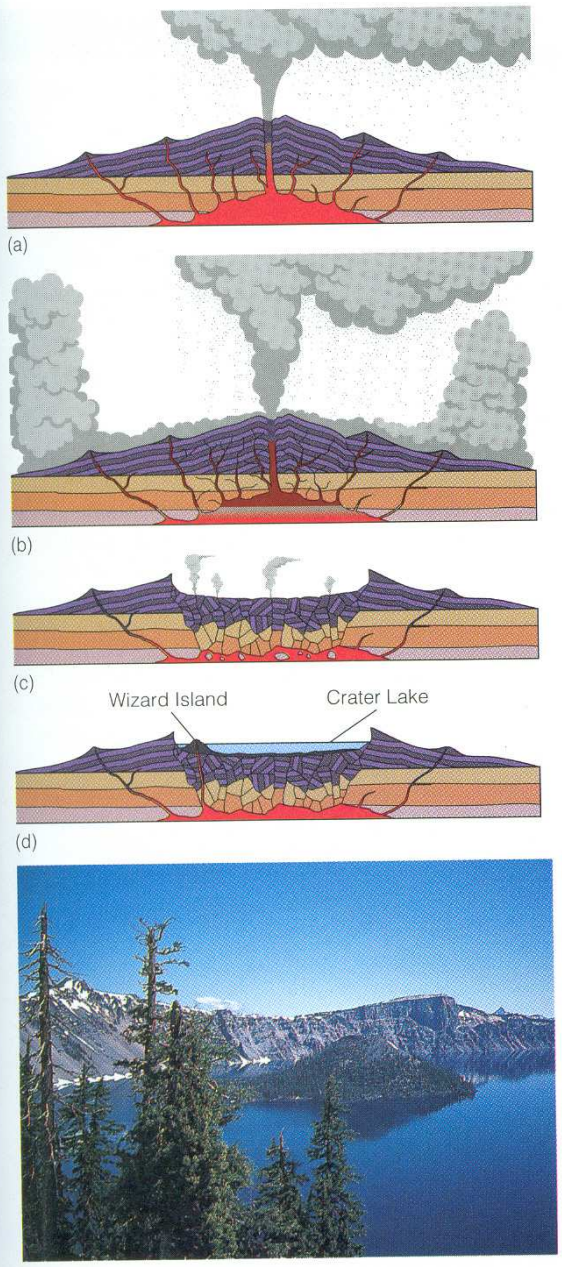
Type of Magma	Silica Content (%)
Mafic	45–52
Intermediate	53–65
Felsic	>65

➢ **FIGURE 3-12** Classification of igneous rocks. The diagram illustrates the relative proportions of the chief mineral components of common igneous rocks.

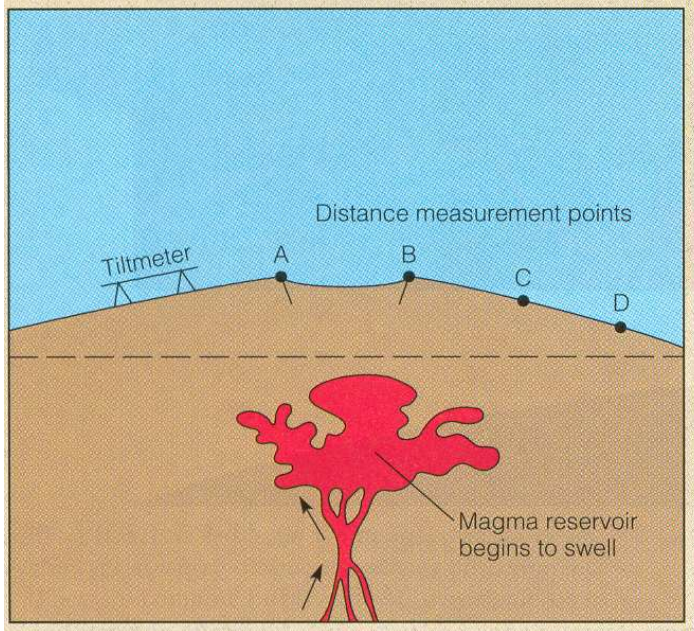


▶ FIGURE 4-21 Most volcanoes are at or near plate boundaries. Two major volcano belts are recognized: the circum-Pacific belt contains about 60% of all active volcanoes, about 20% are in the Mediterranean belt, and most of the rest are located along mid-oceanic ridges.

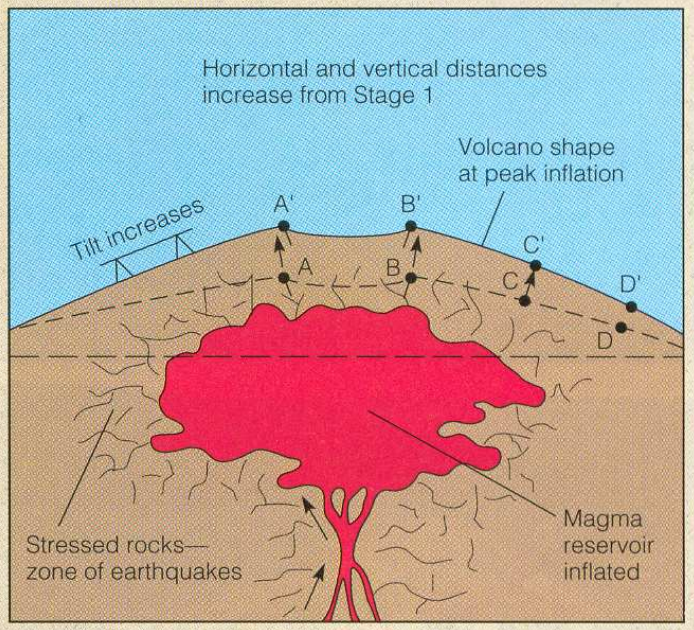




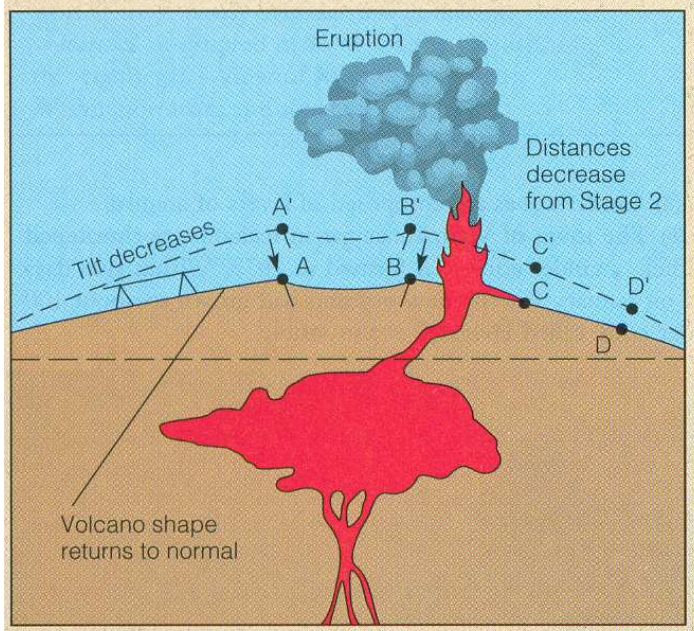
▶ FIGURE 4-12 The sequence of events leading to the origin of Crater Lake, Oregon. (*a–b*) Ash clouds and ash flows partly drain the magma chamber beneath Mount Mazama. (*c*) The collapse of the summit and formation of the caldera. (*d*) Post-caldera eruptions partly cover the caldera floor, and the small volcano known as Wizard Island forms. (*e*) View from the rim of Crater Lake showing Wizard Island.



(a) Stage 1



(b) Stage 2



(c) Stage 3

➢ **FIGURE 1** Volcano monitoring. These diagrams show three stages in a typical eruption of a Hawaiian volcano: (*a*) The volcano begins to inflate; (*b*) inflation reaches its peak; (*c*) the volcano erupts and then deflates, returning to its normal shape.